PREVALENCE OF ACUTE MYOCARDIAL INFARCTION IN YOUNG PATIENTS IN KIRKUK CITY

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ABSTRACT

Background: acute myocardial infarction (acute MI) in young age population is characterized by bad prognosis. Many modifiable risk factors for acute myocardial infarction in young age population are reported.

Aim of study: To measure the prevalence of acute MI among young age population and identifying the common risk factors related to acute MI in young patients.

Patients and methods: This study is a clinical follow up prospective study conducted in Coronary Care Unit (CCU) of Azadi Teaching Hospital and Kirkuk General Hospital in Kirkuk city through the period from 1st of June to 30th of November, 2018 on convenient sample of 250 patients with acute MI . The patients were categorized into two groups; young age (<55 years age) and old age (≥55 years age).

Results: The prevalence of acute MI in young age population was 40.8% (102 patients). The acute MI in young patients was significantly associated with smoking, family history of ischemic heart disease (IHD), diabetes mellitus,, alcohol consumption, and other interesting results were noted in the study which will be mentioned in details later. Heart failure was a significant complication of acute MI in young age population.

Conclusions: The prevalence of acute MI among young population is high, associated with multiple risk factors and smoking, alcohol consumption and family history of IHD being the dominant risk factors.

Keywords: Acute myocardial infarction, Young age population, Heart failure.

INTRODUCTION

1.1. Background

The leading cause of death in the world is coronary heart disease (CHD) and while there is a large data available for CHD, literature focusing on premature CHD and myocardial infarction (MI) in the ‘‘young’’ is lacking. Consequences of MI can be devastating particularly at a ‘‘young’’ age due to its greater potential impact on the patient’s psychology, ability to work and the socioeconomic burden. As ‘‘young’’ MI patients may be the main income producer of the family [1].

Significant advances in primary and secondary prevention of cardiovascular disease (CVD) have led to a large reduction in the incidence of cardiovascular (CV) events as well as CV mortality [2]. However, the same reduction in CV events has not been witnessed in young adults,[3] and CVD remains a major cause of death among young individuals around the world [4].

Over the past decade, the incidence of acute myocardial infarction (MI) among persons age < 55 years has remained stable [3]. With increasing rates of traditional CV risk factors such as diabetes mellitus (DM), obesity, hypertension, hyperlipidemia, and smoking, especially among adolescents, it is likely that coronary artery disease (CAD) will become even more prevalent in this age group [5]. Furthermore, considerable challenges exist in prevention of CAD among young individuals, as significant proportions are unaware of their risk factors. Current risk calculators—which are based on older populations—are less applicable to younger patients, especially those age < 40 years [6]. When young adults, especially females, experience symptoms of CAD, they may be more likely to have atypical symptoms, leading to delays in presentation or treatment [7]. Finally, young adults may have higher rates of medication nonadherence [8].

1.2. Universal definition of acute MI

The term myocardial injury should be used when there is evidence of elevated cardiac troponin values (cTn) with at least one value above the 99th percentile upper reference limit (URL). The myocardial injury is considered acute if there is a rise and/or fall of cTn values [9].

1.2.1. Types

Acute myocardial infarction is classified on the basis of the presence or absence of ST-segment elevation on the ECG and is further classified into six types: infarction due to coronary atherothrombosis (type 1), infarction due to a supply–demand mismatch that is not the result of acute atherothrombosis (type 2), infarction causing sudden death without the opportunity for biomarker or ECG confirmation (type 3), infarction related to a percutaneous coronary intervention (PCI) (type 4a), infarction related to thrombosis of a coronary stent (type 4b), and infarction related to coronaryartery bypass grafting (CABG) (type 5) [10].

1.2.2. Criteria for acute myocardial infarction (types 1, 2 and 3 MI)

The term acute myocardial infarction should be used when there is acute myocardial injury with clinical evidence of acute myocardial ischemia and with detection of a rise and/or fall of cTn values with at least one value above the 99th percentile URL and at least one of the following [9]:

- Symptoms of myocardial ischemia;
- New ischemic ECG changes;
- Development of pathological Q waves;
- Imaging evidence of new loss of viable myocardium or new regional wall motion abnormality in a pattern consistent with an ischemic etiology;
- Identification of a coronary thrombus by angiography or autopsy (not for types 2 or 3 MIs).

Post-mortem demonstration of acute athero-thrombosis in the artery supplying the infarcted myocardium meets criteria for type 1 MI. Evidence of an imbalance between myocardial oxygen supply and demand unrelated to acute athero-thrombosis meets criteria for type 2 MI. Cardiac death in patients with symptoms suggestive of myocardial ischemia and presumed new ischemic ECG changes before cTn values become available or abnormal meets criteria for type 3 MI [9].

1.2.3. Criteria for coronary procedure-related myocardial infarction (types 4 and 5 MI)

Percutaneous coronary intervention (PCI) related MI is termed type 4a MI. Coronary artery bypass grafting (CABG) related MI is termed type 5 MI. Coronary procedure-related MI ≤ 48 hours after the index procedure is arbitrarily defined by an elevation of cTn values > 5 times for type 4a MI and > 10 times for type 5 MI of the 99th percentile URL in patients with normal baseline values. Patients with elevated pre-procedural cTn values, in whom the pre-procedural cTn level are stable (≤ 20% variation) or falling, must meet the criteria for a > 5 or > 10 fold increase and manifest a change from the baseline value of > 20%. In addition with at least one of the following [9]:

- New ischemic ECG changes (this criterion is related to type 4a MI only);
- Development of new pathological Q waves;
- Imaging evidence of loss of viable myocardium that is presumed to be new and in a pattern consistent with an ischaemic aetiology;
- Angiographic findings consistent with a procedural flow-limiting complication such as coronary dissection, occlusion of a major epicardial artery or graft, side-branch occlusion-thrombus, disruption of collateral flow or distal embolization.

