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Pattern of Risk Factors and Angiographic Features of Coronary Artery Disease in a Sample of Young Egyptian Patients

Islam Ebeid[1], Walaa Farid[2], Ashraf Ahmed[1], Neveen Samy[2]

[1]National Heart Institute, Cairo, Egypt

[2]Cardiology Department, Menoufia University, Shebin Elkom, Egypt

Email address:
islamebeid@yahoo.com (I. Ebeid), drwmosa@yahoo.com (W. Farid), dr_ashraf_ahmed@hotmail.com (A. Ahmed),
Neveinsami@yahoo.com (N. Samy)

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Abstract: Objectives: this study aimed to study the pattern of risk factors & angiographic features of CAD in young patient aged < 45 in comparison with older patients in a sample of Egyptian patients. Background: Egypt is one of the developing countries where cardiovascular disease is the leading cause of mortality and morbidity. Purpose of the present study was to assess the risk factors, clinical presentation, angiographic profile including severity of young adults (aged < 45 years) with coronary artery disease (CAD). Methods: Our study was a prospective, cross sectional study conducted at multicenter hospitals included 300 patients with coronary artery disease (CAD), group I comprised of one hundred patients aged < 45 years old and group II comprised of two hundred patients ≥ 45 years old who underwent coronary angiography at National Heart Institute, Menoufia university hospital from October 2018 to April 2019. Results: Smoking and positive family history were significantly higher in group I with age (<45 years) than group II (≥45years). HTN, DM, obesity were significantly higher in group II with age (≥45years) than group I (<45 years). The most common clinical presentation was STEMI were significantly higher in group I than group II & SCAD was in the second order with significantly higher in group II than in group I. One vessel and two vessel disease were most prominent in group I versus group II while MVD was most prominent in group II versus group I with significant P value 0.010. Type A and B lesions were the most common types of lesion in group I, while type C lesion was more common in group II than group I, with significant P value (0.019). Calcified, bifurcational and ostial lesions were most prominent in group II with highly significant P value (<0.001) in calcified lesions. Conclusion: Primordial prevention about smoking cessation and life style modification in cutting down obesity will be important epidemiological tool. Awareness on this topic, importance of golden hour and early diagnosis and treatment will have huge economic impact as sizeable number of patients present late.

Keywords: Coronary Artery Disease, Risk Factors, Angiography, Young Adults

1. Introduction

Coronary artery disease (CAD) is a leading cause of morbidity and mortality in both developing and developed countries [1].

It has been estimated that less than 10% of all individuals presenting with documented coronary artery disease are under age of 40 years [2].

Young and old patients have different risk factor profiles, clinical presentations, angiographic findings and prognosis [3].

The classic presentation of worsening angina culminating acute coronary syndrome (ACS) is rare in younger patients but the first onset of angina that rapidly progresses to fully evolved myocardial infarction (MI) is often the case [4].

The high prevalence of cardiovascular risk factors " such as:- advanced age, male sex, family history of CAD, hypertension, dyslipidemia, diabetes, smoking and obesity " has been described in the population. The association

between conventional risk factors and CAD presence is well established [5].

When CAD occurs below 45 years in men, it is called premature coronary artery disease. The risk factors and their relative frequency vary in between the young and older age groups, so did the severity of the disease [6].

Several studies have also suggested that the distribution and relative effects of risk factors, as well as disease presentation may differ across different age group [7].

The most strongly associated risk factor for CHD in young adults is current tobacco use. A recent study of adults <45 years of age found an eightfold increase of AMI for those who smoked >25 cigarettes/day compared with those who had never smoked [8].

Not only is smoking a risk factor for CHD, but studies of long-term outcomes in young patients found that smoking was a strong predictor of CHD mortality, although this risk declined with smoking cessation [9].

Studies report a wide range of association between CHD in young adults and a positive family history for coronary disease, with estimates varying by age group, population, and specific definition of "family history" [10].

The aim of this work is to study the pattern of risk factors & angiographic features of CAD in young patient aged < 45 in comparison with older patients in a sample of Egyptian patients.

