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Research Article **Open Access Journal**

Frequency of Type II Diabetes Mellitus In ST Segment Elevated MI Patients Presented to French Medical Institute for Mothers and Children: A Cross Section Study

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Abstract

Background: A significant risk of atherosclerosis is diabetes mellitus which ultimately induces cardiovascular disease, mainly affecting coronary arteries. Patients with diabetes have a risk for coronary events similar to those without diabetes who have already had an event, and conversely, many patients with established coronary artery disease have diabetes or pre-diabetes. The study looks at the frequency of diabetes mellitus in patients presenting with the acute coronary syndrome in the French Medical Institute.

Methods: A cross-sectional study design was utilized to conduct this study. Three hundred twenty-one individuals with acute myocardial infarction (AMI) were screened and presented to the Department of Cardiology of the French Medical Institute for Mothers and Children in Kabul, Afghanistan, from January 1, 2019, to December 30, 2019. All patients of any gender with ST Elevated Myocardial Infarction (STEMI) were included in the study and presented to our setting during the study period. Data were collected retrospectively from the patients' medical record files and then analyzed by logistic regression to look for results.

Results: Three hundred twenty-one patients were included in the study, 250 (78%) were males, and 71 (22%) were females. The mean age of the study participants was 57.5 years. The frequency of diabetes mellitus was 26%. There is a strong association between Killip classes and diabetic status (p-value=<0.04). Hypertension and heart failure were not significantly associated with diabetes in STEMI patients.

Conclusion: The frequency of diabetes mellitus in this study was significant as one out of every four patients with the acute coronary syndrome was diabetic.

Keywords: Diabetes mellitus, acute coronary syndrome, Killip Classes.

Frequency of Type II Diabetes Mellitus In ST Segment Elevated MI Patients Presented to French Medical Institute for Mothers and Children: A Cross Section Study

Introduction

A clinical situation associated with acute myocardial ischemia - acute myocardial infarction (AMI) is a condition when there is evidence of myocardial cell death(1). According to Task et al (1) for confirmation of the myocardial infarction (MI) diagnosis, it is necessary to have:

Upsurge and/or drop in cardiac biomarker (cardiac troponin T or I), at least one overhead the 99th percentile upper reference limit, and at least one of the following criteria:

1. Symptoms of ischemia
2. Fresh or assumed new-onset major ST-segment–T wave (ST-T) deviations or new branch block of the Left bundle (LBBB)
3. Pathologic Q waves on the electrocardiography
4. Novel damage from viable myocardium or new regional wall motion abnormality observed by imaging devices
5. thrombus within coronaries detected by angiogram or autopsy used

Classification of STEMI:

Clinically according to Lippi et al (2), MI is divided into five following classes:

- Type 1: MI resulting from plaque separation, destruction, or dissection
- Type 2: MI resulting from demand and supply mismatch, also called demand ischemia
- Type 3: Sudden Cardiac Death with ischemic symptoms, new ST-elevation or LBBB, but biomarkers unavailable
- Type 4a: Myocardial infarction related with angioplasty
- Type 4b: MI due to thrombosis of stent
- Type 5: MI related with CABG

According to Thygesen et al (3) criteria of Diagnosis of Old Myocardial Infarction are:

1- Waves of pathologic Q with or without symptoms

2- Imaging marks of a viable myocardium region loss that is diluted and cannot contract without a non-ischemic cause

3- Pathologic markers of a previous M

Even with essential advancements in medicine in 21 century, ST-Elevation Myocardial Infarction (STEMI) is still a significant public health problem in developed and developing countries, (4) annually more than 1 million patients are hospitalized only in the United States. (5) Coronary disease events, especially MI, are increasing in low-and-middle-income countries, which is considered a substantial public health problem. (6) The primary cause of death worldwide is cardiovascular disease. Rendering to the 2010 Global Status Report of the World Health Organization on non-communicable conditions, over 80% of mortalities from heart and vascular illnesses happen in low- and middle-income countries, with no differences between men and women. (7)

Cardiovascular disease risk factors are unhealthy nutritional regimes, physical inactivity, and smoking. These factors predispose individuals to high blood pressure, dyslipidemia, high blood sugar level, and obesity. The aggregating incidences of obesity and inactive lifestyles—key risk factors for diabetes mellitus type 2 in both developed and developing countries—will cost more diabetes is a rising clinical and public health issue worldwide. (8)