Isolated development of new pathological Q waves meets the type 4a MI or type 5 MI criteria with either revascularization procedure if cTn values are elevated and rising but less than the pre-specified thresholds for PCI and CABG. Other types of 4 MI include type 4b MI stent thrombosis and type 4c MI restenosis that both meet type 1 MI criteria. Post-mortem demonstration of a procedure-related thrombus meets the type 4a MI criteria or type 4b MI criteria if associated with a stent [9].

1.2.4. Criteria for prior or silent/unrecognized myocardial infarction

Any one of the following criteria meets the diagnosis for prior or silent/unrecognized MI [9]:

- Abnormal Q waves with or without symptoms in the absence of non-ischaemic causes.
- Imaging evidence of loss of viable myocardium in a pattern consistent with ischaemic aetiology.
- Patho-anatomical findings of a prior MI.

1.3. Acute MI in young adults

1.3.1. Definition and Epidemiology

There is disparity in the literature on the definition of ‘‘young’’ with respect to premature CHD and MI. The term ‘‘young’’ varies from 40 [11] to 55 years of age [12]. Others have suggested 45 years as a cut-off when defining ‘‘young’’ with respect to MI. As there is no universally accepted age cut-off, this review will not use a single definition but rather will accept the cut-off or range used by the authors of the data being reviewed[13].

There is a paucity of data on MI in the ‘‘young’’ relative to literature on CHD as a whole. Perhaps the most well-known of all epidemiological studies in cardiovascular medicine is, The Framingham Heart Study which reported a 10-year incidence of ‘‘young’’ MI (defined as <55 years of age) as high as 51.1/1000 in men and 7.4/1000 in women [14] In contrast, McManus et al. reported an incidence of 66/100,000 of MI among patients aged between 25 and 54 years [15]. While this may appear relatively low, McGill et al. demonstrated an unexpectedly high prevalence of CHD in men under the age of 35 years with 20% shown to have advanced coronary artery lesions at autopsy [16]. Some authors have reported higher rates of ‘‘young’’ MI with an incidence of approximately 4% in those aged <40 years [17]. While others demonstrated >10% of all MI patients admitted at their institution were ‘‘young’’, where they defined ‘‘young’’ as <45 years of age [18].

1.3. 2. Risk Factors

The extent of relative risk for future events of traditional cardiovascular risk factors are comparable in ‘‘young’’ and older adults. The majority of patients suffering MI at a ‘‘young’’ age are reported to have at least one identifiable cardiovascular risk factor [19]. It was reported that a higher prevalence of smoking, family history of premature CHD and male gender among ‘‘young’’ MI patients compared with their older counterparts. Others have supported this finding and, in addition, have demonstrated higher rates of hyperlipidaemia and lower rates of prior history of CHD, diabetes mellitus and hypertension in ‘‘young’’ MI patients compared to older MI patients [20].

Nine risk factors were examined in large previous international study: cigarette smoking, lipid concentrations, patient-reported hypertension or diabetes, obesity, diet, physical activity, alcohol use, and psychological factors. Smoking, lipid abnormalities, hypertension, and diabetes were shown to be more significant risk factors for MI in younger patients than in older subjects [21]. Smoking is the most prevalent risk factor among young adults. It is also the only factor that is fully modifiable. Tobacco smoking accelerates development of atherosclerosis by causing damage to the vascular endothelium, reducing tissue oxygenation, and increasing activity of the sympathetic nervous system. Additionally, smoking leads to increased aggregatory activity, promoting formation of intravascular clots [22]. The prevalence of smoking among young individuals with MI ranges from 64.5% to 93.7%, depending on the study population [23,24,25,26]. The smoking was much more prevalent among patients with premature MI than in individuals who experienced MI above the age of 45 years (76.78% vs. 24.46%, respectively). As many as 82.56% of individuals with MI aged ≤ 44 years and 41.54% of patients aged 60–74 years confirmed that they were smokers. Smoking prevalence among young individuals without coronary heart disease was assessed at 49.37% 24. A group of Greek researchers determined the long-term outcomes of patients aged ≤ 35 years with MI and found that cigarette smoking was the strongest prognostic factor of secondary cardiovascular events [26]. Long-term follow-up revealed that 75.8% of those who experienced a secondary cardiovascular event continued to smoke. Among young people with MI, smoking was disclosed as the most common risk factor[27].

Smoking is highly prevalent among younger adults with MI, as shown above, and is an independent risk factor for MI among young individuals. Therefore, limiting the prevalence of smoking seems to be one of the essential components of both primary and secondary prevention of MI in young adults. The smoker's paradox is a very important issue, and has led clinicians and patients to make incorrect decisions. The mechanism of this phenomenon warrants further discussion and analysis. Some studies have suggested that it may be caused by the interaction of additional risk factors, such as age. However, other studies have found that the phenomenon persisted even after correcting for these possible interference factors. Therefore, researchers have continued to explore the underlying mechanisms of the paradox. Recently it was demonstrated that smoking induces cytochrome

P450 1A2 a hepatic enzyme involved in the metabolism of clopidogrel, and causes an increased clopidogrel response among smokers [28].