2. Patients and Methods

Study design:

Our study was a prospective, observational study conducted at two large hospitals included 300 coronary artery disease (CAD) patients at National Heart Institute, Menoufia university hospital from October 2018 to April 2019 divided into two groups to evaluate clinical condition, risk factors and angiographic characteristics, Group (A) Consisted of 100 patients with CAD aged < 45 years old, Group (B) Consisted of 200 patients with CAD aged ≥ 45 years old to evaluate clinical condition, risk factors and angiographic characteristics.

Methods:

All included patients were subjected to complete and detailed medical history, laboratory investigations, resting standard 12 leads electrocardiogram, detection of ejection fraction by echocardiography and coronary angiography.

This study included 300 patients who underwent angiogram at cardiology department of National Heart Institute and cardiology department at Menoufia University Hospital. Coronary angiography considered abnormal when there is diameter stenosis (occlusion) that occurs to one or more of the three major coronary arteries during the angiogram procedure. Significant occlusion defined as equal or more than 50% narrowing in left main branch and equal or more than 70% of other epicardial artery [11].

3. Results

There were significant difference between Group (A) patients with CAD aged < 45 years old, Group (B) patients with CAD aged ≥ 45 years old in risk factors as *male gender;* 73 (76%) vs. 130 (63.7.0%), p=0.033, *body mass index (BMI);* 25.2±3.5 vs. 27.0±7.1, p=0.016, *smoking;* 65 (67.7%) vs 108 (52.9%) p=0.061, *hypertension;* 40 (41.7%) vs. 112 (54.9%), p=0.032, *diabetes;* 22 (22.9%) vs 89 (43.6%), p=0.001, *dyslipidemia;* 29 (41.4%) vs. 22 (44.0%), p=0.779, *family history of CAD;* 36 (37.5%) vs 51 (25.0%), p=0.006 and were statistically significant between the two groups

Trans thoracic echocardiography (TTE) was undertaken in both treatment arms, The ejection fraction (EF) was similar in both groups; 48.5±6.5 in group (A) and 48.8±7.1 in group (B), p=0.761.

The most common clinical presentation was STEMI were significantly higher in group I (<45 years) than group II (≥ 45years), SCAD was in the second order with significantly higher in group II (≥ 45 years) than in group I (<45years). None of SBP or DBP or HR were statistically significant between patients of group A & patients of group B "table 1".
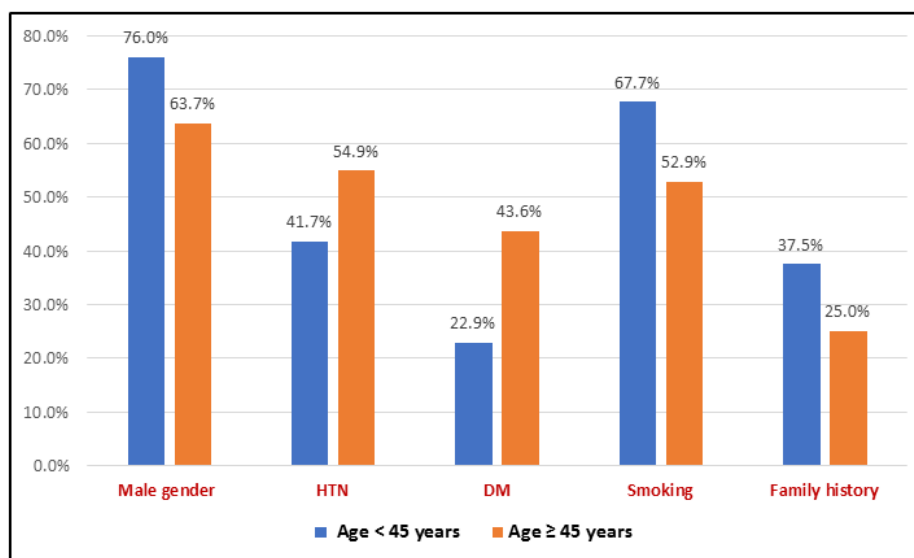

Figure 1. Bar chart between group A and group B regarding the demographic data.

Table 1. Comparison between the studied groups regarding the clinical data.