The risk factors of coronary artery disease (CAD) were recognized in the early 1960s after the preliminary results of the Framingham Heart Study. Conventional risk factors and non-traditional or new risk factors are two sets of risk factors for CAD. Traditional risk factors for CAD contain older age (age > 45 years in men, age >55 years in females), high blood cholesterol levels, family history of early heart disease, tobacco usage, high blood pressure (BP), diabetes mellitus, inactive lifestyle, metabolic syndrome, obesity, mental problems and psychological issues. (9) Conventional risk factors are further split as risk factors that are changeable and not changeable. Risk factors that are not changeable are age, sex, genetic factors, race, and ethnicity, while modifiable risk factors are tobacco usage, high BP, diabetes mellitus, dyslipidemia, lack of physical activity, and obesity. (10) Non-traditional or novel risk factors have been identified recently, that include high levels of lipoprotein (a), fibrinogen, C-reactive protein (CRP), homocysteine, and small-dense LDL-C particles. (9)

The prevalence of diabetes (type-2 Diabetes) has risen dramatically over the past 30 years.

According to Global Burden of Disease (GBD) research, approximately 346 million people worldwide have diabetes. (11) More than 430 million persons, 7.7% of the global adult population, are predicted to suffer from diabetes by 2030. (11) According to International Diabetes Federation (IDF), 371 million individuals had diabetes in 2012. The global prevalence of diabetes was 8.4% in the 20 to 79 years aged population. (8)

Multiple analytical studies show the association between diabetes mellites and acute coronary syndrome (ACS). INTERHEART, a large-scale standardized, case-control research study including 15,152 patients with acute myocardial infarction and 14,820 controls, observed the association between main cardiovascular risk factors, like hypertension, diabetes mellitus, and lifestyle, and myocardial infarction in 52 nations globally. The research recognized diabetes mellitus to be related to more than twofold adjusted odds for the development of MI (odds ratio [OR] 2.37, 95% confidence interval [CI] 2.07-2.71). (12)

Studies have also shown that diabetes mellitus makes myocardial infarction more complicated. The risk of developing cardiogenic shock and conduction disorders is much higher in diabetic patients than in non-diabetics. (13) AMI patients with diabetes have an ominously greater mortality rate than non-diabetics. Poor control of blood glucose may worsen the prognosis for AMI. (13)

In summary, Diabetes mellitus is a significant risk factor for CAD. The prevalence of DM is increasing globally; about one-half of CAD patients with diabetes are undiagnosed. Based on observational data, new guidelines recommend screening of blood glucose levels in patients with ischemic heart disease, including those with ACS. (8)

According to the WHO, non-infectious diseases kill 41 million individuals yearly, equal to 71% of global mortalities. 15 million people between the ages of 30 and 69 years expire every year from a non-infectious disease; over 85% of these "premature" expiries occur in countries with low and medium income. Cardiovascular diseases account for most non-communicable disease (NCDs) mortalities, 17.9 million individuals yearly. Malignancies, airway disease, and diabetes kill 9.0 million, 3.9 million, and 1.6 million people annually and can cause over 80% of premature deaths. Smoking, inactive life, heavy alcohol drinking, and harmful diets increase the risk of death from non-communicable diseases. Diagnosis, screening, and treating non-infectious diseases, and prevention, are primary measures of the response to NCDs. (7)

In South Asia, approximately 50% of the adult disease load is attributed to non-infectious diseases. For nearly all non-infectious diseases, ecological components are the leading causes. Inactive routines, life-threatening shortages, and inadequate health care services are common challenges in managing non-infectious diseases in South Asia. India has a higher prevalence of diabetic patients. (14)

Fifty-two percent of cardiovascular deaths occur in India below 70, compared to 23% in countries with good economies. In the Maldives, 48% of all deaths are caused by non-communicable diseases, and strokes account for 11% of non-communicable disease deaths. (14)

Around 35% of all mortalities in Afghanistan are attributed to non-communicable diseases like heart and vascular diseases and malignancies, whereas nearly 3/10 are attributed to communicable diseases and infections. (15) In women, the significant causes of death are contagious and parasitic diseases (18%) and cardiovascular diseases (18%), followed by airway infections (15%) and perinatal circumstances (12%). Airway infections, infectious/parasitic diseases, and perinatal conditions are the leading causes of mortality in female babies under five, accounting for 77% of expiries. Cardiovascular diseases outweigh these at ages 15-59 years (23%) and 60 and over (45%). Maternal circumstances account for one in every five deaths of women ages 15-59, whereas injuries cause 9% of deaths in this age group. (15) Though more than 80% of the international burden of heart and vascular disease happens in low- and middle-wage states, information on the study of risk factors is mainly derived from industrialized states. Consequently, the impact of such variables on risk of coronary heart disease remain uncertain in most regions of the world. (12)

According to medical literature, the mortality risk in MI patients is more than doubled in males and quadrupled in females who have diabetes, relative to the rate in their non-diabetic counterparts(16). Therefore, the early screening for diabetes mellitus, its detection, and reasonable control can help prevent the mortality of MI patients. Diabetes mellitus predisposes the pre-ischemic patients to MI and increases mortality in MI patients. Therefore, finding the percentage of DM in MI patients is reasonable. (16)