Dyslipidaemia is another risk factor for MI that is highly prevalent among young individuals. According to the results previous study, dyslipidaemia and smoking are the two most important risk factors [21]. A correlation has been found between the blood concentration of lipids and the risk of cardiovascular disease. Studies have shown that a reduction in the total cholesterol (TC) and low-density lipoprotein cholesterol (LDL-C) levels of 1% is associated with a reduction in the risk of coronary heart disease by 2%. Moreover, epidemiological data have shown that a reduction in high-density lipoprotein cholesterol (HDL-C) level of 1% is associated with an increase in the risk of coronary heart disease by 2% [22]. Myocardial ischemia occurs as a result of plaque buildup in the coronary arteries, a disease formally known as atherosclerosis or coronary artery disease (CAD). Rupturing of vulnerable atherosclerotic plaque follows a period of continual plaque destabilization and/or plaque growth due to various pathobiological processes [29] . Plaque contents are enclosed within a stabilizing fibrous cap that prevents exposure of the thrombogenic core to the bloodstream, and weakening of this cap can therefore lead to plaque rupture and MI. There is substantial evidence illustrating a positive relationship between low-density lipoprotein cholesterol (LDL-C) and elevated triglyceride (TG) to CAD progression. Oxidized LDL particles damage endothelium and promote plaque rupture. Although LDL-C is well studied, there is also a significant inverse relationship between high-density lipoprotein cholesterol (HDL-C), the "good cholesterol," and CAD progression. Studies show that the strongest independent risk factor for CAD is a low serum concentration of HDL, resulting in an increased risk of MI and stroke, although many patients with MI have normal HDL-C levels [30].

Hypertension is less common in young patients with MI than in older patients. Pineda et al. [25] reported hypertension in 28.5% of patients aged ≤ 45 years and in 49.5% of patients aged > 45 years with MI. A similar dependency, but with a higher prevalence of hypertension in both age groups, was observed by Yunyun et al. [26]. Hypertension was present in 47.7% of young patients with MI and in 53.9% of older patients. Hypertension in young individuals was also found to be less common in those without coronary heart disease (44.3%). Data obtained from PL-ACS reports hypertension in 42.5% of young patients with

MI and in 70.7% of individuals above 40 years [27]. The relation between HTN and myocardial infarction can be mainly explained underscoring two key factors: (1) common risk factors shared by the two diseases, such as genetic risk profiles, insulin resistance, sympathetic hyperactivity, and vasoactive substances (i.e., angiotensin II) and (2) hypertension is associated with accelerated atherosclerosis, which contributes to progression of myocardial infarction. Genetic risk factors, specifically gene polymorphisms of the angiotensinogen-converting enzyme (ACE) and of the renin-angiotensin-aldosterone system (RAS), could represent a "common milieu" responsible for both hypertension and myocardial infarction, in a specific subset of patients at high risk for cardiovascular complications [31].

Another important risk factor that is less prevalent in young individuals with MI is diabetes. Pineda et al. [25] reported diabetes in 11.5% of young patients with MI and in 24.5% of patients above the age of 45 years. Yunyun et al. [26] reported an even larger proportion of young patients (20.93%), while the prevalence of diabetes among patients with MI above the age of 60 years was 32.3%. Diabetes was reported by Trzeciak et al. [28] to be present in 5.5% of patients with MI younger than 40 years and in 24.7% of those above that age. Acute phase hyperglycaemia and diabetes are both associated with adverse outcomes in acute myocardial infarction, with higher reported incidences of congestive heart failure, cardiogenic shock, and death. However, the association between hyperglycaemia and adverse outcomes is not confined to patients with diabetes. The mechanism is not clear, but it is commonly regarded as a response to stress resulting from catecholamine induced glycogenolysis. Hyperglycemia, therefore, is seen as an epiphenomenon that is associated with poor outcomes only because adrenergic stress is closely related to the extent of myocardial injury [32].

1.3. 3. Clinical Presentation and Angiographic Findings

Up to two-thirds of ''young'' MI patients will present with non-ST elevation myocardial infarction (NSTEMI) with approximately a third presenting with STEMI [14]. It appears that, overall, the incidence of STEMI is reducing among the ''young'' but the proportion of ''young'' patients diagnosed with STEMI is increasing [14]. Most ''young'' MI patients do not report a history of previous angina, MI or congestive heart failure and they report this less frequently in their histories than their older counterparts [17]. Egiziano et al.

reported only about 25% of ‘‘young’’ MI patients complained of chest pain in the month prior to their acute presentation for MI [33]. The rate was even lower among ‘‘young’’ women [32]. By way of comparison, in a study of all-comers with MI, chest pain was reported among two thirds of patients and those presenting with chest pain had a median age of 67 years [34].

Coronary angiography usually reveals less extensive disease in ‘‘young’’ MI patients than older patients. Others reported normal coronary arteries in 16% of men and 21% of women. By comparison only 2% of older men and 11% of older women had normal coronary arteries [12]. Three vessel disease is infrequent with Fournier et al. reporting it in less than 10% of ‘‘young’’ MI patients. In that study there was no report of left main coronary artery stenosis in ‘‘young’’ MI patients which is supported by other authors [33]. Single vessel disease is more frequent among ‘‘young’’ MI patients compared to their older counterparts and the left anterior descending artery is most commonly affected [12]. Spontaneous coronary artery dissection is not an infrequent finding at angiography in ‘‘young’’ MI patients. Tweet et al. described the occurrence of spontaneous coronary artery dissection in a group of Myocardial Infarction in the ‘‘Young’’ 957 ‘‘young’’ patients with a mean age of 43 years, who were mostly female. Approximately 50% of these patients presented with STEMI and conservative management was associated with an uncomplicated in-hospital course [35].

1.3. 4. Management

The management of MI generally is not dependent on age and guideline-suggested therapies are just as applicable to younger patients as they are to their older counterparts [36]. With respect to STEMI management, the benefits of primary angioplasty over thrombolysis are as applicable in ‘‘young’’ patients as they are in older individuals and no particular age cohort has a greater relative benefit [37]. ‘‘Young’’ age is an independent predictor for favorable prognosis following thrombolysis and hence thrombolysis should still be utilized where timely primary angioplasty cannot be offered. Given the longer expected survival of younger patients, the rate of repeat revascularisation would be expected to be high. One study suggests a rate of about 50% at a median of 4.7 years [38].