Clinical data	Age < 45 years	Age ≥ 45 years	P-value
Count	96	204	(Sig.)
Diagnosis			
STEMI	60 (62.5%)	93 (45.6%)	
Non-ST ACS	15 (15.6%)	46 (22.5%)	0.012 (S)
SCAD	21 (21.9%)	65 (31.9%)	
SBP (mmHg)			
Mean±SD	123.1±17.2	118.8±20.4	0.075 (NS)
DBP (mmHg)			
Mean±SD	75.2±10.5	73.7±11.8	0.294 (NS)

One vessel and two vessel disease were most prominent in group A with age (< 45 years) versus group B with age (≥ 45 years) while MVD was most prominent in group II versus group I with significant P value 0.010,

Type A lesion (discrete <10 mm length) and B lesion (tubular 10 - 20 mm length) were the most common types of lesion in group A, while type C lesion (diffuse excessive tortious > 20 mm length) was more common in group B than group A, with significant P value (0.019), Calcified, bifurcational and ostial lesions were most prominent in group B with highly significant P value (<0.001) in calcified lesions "table 2".

Table 2. Comparison between the studied groups regarding the coronary angiographic data.

Coronary angiographic data	Age < 45 years	Age ≥ 45 years	P-value
Count	96	204	(Sig.)
N. of diseased vessels			
One vessel	48 (50%)	76 (37.3%)	
Two vessels	30 (31.3%)	62 (30.4%)	0.010 (S)
Multi-vessels	18 (18.7%)	66 (32.3%)	
Lesion type			
Type A	8 (8.3%)	4 (2%)	
Type B	30 (31.3%)	56 (27.4%)	0.019 (S)
Type C	58 (60.4%)	144 (70.6%)	
Other lesion characteristics			
Calcified	8 (8.3%)	58 (28.4%)	<0.001 (HS)
Bifurcational lesion	18 (18.7%)	26 (26.7%)	0.170 (NS)
Ostial lesion	14 (14.6%)	38 (18.6%)	0.338 (NS)

In STEMI patients; one vessel, two vessel and multivessel disease were most prominent in group I with age (< 45 years) than in group II with age (≥ 45 years), with no statistically significant difference in both groups. Type A and B lesions were the most common types of lesion in group I, while type C lesion was more common in group II than group I, with no statistically significant difference in both groups. Calcified lesions was most prominent in group II with significant P value (0.006). Regarding thrombus grade:- grade 5 was most prominent in group II, but grade 3 and 4 were most prominent in group I. Regarding TIMI flow " pre-intervention":- TIMI flow 0 was the most prominent in group I " <45 years old "while TIMI I was the most prominent in group II "≥45 years old " with no statistically significant difference in both groups. Regarding TIMI flow "post-

intervention":- TIMI flow 3 was the most prominent in group I " <45 years old " to be achieved with no statistically significant difference in both groups "table 3".

Table 3. Comparison between the age groups within STEMI patients (n=153) regarding the coronary angiographic data.

Coronary angiographic data	Age < 45 years	Age ≥ 45 years	P-value
Count	60	93	(Sig.)
N. of diseased vessels			
One vessel	33 (55%)	48 (51.6%)	
Two vessels	20 (33.3%)	29 (31.2%)	0.645 (NS)
Multi-vessels	7 (11.7%)	16 (17.2%)	
Lesion type			
Type A	5 (8.3%)	3 (3.3%)	
Type B	22 (36.7%)	27 (29%)	0.180 (NS)
Type C	33 (55%)	63 (67.7%)	
Other lesion characteristics			
Calcified	4 (6.7%)	22 (23.7%)	0.006 (S)
Bifurcational lesion	11 (18.3%)	13 (14%)	0.470 (NS)
Ostial lesion	11 (18.3%)	10 (10.8%)	0.183 (NS)
Thrombus grade			
Grade 1	0 (0%)	1 (1.1%)	
Grade 2	0 (0%)	1 (1.1%)	
Grade 3	8 (13.3%)	5 (5.4%)	0.248 (NS)
Grade 4	24 (40%)	32 (34.3%)	
Grade 5	28 (46.7%)	54 (58.1%)	
TIMI flow pre			
TIMI 0	37 (61.7%)	54 (58.1%)	
TIMI 1	17 (28.3%)	32 (34.3%)	0.774 (NS)
TIMI 2	6 (10%)	5 (5.4%)	
TIMI 3	0 (0%)	2 (2.2%)	
TIMI flow post			
TIMI 0	0 (0%)	2 (2.2%)	
TIMI 1	7 (11.7%)	7 (7.5%)	0.691 (NS)
TIMI 2	2 (3.3%)	9 (9.7%)	
TIMI 3	51 (85%)	75 (80.6%)	