According to the literature review, the frequency of DM is rising. Therefore it is reasonable to conduct research in this area. According to International Diabetes Federation (IDF), in 2012, 4.8 million people expired from complications of diabetes mellitus.(17) The prevalence is growing, and about 640 million adults are expected to have diabetes by 2040.(18) In the ranking of causes of death, diabetes will change from rank 11 in the year 2002 to rank 7 in 2030.(19)

Because of ethnic, economic, and cultural differences, populations have different situations; therefore, all studies' results will not be applied universally. Our region is distinctive based on various social, economic, and cultural condition.

Afghanistan is located between central and south Asia, with approximately 31 million populations. Four decades of continued war have contributed to a large extent to the increased morbidity and mortality in this country. The low education level of people has contributed to low levels of awareness regarding health issues in Afghanistan; this could result in the high prevalence of non-communicable diseases. As far as we know, such studies have not been carried out in Afghanistan to this date. We believe our study will contribute to filling the available gap in this field.

All risk stratification systems (e.g., GRACE SCORE or TIMI SCOR) in acute MI patients count DM as an essential factor in classifying high-risk and low-risk patients in Emergency Department. Diabetic, old age, and renal failure increase the risk of complications and death during the hospital stay and after discharge. Therefore, it is necessary to know the percentage of DM in MI patients and their prognosis. This study will help clinicians follow the diabetic patients with MI more strictly and improve the quality of treatment.

Objective:

To present the frequency of diabetes mellitus type II in myocardial infarction patients at French Medical Institute for Mothers and Children, Cardiology Department.

Research Question:

What is the frequency of diabetes mellitus type II at the French Medical Institute for Mothers and Children in myocardial infarction patients?

Literature Review

Search strategy:

Multiple online databases and search engines like Pub Med, Sci-Hub, Science Direct, Google scholar, and Hinary webs were opened to check for papers relevant to the research aim using key terms: Frequency, Diabetes mellitus, and Acute Myocardial Infarction. The search date was set from 1997 to 2019. Relevant studies were selected after reviewing the abstracts and titles, and eventually, approximately 30 research articles were reviewed, out of which 24 relevant studies were cited in the text.

Background:

Diabetes and CAD:

Diabetes mellitus is quickly evolving, and the international health concern is that it will hit pandemic levels by 2030, with the most devastatingly rising in developing states. (20) Diabetic patients are at high risk for serious health issues, such as cardiovascular disease (CVD), early demise, blindness, renal failure, amputations, hopelessness, and psychological problems. The most prevalent complication linked to diabetes is CVD. (21)

Patients with diabetes mellitus tend to transition rapidly from early to severe atherosclerosis. (22) There is confirmation that even with the onset of the diagnosis, the patient has an augmented propensity to develop coronary artery disease. (23) Diabetes is a major modifiable risk factor for ischemic heart disease. According to the Framingham Heart Study, the risk of IHD is double in diabetic men and triple in diabetic women compared to those with age-matched diabetes-free subjects. (2)

Diabetes mellitus increases the risk of myocardial infarction. People with diabetes have even worse CVD following ACS events. (24) Based on the Emerging Risk Factors partnership without a history of diabetes, stroke, or MI at baseline (reference group), the all-cause mortality rate adapted to 60 years was 6.8 per 1000 individual years. The rate of deaths and morbidity from coronary artery disease is higher in diabetic patients than in diabetes-free patients. Mortality rates per 1000 person-years for participants with a history of diabetes were 15.6, 16.1 for those with stroke, 16.8 for those with MI, 32.0 for those with both diabetes and MI, 32.5 for those with both diabetes and stroke, 32.8 for those with both stroke and MI, and 59.5 for those with diabetes, stroke, and MI.(25, 22, 3) In addition to ischemic heart disease, diabetes has increased the chance of cerebrovascular disease, heart and vascular disease, and peripheral arterial disease. Patients with diabetes have a double risk of stroke compared with non-diabetic persons. (25)

The Emerging Risk Factors Collaboration commenced a large meta-analysis that showed doubled risk of results such as ischemic heart disease, coronary death, and nonfatal MI among subjects with known diabetes. They also found a strong association between diabetes with fatal MI suggesting stronger manifestations of coronary disease in those with diabetes. (26)

Between November 1997 and 31 December 2000, a study conducted on 134 consecutive ACS patients in the Cardiac ward of Jikei College School of Medicine in Japan, aiming to find the prevalence of post-challenge hyperglycemia in acute coronary syndrome patients who were non-diabetics previously. The results showed impaired glucose tolerance (IGT) and diabetes reported in 50 (37%) and 13 participants (10%) of ACS patients, respectively. (27)

Data in a study from the International Record of Acute Coronary Syndrome, observational research on patients admitted with ACS, included 1616 participants, including 5403 with acute myocardial infarction with STEMI and 4725 with acute myocardial infarction with NSTEMI and 5988 with unstable angina.