Data to guide management of ‘‘young’’ NSTEMI is lacking as younger patients are under-represented in the clinical trials and hence it is difficult to suggest routine early coronary

angiography in addition to other evidence-based therapies. An invasive strategy post NSTEMI has been associated with improved survival regardless of age but this observation is based upon data from a study where the mean age of the invasive strategy cohort was 67 years [39]. In a controversial study published in 1994 Negus et al. suggest routine coronary angiography post MI in those who are asymptomatic, aged 40 years or less and do not exhibit spontaneous or provocable post-infarction ischaemia is not warranted [40]. This conclusion was based upon their finding that no patient with these characteristics who underwent coronary angiography required revascularisation [40]. This study, however, was conducted over 20 years ago and only included 129 ‘‘young’’ MI patients. Current equipment, therapies and techniques afford better outcomes. In a real-world setting invasive management in ‘‘young’’ NSTEMI patients is a norm rather than an exception. Nonetheless, further studies are therefore necessary to fully address the utility of this approach [12].

In addition to medical treatment of acute events, risk factor modification is of utmost importance in any patient post-MI. As highlighted above, smoking is one of the most important modifiable risk factors among ‘‘young’’ MI patients; addressing this may yield the highest reward. Critchley et al. studied the benefit of smoking cessation in patients with CHD in a systematic review. They report a 36% reduction in crude relative risk of mortality for patients with CHD who quit smoking compared to those who continued to smoke (relative risk 0.64: 95% CI, 0.58-0.71) [41]. This benefit did not appear to be affected by age [40]. Recurrent coronary events also appear to be reduced by smoking cessation. Rea et al. demonstrated a relative risk of 1.51 (95% CI, 1.10-2.07) for recurrent coronary events among continued smokers compared to non-smokers [42]. Smoking cessation is a difficult task for patients and healthcare professionals. It often requires multiple strategies including counseling, personalized prescription and management of co-occurring mental health conditions [43].

1.3. 5. Prognosis

In-hospital and short-term outcomes are generally favorable in ‘‘young’’ MI patients. In-hospital and six-month mortality has been shown to be 0.7% and 3.1%, respectively [44]. This compares favorably to their older counterparts whose in-hospital and six-month

mortality were 8.3% and 12%, respectively [43]. Beyond five years post-MI, however, there is an alarming drop in survival among ‘‘young’’ MI patients with mortality exceeding 15% at seven years and being between 25-29% at 15 years [45]. Heart failure, malignant ventricular arrhythmias, angina pectoris and re-infarction were found to be associated with higher mortality [45]. The strongest independent risk factor reported is left ventricular ejection fraction of 45% (OR 4.4: 95% CI, 1.6-12.4) [44]. In particular, the rate of sudden cardiac death appears to be dramatically increased in ‘‘young’’ MI patients compared to the general population of a similar age. Risgaard et al. demonstrated a more than 74-fold increase in mortality [46]. Nonetheless, over the last three decades, in-hospital and 30- day mortality have markedly decreased probably due to improved acute management of MI [14].

The common complications of acute MI in young age population were:

- Arrhythmia complications
- Mechanical complications like degree of left ventricular insufficiency
- Ischemic complications
- High mortality

Heart failure is a potentially debilitating complication of MI in ‘‘young’’ patients. They are often at the peak of their productive lives and may have multiple dependents. As illustrated above, heart failure is also an important predictor for long-term prognosis. Fortunately, the rate of heart failure has markedly reduced from 20% in 1970s to below 6% in 2005 among ‘‘young’’ MI patients [14]. This is likely due to a combination of factors and not least the use of prophylactic implantable cardiac defibrillators. The MADIT II trial demonstrated their utility in reducing mortality in patients with previous MI and severe reduction in left ventricular ejection fraction [47]. The mean age of patients in the study was approximately 65 years but sub-group analysis demonstrated benefit among patients aged <60 years [47]. Even so, it is vital to diagnose heart failure early and instigate evidence-based management to limit progression and improve outcomes [12].

There is significant reduction of health-related quality of life post MI in ‘‘young’’ MI patients. Depression is common after MI [48] with Denollet et al. reporting post-MI depressive symptoms in approximately 47% of patients with a mean age of 54 years [49]. Hence,

identifying and managing depression following MI in ‘‘young’’ patients is important. Angina is also a significant contributor to lower health-related quality of life post MI but it appears improving control of angina leads to greater improvement in health-related quality of life in older patients only [50].

PATIENTS&METHODS

Patients

Design, settings & sampling

This study is a clinical prospective follow up study conducted in coronary Care Unit (CCU) of Azadi Teaching Hospital and Kirkuk General Hospital in Kirkuk city. The duration of study was through the period from 1st of June to 30th of November, 2018. All patients admitted to CCU with acute MI were the study population. Inclusion criteria were adult age with typical ischemic pain, ECG changes, and or changes in cardiac markers (age ≥28 years) with confirmed diagnosis of acute MI. The exclusion criteria were other cardiac diseases, with none specific chest pain, none conclusive ECG , and without changes of cardiac markers. A convenient sample of 250 patients with acute MI was selected after eligibility to inclusion and exclusion criteria. After inclusion to study, the patients were categorized into two groups; young age (<55 years age) and old age (≥55 years age).

Methods

Data collection

The data collection was carried out by the researcher with filling of a prepared questionnaire. The information was taken directly from the patients.