4. Discussion

Coronary heart disease is the leading cause of morbidity and mortality, worldwide both in developing as well as developed countries, and is responsible for one third or more of all deaths in individuals greater than 35 yearsof age [12].

In Choi J et al 2014, we found that The prevalence of conventional risk factors like hypertension (67%), dyslipidemia (67%), obesity (53%), smoking (42%), and diabetes (33%) is higher in women with a family history of CAD which is concordant with our study except the gender [13]. In Aggarwal A et al 2014, we found that a recent increase in the prevalence of hypertension [8.86% (2001-2002) to 27.7% (2009-2010)] and dysglycemia [7.6% (2001-2002) to 36.15% (2009-2010)] in young CAD [14]. In spite of that in Wadkar et al., 2014 systemic hypertension and diabetes mellitus are well established risk factors for atherosclerosis, they may not be prevalent in younger age groups as in older ones, the results were observed with only 14.5% were diabetic and 19% were hypertensive in young

patients [15]. In our study hyper tension and diabetes mellitus were significantly higher in group B with age (≥45years) than group A (<45 years). In our study there were 203 (67.7%) male patients, 97 (32.3%) female patients in the study. There were 152 (50.7%) hypertensive patients, 111 (37%) were diabetic, 173 (57.7%) were smoker and 87 (29%) had a positive family history of coronary arterial disease.

In Yusuf S et al, 2004 Obesity was the infrequent cause in all the earlier studies with incidence of 3.3%–20%. Physical inactivity was present in 53.5% patients. The prevalence of obesity was 39.1% in India-AMIYA study which was similar to South Asian cohort of INTERHEART study (44.2%). In our study, obesity were significantly higher in group B with age (≥45 years) than group A (<45 years)

In the study carried by Schoenenberger, 2011 the STEMI presentation was significantly increased in the CAD patients of age (<45 years) group while patients of age (≥ 45years) were presented more by NSTEMI in agreement with, Avezum et al., 2005 & Al Khadra et al., 2003 who reported that STEMI was more frequent in the young patients, whereas NSTEMI was in the elderly [17]. In our study the most common clinical presentation was STEMI were significantly higher in group I (<45 years) than group II (≥ 45years) while Non-ST ACS and SCAD were significantly higher in group II (≥ 45 years) than in group I (<45years).

5. Study Limitations

First: The present study was not a randomized controlled trial, and a selection bias may have existed.

Second: Small sample size, which reduces the statistical validity of some of the differences between the groups.

Third: Only conventional coronary disease risk factors were identified. Several emerging risk factors such as high-Sensitivity C- Reactive Protein (hs-CRP), lipoprotein abnormalities, hypercoagulable states, elevated homocysteine levels, markers of inflammation and platelet glycoprotein IIIa, PlA2 polymorphism were not evaluated.

Fourth: Risk-factor identification was based on the information provided by patients or their relatives. Identifying risk factors in this manner leads to an underestimation of their true prevalence; however, this is the method used in recent studies

6. Conclusion & Recommendations

Based on age, CAD patients had a different risk factors profile & different clinical presentation with variable lesion severity.

STEMI is the most common presentation among the sample of young Egyptian patients which manifests decades earlier compared to Western population. Smoking, family history of premature CAD, obesity were the most common risk factors.

Non ST ACS and SCAD were more in group II " age ≥ 45 years " with multivessel disease and complication and more

prominent in diabetic patients.

Primordial prevention about smoking cessation and life style modification in cutting down obesity will be important epidemiological tool. Awareness on this topic, importance of golden hour and early diagnosis and treatment will have huge economic impact as sizeable number of patients present late.

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