The study revealed that about 1 in 4 patients had diabetes. Patients with diabetes were middle-aged to elderly. More often, females had a higher rate of comorbidity disease and were less likely than non-diabetic patients to be treated with successful cardiac therapy. For each hospital outcome studied, including heart failure, renal failure, cardiogenic shock, and death, patients with diabetes who developed an ACS were at elevated risk. After correction for possibly confounding prognostic variables, these discrepancies persisted. Compared to patients without diabetes, many patients with ACS have diabetes and are at higher risk for bad results. In the diabetic community, some confirmed therapeutic methods persist underused. For diabetic patients who experience an ACS, a more extensive understanding of this elevated risk and more careful use of established cardiac care methods are suggested. (28)

Between Nov 1, 1998, and Dec 15, 2000, Norhammar et al (29), in a prospective study in CCUs of two hospitals in Sweden, included 181 consecutive acute myocardial infarction patients with no prior history of diabetes and a blood glucose level of less than 11.1 mmol/L. HbA1c on admission ($p<0.024$) and fasting blood glucose concentration on day 4 ($p<0.044$) were independent predictors of elevated glucose tolerance at three months. (29)

Furthermore, a prospective study was conducted by Ishihara et al (30) at Japan's Hiroshima City hospital between August 1999 and December 2003 to assess if admission hyperglycemia is a proxy for formerly undiagnosed impaired glucose tolerance in non-diabetic patients with acute myocardial infarction. In this study, 200 diabetes-free participants with myocardial infarction were separated into 3 clusters: 81 patients with admission glucose <7.8 mmol/L (cluster 1), 83 patients with admission glucose equal to or more than 7.8 mmol/L and <11.1 mmol/L (cluster 2), and 36 patients with admission glucose ≥11.1 mmol/L (cluster 3). An oral glucose tolerance test (OGTT) was used to detect abnormal glucose tolerance, diabetes, or impaired glucose tolerance (IGT). Fifty-three patients (27%) had diabetes, and 78 patients (39%) had impaired glucose tolerance, respectively, by OGTT. Nevertheless, only 14 patients (7%) had diabetes when the standards of fasting glucose were applied. The frequency of abnormal glucose tolerance was comparable in the three groups: 67% (cluster 1), 63% (cluster 2), and 69% (cluster 3) (P < 0.74). (30)

In 2008 Onybuchi et al (31) conducted a cross-sectional study of over one hundred and forty participants admitted with the diagnosis of acute coronary syndrome to the hospital. The study objective was to look at the frequency of undiagnosed abnormal glucose tolerance, i.e., Diabetes mellitus and impaired glucose tolerance (IGT) in ACS patients, and to investigate the usefulness of admission and fasting glucose in recognizing diabetes mellitus. The result revealed that the frequency of diabetes and IGT were 27% and 39%, correspondingly, based on OGTT standards. A FPG limit ≥5.6 mmol/l (100mg/dl) and/or admission plasma glucose (APG) ≥7.8 mmol/l (140 mg/dl) produced a sensitivity of 89.5% and a positive predictive value of 43.6% for detecting diabetes. (31)

Several studies have been conducted in our region investigating the frequency of diabetes mellitus in ACS patients. Over 171 patients with coronary artery syndrome and acute myocardial infarction were recruited by the study conducted in Pakistan to find the effect of non-diabetic hyperglycemia on morbidity and mortality of acute coronary syndrome. It indicated a rise in mortality with a rising degree of hyperglycemia, with a (p-value of 0.058). Impaired left ventricular function, and clinical evidence of left ventricular dysfunction has also been associated with hyperglycemia. Insulin therapy has been underused and may have led to high morbidity and deaths. According to this study, they also found that 37.34% of patients with ACS had diabetes. (32)

Another study from Pakistan investigated the frequency of diabetic patients presenting in a cluster with the acute coronary syndrome. The findings revealed that 31.6% of patients with ACS had diabetes. 25.6% of patients were known for diabetes, 74.4% had no record of diabetes, and 6% were newly diagnosed as diabetics. Forty one (52%) patients with diabetes were men, and 38 (48%) were women. (33)