The questionnaire included the followings:

1) Socioemographic characteristics of AMI patients: Age, gender, occupation and marital status.
2) Clinical presentation of AMI patients.
3) Atherosclerotic risk factors of AMI patients.
4) Family history of IHD and other risk factors for AMI patients.
5) Examination findings of AMI patients.
6) Electrocardiography findings of AMI patients.
7) Cardiac enzymes of AMI patients.
8) Outcome and complications of AMI patients: Arrhythmia, heart failure, post-MI angina and hypotension.

After taking full history and examination of patients in CCU, the confirmed diagnosis of AMI was done by the supervisor according to guidelines of European Society of Cardiology/American College of Cardiology Foundation depending on clinical features, ECG, cardiac enzymes and echocardiography. The monitoring and assessment of patients was done by resident physicians in CCU. The ECG was implemented by nurse in CCU using ECG equipment NIHON KOHDEN Cardiofax ECG. cardiac enzymes were done in Laboratory of Azadi Teaching Hospital by BIOZEC medical 1 step rapid test.

Follow up

The AMI patients were followed up by the researcher in the CCU for an average of 3 days and checking the outcomes and complications.

Ethical considerations:

- An approval was taken from Internal Medicine Scientific Committee of Iraqi Board.
- Agreement taken from Azadi Teaching Hospital and Kirkuk General Hospital administrations.
- An oral informed consent was taken from patients or their relatives.
- Management of any complications of acute myocardial infarction.

Statistical analysis

The data of AMI patients were analyzed by application of Microsoft excel program and Statistical Package for Social Sciences (SPSS) version 23. Outcomes of analysis were arranged in scales variables (means & standard deviation) and in categorical variables. Chi square test was used for comparison between categorical data (Fishers exact test applied when expected variable was less than 20% of total). Independent sample test was used to compare between two means. The level of significance (p value) was set as ≤ 0.05.

RESULTS

This study included 250 acute MI patients with mean age of 56.4±14 years and ranging from 28-80 years; 40.8% (102 patients) of them were in young age and 59.2% of them were in old age group. All these findings were shown in figure 1.

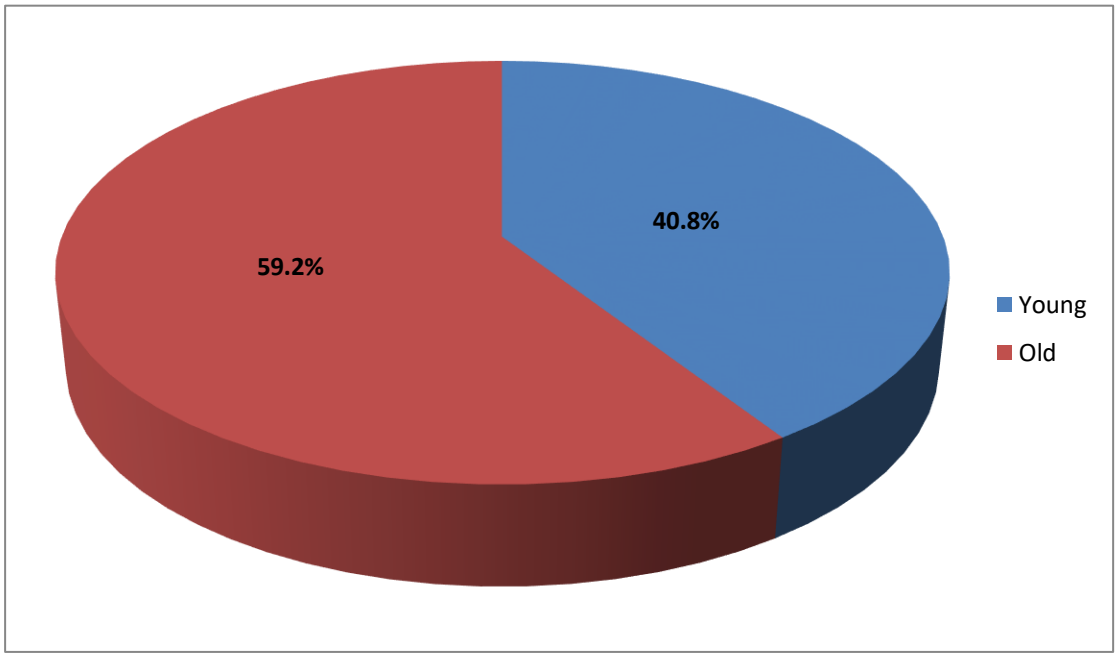

Figure 1: Prevalence of young age AMI patients.

No significant differences between young age AMI patients and old age AMI patients regarding their gender (p=0.1). There was a highly significant association between young age AMI patients and job (p<0.001). A significant association was observed between marriage and young age AMI patients (p=0.01). All these findings were shown in table 1.

Table 1: Distribution of sociodemographic characteristics according to age of AMI patients.

Variable	**Young age**		**Old age**		**P**
	No.	**%**	**No.**	**%**	
Gender					0.1*NS
Male	78	76.5	102	68.9	
Female	24	23.5	46	31.1	
Occupation					**<0.001***S
Housewife	24	23.5	48	32.4	
Public servant	40	39.2	55	37.2	
Self employed	38	37.3	13	8.8	
Retired	0	-	32	21.6	
Marital status					**0.01****S
Married	100	98.0	139	93.9	
Single	2	2.0	0	-	
Widow	0	-	9	6.1	
Divorced	0	-	0	-	

** Chi-square test, **Fishers exact test, S=Significant, NS=Not significant.*

No significant differences between young age AMI patients and old age AMI patients regarding acute coronary syndrome type (p=0.1). There was a highly significant degree of young age AMI patients and chest pain presentation (p<0.001). All these findings were shown in table 2.

Table 2: Distribution of clinical presentation according to age of AMI patients.