A more recent study was conducted by Lalatendu et al (34) at Kalinga Institute of Medical Sciences, Bhubaneswar, Odisha, India, aiming to find the frequency of diabetes in myocardial infarction patients, either previously diagnosed or newly detected diabetics. Male and female participants were 63.5 percent and 36.5%, respectively. The mean age was around 66 years. The majority of the patients were obese or overweight with high cholesterol and triglyceride levels. Of the 104 participants, 59 (56.7%) were non-diabetics, and 29 (27.9%) were known as people with diabetes. 11 (10.6%) of them were newly diagnosed as diabetic patients. (34)

Considering diabetes in Afghanistan, World Diabetes Foundation has reported that around 1 million Afghans have diabetes, and its prevalence is estimated between 5-9% of the general population. 1-2 million additional people might have undiagnosed diabetes. (17) Hyperlipidemia, hypertension, cigarette smoking, and diabetes mellitus are risk factors for atherosclerosis. Diabetes mellitus and ACS has an important co-effect in the context of public health. Therefore, looking for the frequency of diabetes mellitus in ACS patients is relevant. This study can help contributors concentrate on this difficulty and with policymakers propose further interventions.

Gap Analysis:

It is appropriate to know the frequency of diabetes mellitus among STEMI patients in Afghan patients because of the importance of diabetes mellitus and ACS in the context of public health to encourage care providers to reflect on this issue as well as the policymakers to propose concrete measures. Unfortunately, there is no reported frequency of diabetes mellitus in ACS patients in Afghanistan. Regional studies on the topic are limited and insufficient to reflect the conditions in Afghanistan, owing to socio-demographic, educational, geopolitical, climate, and lifestyle variations. Considering the lack of studies related to this topic in Afghanistan, this study was undertaken to obtain baseline information on the concerned topic to guide the course of future research and practice implications.

Methodology

Study Design:

An observational descriptive cross-sectional research design was used to find the aims of this research. A cross-sectional study observes data from a population at one exact time. The members in this study are carefully chosen based on specific variables of concern. Cross-sectional studies are qualitative, not causal or relational, and are referred to as descriptive analyses, which means that we do not use them to assess the cause of something such as a disease. Researchers record information in a population but do not control variables.

Study Setting:

The research was carried out at the French Medical Institute for Mothers and children (FMIC). FMIC is a tertiary care hospital located in Kabul, Afghanistan. The cardiology department of FMIC is well equipped with brand new machinery and has an expert cardiology team.

Study Population:

The study population was comprised of all the patients who presented to the FMIC Cardiology Department with the complaint of chest pain with Acute Myocardial Infarction.

Study Period:

From 01 January 2019 to 31th December 2019.

Data Collection Period:

Data of the patients from 01 January 2019 to 31 December 2019 was included in this study.

Data Collection Tool:

A structured data collection form was developed by primary investigator under supervision of the supervisor to collect the data.

Data Collection Method:

Data was collected from the history of patients recorded in their files from medical record department of French Medical Institute for Mothers and Children and recorded on data collection paper. A pretest was done before collection. The data collection form is attached to annex 2.

Variables:

The following variables were recorded:

1) Age
2) Gender
3) Smoking status
4) Alcohol drinking
5) Diabetes mellitus
6) History of HTN
7) Dyslipidemia, total cholesterol, LDL and HDL
8) Family history of IHD
9) Individual and family history of ischemic heart disease, and revascularization by PCI or CABG.
10) Heart rate
11) Systolic blood pressure
12) Killip classes
13) ECG
14) Echo
15) Type of MI
16) HFrEF
17) HFmEF
18) HFpEF
19) Cardiogenic shock
20) Pulmonary Edema

Data Management:

Data was collected by principal investigator in soft and hard forms. Double entry was done to minimize the error in data entry and then data was cleaned and edited. Soft copies were kept in secured database and hard copies were kept safe by the principal investigator. A unique ID was dedicated to each patient.

Plan for Data Analysis:

Package SPSS 25.0 was used to analyze the data. Descriptive statistical methods were first implemented to analyze data. Mean and standard deviations or median (IQR) were calculated and used to represent quantitative data, considering their distribution types.

For categorical data, frequencies and percentages were calculated. Specific methods were chosen and applied for comparison between data groups according to the data type and distribution, number of groups, and their dependency.

Eligibility criteria

Including criteria:

- All confirmed acute myocardial infarction patients presented to cardiology department of FMIC from Jan 2019 to Dec 2019.

Excluding criteria:

- Incomplete medical record
- Patients with cardiac problems other than MI
- Patients of type one diabetes mellitus

Sample size:

All patients in the given period (from 01 Jan 2019 to 31 Dec 2019) who met inclusion criteria.

Sampling strategy:

Consecutive sampling was used for the study.

Ethical Consideration:

The head of the cardiology department permitted the study. The research was accepted by the Ethical Review Board of the FMIC and by the institutional review board (IRB) of the Ministry of Public Health. All personal information of the study participants was kept confidential with unique codes. The soft copies of the data were kept in computers locked with strong passwords, and hard copies of the data were kept in secure and locked places. Data will be destroyed after five years. **Limitations:**

Since this study was done in a limited setting at a tertiary care hospital, the results of the study will not be generalizable to the Afghan population. The result can apply to FMIC patients and other hospitals with similar characteristics. Moreover, it can provide helpful insights to generate hypotheses for further studies in the country.

Results

Descriptive statistics of this study participants:

A total of 321 patients who fulfilled the eligibility criteria and presented to FMIC between January 2019 and December 2019 were included in the analysis. Descriptive statistics were calculated for categorical variables by figuring their frequencies and percentages, whereas, for the quantitative variables, mean and standard deviation were calculated. The demographic and clinical characteristics of the study participants are presented in table1.

Baseline socio demographic of study participants: (n=321)

Characteristics	Frequency (n=321)/Mean	Percentage (%)/SD
Age range in years		
< 40	16	5.0
≥40	305	95.0
Gender		
Male	250	77.9
Female	71	22.1
Systolic blood pressure		
≥ 90	301	93.8
< 90	20	6.2
Heart Rate		
≥100	18	5.6
<100	303	94.4
Killip Class		
I	146	45.5
II	128	39.9
III	47	16.6
IV	0	0.0
Diabetes Status		
Diabetic	83	25.9
No diabetic	238	74.1

Smoking habit		
Smoker	26	8.1
Nonsmoker	295	91.9
History of Coronary Heart Disease		
Positive History of CHD	1	0.3
Negative History of CHD	320	99.7
Alcohol drinking status		
Alcoholic	**0**	**0**
Nonalcoholic	321	100.0
Tobacco Using (Naswar)		
Tobacco Using	12	3.7
Nontobacco using	309	96.3
Hypertension Status		
Hypertensive	219	68.2
Normotensive	102	31.8
Heart Failure Status		
Heart Failure with reduced EF (HFrEF)	167	52.0
Heart Failure with mid-range EF (HFmEF)	74	23.1
Preserved LV Function	80	24.9
Chronic Obstructive Pulmonary Disease (COPD)		
Patients with COPD	0	0
Patients without COPD	321	100.0
Asthma Status		
Patients with Asthma	1	0.3
Patients without Asthma	320	99.7
History of Stroke		
Positive Stroke History	0	0.0
Negative Stroke History	321	100
Family History of CAD		
Positive Family History of CAD	9	2.8
Negative Family History of CAD	312	97.2
Family History of Diabetes Mellitus		
Positive Family History of DMT2	3	0.9
Negative Family History of DMT2	318	99.1
History of Previous Procedure		
No previous procedure	319	99.4
PCI	2	0.6
Territory of STEMI on ECG		
Anterior wall MI	258	80.4
Inferior wall MI	63	19.6
LV Function by Echocardiography		
LVEF equal or more than 50%	81	25.2

LVEF equal or more than 40% and less than 50%	101	31.5
LVEF less than 40%	139	43.3
Blood Glucose Level		
RBS equal or more than 200	55	17.1
RBS less than 200	266	82.9
Coronary Angiography Findings		
SVD (Single Vessel Disease)	168	52.3
DVD (Double Vessel Disease)	89	27.7
TVD (Triple Vessel Disease)	64	19.9
Revascularization Strategy		
CABG	41	12.8
PCI to one vessel	222	69.2
PCI to double vessel	52	16.2
PCI to triple vessel	6	1.9
Time of Revascularization		
<12 hours	62	19.3
13-24 hours	92	28.7
> 24 hours	167	52.0
Acute Kidney Injury Status		
Patients with AKI	53	16.5
Patients without AKU	268	83.5
History of Chronic Renal Failure		
Positive History of CRF	5	1.6
Negative History of CRF	316	98.4
Creatinine Level		
Less than 1	251	78.2
equal or more than 1	70	21.8
Status of Anemia		
Hb < 11	0	0.0
Hb≥11	321	100.0

As shown in Table 1, more than $2/3^{rd}$ of the study sample was comprised of males.

According to the age range, the age of only 16 (5%) patients was < 40 years, and the age of the remaining 305 (95%) patients was ≥ 40 years.

The hemodynamic status of most of these patients was stable. Based on the patient's clinical presentation to the hospital, the Systolic Blood Pressure (SBP) of most (93.8%) patients was equal to or more than 90 mm Hg. The Heart Rate (HR) of most (94.8%) patients was less than 100 beats per minute, indicating a good prognostic sign in STEMI patients.

Based on Killip classifications, the majority (45.5%) of patients were on Killip class I, followed by (39.9%) Killip class II and class III (16.6%), and no patient was on Killip class IV.