Variable	**Young**		**Old age**		**P**
	No.	**%**	**No.**	**%**	
Acute coronary syndrome type					0.1*NS
ST elevation-MI	84	82.4	127	85.8	
Non-ST elevation-MI	15	14.7	16	10.8	
New LBBB	3	2.9	5	3.4	
Presenting complaints					**<0.001***S
Chest pain	41	40.2	57	38.5	
Dyspnea	8	7.8	11	7.4	
Palpitations	1	1.0	11	7.4	
Syncope	0	-	6	4.1	
Others	5	4.9	12	8.1	
Chest pain associated with palpitations	5	4.9	2	1.4	
Chest pain associated with dyspnea	26	25.5	32	21.6	
Chest pain, dyspnea and syncope	3	2.9	8	5.4	
Chest pain, dyspnea and others	2	2.0	0	-	
Chest pain, dyspnea and palpitations	6	5.9	7	4.7	
Chest pain associated with syncope	2	2.0	1	0.7	
Dyspnea associated with palpitations	3	2.9	1	0.7	

** Fishers exact test, S=Significant, NS=Not significant.*

A significant association was observed between DM and young age AMI patients (p=0.02). All these findings were shown in table 3.

Table 3: Distribution of atherosclerotic risk factors according to age of AMI patients.

Variable	Young age		Old age		P
	No.	%	No.	%	
Atherosclerotic risk factors					**0.02***S
Smoking	26	25.4	45	30.4	
HT	12	11.8	21	14.2	
Obesity	10	9.8	12	8.1	
DM	7	6.9	4	2.7	
Dyslipidemia	0	-	7	4.7	
HT, obesity and DM	5	4.9	1	0.7	
Smoking and HT	9	8.8	9	6.1	
Smoking and dyslipidemia	4	3.9	3	2.0	
Smoking, HT and DM	3	2.9	9	6.1	
Smoking ,Obesity and DM	5	4.9	5	3.4	
HT and obesity	3	2.9	0	-	
Smoking, HT, obesity and DM	1	1.0	3	2.0	
HT, obesity, DM and dyslipidemia	2	2.0	0	-	
Smoking and DM	6	5.9	5	3.4	
HT and DM	1	1.0	11	7.4	
Smoking, HT, DM and dyslipidemia	2	2.0	5	3.4	
Smoking, HT, obesity and	0		3	2.0	
DM and dyslipidemia	3	2.9	2	1.4	
Obesity and dyslipidemia	2	2.0	2	1.4	
Smoking and obesity	1	1.0	1	0.7	

** Fishers exact test, S=Significant.*

A highly significant association was observed between family history of IHD and young age AMI patients ($p<0.001$). There was a significant association between young age AMI patients and positive smoking history ($p=0.02$), 55.9% of young age AMI patients were smokers, while 41.2% of old age AMI were smokers. A significant association was observed between positive alcohol consumption and young age AMI patients ($p=0.003$), especially for Arak drink ($p=0.02$). There was a significant association between menopausal changes and acute MI in young age ($p=0.003$). All these findings were shown in table 4 and figure 2.

Table 4: Distribution of family history of IHD and other risk factors according to age of AMI patients.

Variable	Young age		Old age		P
	No.	%	No.	%	
Family history of IHD					**<0.001***S
No	51	50.0	112	75.7	
Father	21	20.6	10	6.8	
Mother	5	4.9	8	5.4	
Brother	2	2.0	8	5.4	
Sister	0	-	1	0.7	
Father, mother, brother and sister	10	9.8	1	0.7	
Father and mother	4	3.9	0	-	
Father and brother	5	4.9	5	3.4	
Mother and brother	4	3.9	3	2.0	
Smoking					**0.02****S
Yes	57	55.9	61	41.2	
No	45	44.1	87	58.8	
Alcohol consumption					**0.003****S
Yes	16	15.7	7	4.7	
No	86	84.3	141	95.3	
Alcohol types					**0.02***S
Beers	2	12.5	0	-	
Whiskey	4	25.0	6	85.7	
Arak (traditional Iraqi alcohol)	10	62.5	1	14.3	
Menopause					**0.003****S
Yes	20	83.3	20	43.5	
No	4	16.7	26	56.5	