Based on diabetic status, most (74.1%) of patients were non-diabetics. Regarding smoking history, most (91.9%) patients were nonsmokers and 99.7% of patients had no previous history of coronary artery disease, and none of the patients were alcoholics. However, 3.7% of patients were tobacco (Naswar) users.

Similarly, almost 2/3 of study participants were hypertensive, none had COPD or Stroke, and only 1(0.3%) patient had a history of Bronchial

Asthma. 98.4% and 83.5% of patients did not have CKD or Acute Kidney Injury (AKI), respectively. About family history, 97.2% did not have a family history positive for coronary artery disease, while 99.1% of patients had no family history of DM. Almost half (52%) of the patients had Heart Failure with reduced Ejection Fraction (HFrEF), followed by (23.1%) of patients having Heart Failure with mid-range Ejection Friction (HFmEF), and 80 (24.9) patients had a normal left ventricular function.

99.4% of study participants presented with denovo lesions. (80.4%) the patient had anterior wall ST-segment elevation MI.

About the spot laboratory findings, most (82.9%) patients had Random Blood Glucose (RBG) levels of less than 200 mg/dl. Serum Creatinine level of 78.2% of patients was less than 1, while none of the patient's Hemoglobin levels was less than 11 gr/dl.

Regarding the Coronary Angiography (CAG) findings, half (52.3%) of the study participants had single Vessel Disease (SVD). Percutaneous Coronary Intervention (PCI) or Angioplasty to SVD was done for (69.9%) of patients. (52%) patients received revascularization after 24 hours of symptoms starting.

Regarding the time of revascularization, (19.3%) of patients were revascularized in equal or less than 12 hours. (28.7%) patients received revascularization between 13 and 24 hours of chest pain initiation.

2. Association of Diabetes with demographic and clinical characteristics

Diabetes status was found to be significantly associated with the Killip classification (p-value=0.04). While diabetes was not found to be associated with heart failure status (p-value=0.25), hypertension (p-value=0.09) and history of CAD (p-value=0.065).

Table 2: Inferential table

Variable	**Diabetic (N=83)**		**Non-Diabetic (N=238)**		**P value**
Killip Class:	No	%	No	%	
1. I 2. II 3. III **4.** IV	28 39 16 0	34 47 19 0	118 89 31 0	50 37 13 0	**0.04**
HTN Status:	No	%	No	%	
1. Hypertensive 2. Normotensive	62 21	75 25	157 81	66 34	0.09
Heart Failure Status:	No	%	No	%	
1. HFrEF 2. HFmEF 3. Normal EF	52 19 12	63 23 14	115 55 68	48 23 29	0.25

Study findings including the participants' characteristics and association of diabetes with plausible demographic and clinical variables. Diabetes was found to have statistically significant associations with Killip Classes and non-significant association with Heart Failure and HTN.

Discussion

The study revealed insightful information about diabetes among patients with AMI. This research showed that approximately 26% of patients with AMI had Diabetes Mellitus. This finding is in line with the previous study by Okosieme et al (31), which also showed that 27% of ACS patients had diabetes(31). Similarly, other studies of ACS patients by Kristen et al (28), Anna Norhammar et al (29) in Sweden, Masaharu et al (30) in Japan, and Nasir et al (33) in Pakistan found that the frequency of DM in STEMI patients was 25%, 31%, 27 and 31% respectively.

In the current study, most (78%) of STEMI patients are males. This finding is consistent with the previous studies carried out by Butt et al (35), Chan et al (36), and Assiri (37), which showed similar percentages of males in STEMI patients as 69%, 68.9%, and 73% respectively. (35-37) The findings corroborate that health care utilization is higher among males than females, especially in patriarchal societies like Afghanistan.

Moreover, none of our study participants consumed alcohol. This finding is an exciting addition to many previous studies which identified alcohol as a significant factor for AMI. Different studies from different regions showed that approximately 50% of STEMI patients had a history of alcohol consumption or they were active alcoholics. Alic et al (38) published a study in 2018 which showed that the percentage of those who were consuming alcohol was higher (54.5%) in STEMI patients. (38) A similar proportion of alcohol consumers was reported by Ralapanawa et al (39) in a study published in 2019. (39) The considerable difference in the findings could be attributed to the differences in the culture. Afghanistan is an Islamic state where alcohol drinking is religiously forbidden and socially considered taboo. People neither talk about it nor publicly admit to consuming it. Since alcohol consumption is self-reported data, it is also possible that patients may have lied to the physicians.