** Fishers exact test, **Chi-square test, S=Significant, NS=Not significant.*

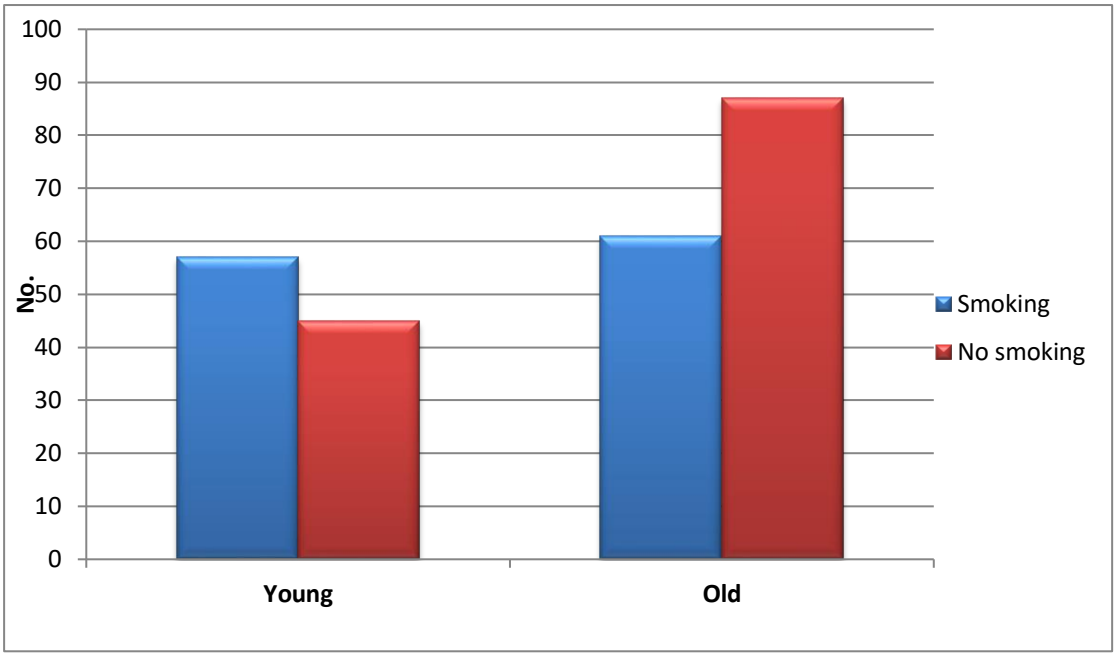

Figure 2: Distribution of smoking according to age of AMI patients.

The ECG findings of ST elevation and ST depression and were significantly higher among young age AMI patients (p=0.03). No significant differences between young age AMI patients and old age AMI patients regarding myoblobin, CK-MB and troponin. All these findings were shown in table 5.

Table 5: Distribution of ECG and cardiac enzymes according to age of AMI patients.

Variable	**Young age**		**Old age**		**P**
	No.	**%**	**No.**	**%**	
ECG findings					**0.03***S
ST elevation	57	55.9	85	57.4	
ST depression	21	20.6	19	12.8	
LBBB	5	4.9	15	10.1	
T inversion	6	5.9	2	1.4	
AF	2	2.0	0	-	
Q wave	7	6.9	18	12.2	
Q wave and ST elevation	4	3.9	9	6.1	
Myoglobin					0.8**NS
Positive	29	28.4	40	27.0	
Negative	73	71.6	108	73.0	
CK-MB					0.7**NS
Positive	30	29.4	41	27.7	
Negative	72	70.6	107	72.3	
Troponin					0.7**NS
Positive	101	99.1	147	99.4	
Negative	1	0.9	1	0.6	

** Fishers exact test, **Chi-square test, S=Significant, NS=Not significant.*

No significant differences between young age AMI patients and old age AMI patients regarding arrhythmia, post MI angina and hypotension. A significant association was observed between heart failure and young age AMI patients (p=0.01). All these findings were shown in table 6 and figures 3, .

Table 6: Distribution of complications and outcome according to age of AMI patients.

Variable	Young age		Old age		P
	No.	%	No.	%	
Arrhythmia					0.6*NS
Yes	23	22.5	30	20.3	
No	79	77.5	118	79.7	
Heart failure					**0.01***S
Yes	21	20.6	14	9.5	
No	81	79.4	134	90.5	
Post MI angina					0.1*NS
Yes	10	9.8	8	5.4	
No	92	90.2	140	94.6	
Hypotension and shock					0.3**NS
Yes	6	5.9	13	8.8	
No	96	94.1	135	91.2	

** Chi-square test, S=Significant, NS=Not significant.*

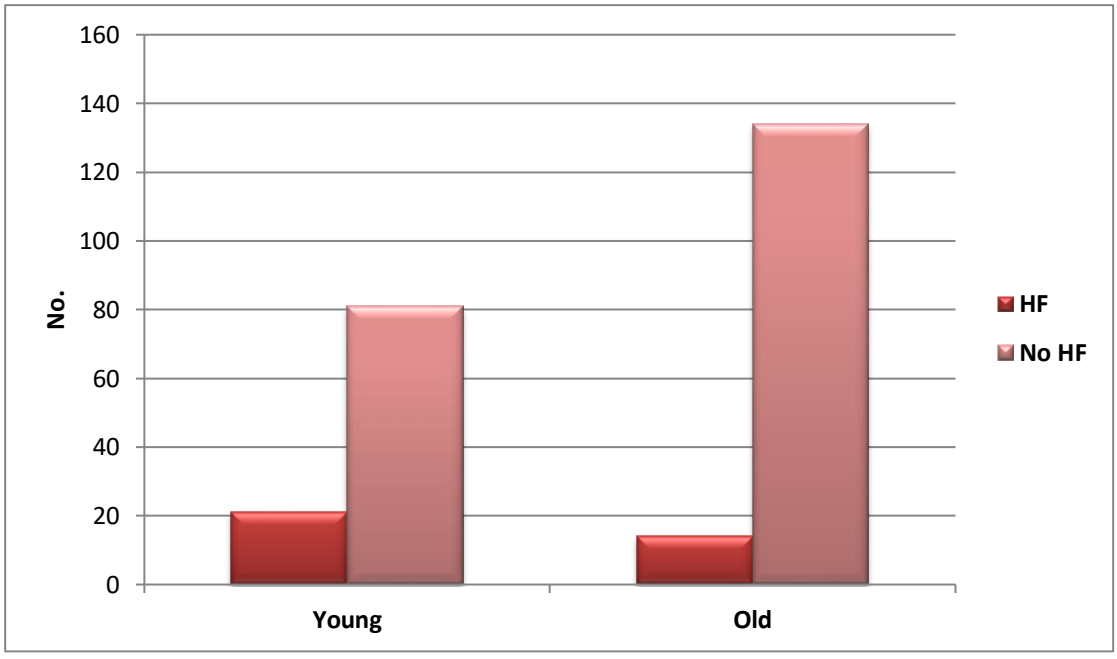

Figure 3: Distribution of HF according to age of AMI patients.

DISCUSSION

Globally, the incidence of CAD has been increased recently in young age population to reach about 10% [51] and the acute MI incidence among young age adults is 51.1/1000 for males and 7.4/1000 for females [13], while the first reported prevalence of CAD in young age population detected in Iraq was 37% as complete occlusion and 14% as severe stenosis [52].

Present study showed that 40.8% of patients with acute MI were young age adults. This prevalence is close to prevalence of 40.5% of AMI in young age population found by Chaudhary et al [53] study in India. On other hand, this prevalence of 40.5% is higher than prevalence of 31% for young adults with premature coronary artery diseases found by Mohammad et al [51] study in Iraq. The present study prevalence is higher than prevalence of 6.8% for young age population admitted to coronary care unit in Spain hospitals reported by Morillas et al [54] study. The high prevalence of AMI among young age population in present study is attributed to many reasons such as high prevalence of risk factors for young age MI in population of Kirkuk city, variance in definition of age limits and difference in methodology between different studies. Shah et al [55] study in Pakistan reported that 16% of patients diagnosed by coronary angiography with acute MI were in age of 40 years and less. . Another study in India found that 60.8% of patients with acute myocardial infarction were in age group of 30-40 years [56]. A multi-centers study in USA by Gupta et al [3] using national inpatients sample of 230684 patients with AMI for 10 years and revealed that incidence rates of AMI in young age population (<55 years) was not declined in ten years period and the young females with acute myocardial infarction were more prevalent with complications, long hospital stay and mortality than males. On other hand, Alzuhairi et al [57] study in Denmark documented that the incidence of acute myocardial infarction in period from 1978-2012 was significantly decreased among young age population for both males and females.

Our study revealed no significant differences between young age AMI patients and old age AMI patients regarding their gender. Although higher incidence of AMI among males in comparison to females, the male to female ratio in both study groups was close. This finding is inconsistent with results of Farhan and Al-Saffar study [58] in Iraq which documented that

prevalence of AMI in young age population was higher for men than women. However, our study findings regarding gender are similar to results of Canto et al [59] study in USA which stated that difference in prevalence of AMI according to age for both genders is not significant, but the mortality and hospital stay for women was higher than men in young age population while with increased age these differences regarding complications and mortality were diminished. Current study showed a highly significant association between young age AMI patients and job ($p<0.001$). Similarly, Shahan et al [60] study in Turkey found that hard work employment represented significant risk factor for AMI in young age adults. In present study, a significant association was observed between marriage and young age AMI patients ($p=0.01$). This finding is inconsistent with many literatures like Schultz et al [61] study in USA and Hu et al [62] study in China which found that unmarried men and women were at higher risk of acute MI and death than married women and in different age groups. This inconsistency might be due to the number of unmarried patients in our study are very small .

In current study, there was a highly significant association between young age AMI patients and chest pain presentation ($p<0.001$). This finding coincides with results of Sinha et al [63] study in India which stated that chest pain was the most common presentation of acute myocardial infarction in young age population. The significant atherosclerotic risk factors for young age AMI was diabetes mellitus ($p=0.02$). Akram et al [64] study in India documented that young age acute myocardial infarction patients were more prevalent with smoking, hypertension, dyslipidemia and diabetes mellitus than older age patients. A highly significant association was observed in our study between family history of IHD and young age AMI patients ($p<0.001$). This finding is in agreement with results of Oslu et al [65] study in UK which reported that positive family history of IHD is common risk factor for AMI in young age population.

Current study showed a significant association between young age AMI patients and positive smoking history ($p=0.02$). Many authors like Nafakhi et al in Iraq [66], Al-Khadra et al in Saudi Arabia [67] and Singh et al[68] in USA reported the cigarette smoking as the main risk factor for acute myocardial infarction in young age population. Mirza et al [69] reported that smoking is not as important risk factor for young AMI patients in Iraq as obesity. In our study, the alcohol consumption was significantly associated with young age AMI ($p=0.003$).

Motofsky et al [70] stated that alcohol drinking daily increases risk of acute MI in young adults by 1.72 folds. Regarding alcohol types, Biyik and Ergene study [72] in Turkey found that Arak consumption had favorable and unfavorable outcomes on incidence of AMI in young population depending on frequency and amount of alcohol intake; however, they recommended the warning of alcohol drinkers with high risk of Arak on development of liver cirrhosis and acute myocardial infarction [71]. Our study showed a significant association between menopausal changes of women and acute MI in young age (p=0.003). This finding is consistent with results of Chandrasekhar et al [72] study in USA which revealed that hormonal changes in women were predominant risk factors for AMI in young women.

In our study, ECG findings of ST elevation and ST depression were significantly higher among young age AMI patients (p=0.03).This result is consistent with a study done by Rajeev Bhardwaj et al [73] in Nigeria that found the ECG finding of ST elevation MI in young patients is significantly high . The significant outcome or complication of young age patients with AMI in our study was heart failure (p=0.01). Cahill and Kharbanda et al[74] study in UK stated that heart failure is a frequent late complication after AMI, mostly for young age patients.

The main study limitations were loss to follow up, single center study and short study duration.

CONCLUSIONS

- The prevalence of acute MI among young population is high.
- The common clinical presentation for acute MI among young population is chest pain and shortness of breath.
- The main electrocardiography findings of young patients with acute MI are ST-elevation MI.
- The risk factors for acute MI in young age population are smoking, family history of IHD, diabetes mellitus ,Arak alcohol consumption and menopause in women, job, and marriage.
- The young age patients with acute MI are more likely to be complicated with heart failure.

RECOMMENDATIONS

- Young age adults suspected with MI should be regarded as high risky population who need special monitoring and care.
- Most of risk factors for acute MI in young age population are preventable by smoking cessation, alcohol withdrawal, and strict control of glycemic control in diabetic patients.
- Public health education of young people about the serious and significant risk of smoking in contribution to acute MI.

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