The frequency of HTN in STEMI patients is more than 50% in our study. This finding is consistent with previous studies. The SYMPHONY trial revealed that the frequency of hypertension in ST elevated myocardial infarction (STEMI) patients was more than 50%. (40) Similarly, in a study by Lazzeri et al (41), a history of HTN was detected in 50.6%. (41)

Also, in the present study, only 2.8% of patients with STEMI had a positive family history of coronary artery disease. This finding is inconsistent with the literature, which reports family history as a strong predictor of STEMI. A study by Khan et al (42) showed that 33.6% of STEMI patients had a positive family history of CAD. (42) Similarly, Hosseini et al (43)also showed that 34.6% of STEMI patients were positive for a family history of CAD. (43) The reason for the differences in these findings could be due to the knowledge deficit among people regarding the cause of death of their forefathers. I have observed in my clinical experience that many patients are oblivious to the cause of their parent's death because they could not seek medical help for their parent's illness. As a result, they never figured out the cause of their parents' or ancestors' death.

Nearly 50% of patients in the present study had Heart Failure with Reduced Ejection Fraction (HFrEF). The finding is similar to Weir et al (44) and Shamim et al (45), who also showed 52% HF among STEMI patients. The equal distribution of HF patients in the present study could be attributed to the fact that a considerable proportion of patients in the given study underwent intervention for denovo lesions characterizing the new/recent onset of the CAD. Hence, their LV functions were preserved at the time of hospitalization. (44, 45)

In the present study, the Killip classification was found to have a significant association with diabetes mellitus. This classification also has prognostic value because the higher the Killip class, the greater the mortality rate in STEMI patients. Our study shows that diabetes status has significantly associated with the Killip classification (p- value=0.04), which means that in diabetic patients, there were higher Killip classes than non-diabetics. This finding corroborates with the previous studies too. A study conducted by Pinto et al (47) revealed that high Killip Classes (II-IV) were significantly associated with poor glucose control (p- value=0.049) (46). Also, De Luca et al (47) study revealed the same result. (47)

According to the present study, diabetes and HF did not have a significant association. p-value=0.25). This finding is inconsistent with the previous studies, which report a strong association between HF and DM. For instance, a study by Inciardi et al revealed that heart failure in STEMI patients was significantly associated with diabetic status (p-value < 0.01). (48) The possible reason for this difference could be that most participants in the current study were young people who had suffered their first heart attack of STEMI. Also, nearly 99% of our study population did not have a CAD history. High age, recurrent heart attacks, diabetes mellitus, and a history of CAD are the factors that predispose STEMI patients to heart failure (49).

Likewise, HTN and DM were not associated with each other in the present study. P-value is 0.09. This finding is also non-consistent with previous studies. Petrie et al found in their studies that hypertension is significantly associated with the diabetic status in STEMI patients. (50) The possible reason for this difference could be that most people in developing countries do not check their BP regularly, and for this reason, their hypertension remains uncovered for years. Consequently, patients do not list HTN as their comorbid condition.

Strength of the study:

1. A major strength of this study is that this is the first hospital-based study in Afghanistan that can be one of the pioneer studies focusing on the frequency of diabetes mellitus in STEMI patients, and can pave the way for future research and investigation regarding AMI in Afghanistan.
2. The study was adequately powered with a large sample size.
3. This study identified the burden of DM among AMI patients along with key demographic and clinical variables including socio-demography and clinical profile.

Limitations of the study:

The Study has following limitation:

1. The study design was retrospective in nature, therefore results should be analyzed cautiously and should not be inferred for causal relationship.
2. The generalizability of study findings is limited due to selection of study participants only from a single health care setting.

Recommendation:

Based on study findings, the following recommendations are proposed:

1. The prevalence of DM among AMI patients calls for frequent screening and early management to prevent STEMI.
2. The data gaps in the current study related to family history and previous comorbidities indicate that history taking mechanism should be strengthened to obtain authentic data for robust analysis.
3. It is reasonable to initiate early management of high-risk patients with STEMI owing to the prognosis of better clinical outcomes. .
4. There is a need to conduct a multicenter prospective and comparative studies to estimate the proportion, risk factors and clinical outcomes of AMI in the country.
5. Population should be provided awareness regarding the predictors of CAD and importance of family history and self-monitoring for HTN and DM. Cardiologists should detect the diabetic status of STEMI patients, and strictly control the blood glucose level, because poor glucose control in STEMI patients has a bad prognosis.

Conclusion:

The research study revealed that every fourth patient of STEMI (26%) has diabetes mellitus. There is a strong association between Killip classes and diabetic status, consistent with previous research findings. Hypertension and heart failure were not significantly associated with diabetic status in STEMI patients. These findings were different from previous studies' results. In the light of findings, it is indicated that the population should be frequently screened for DM to prevent AMI complications, which requires government and private stakeholders policy-level measures.

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