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Abstract

Background: Ischemic heart disease is a common cause of death all over the world. This disease occurs due to the imbalances between the supply and demand of oxygen to the myocardium resulting in myocardial ischemia. It is considered as a life-threatening condition due to the increases in the prevalence of its risk factors. This study aimed to investigate the relationship between the angiographic findings and risk factors among Omani ischemic heart disease patients presented at Sultan Qaboos University Hospital.Methods: This is a retrospective study, the data collection done by using Hospital information system in the period between January to December 2018. Patients were grouped according to the number of risk factors into; patients with a single risk factor and patients with multiple risk factors. Coronary angiography results were categorized into; insignificant coronary lesion and significant coronary lesion according to the percentage of stenosis (with a cut-off point of 50

Index terms— ischemic, heart, diseases, risk factors, coronary angiography, oman.

Abstract-Background: Ischemic heart disease is a common cause of death all over the world. This disease occurs due to the imbalances between the supply and demand of oxygen to the myocardium resulting in myocardial ischemia. It is considered as a life-threatening condition due to the increases in the prevalence of its risk factors. This study aimed to investigate the relationship between the angiographic findings and risk factors among Omani ischemic heart disease patients presented at Sultan Qaboos University Hospital.

Methods: This is a retrospective study, the data collection done by using Hospital information system in the period between January to December 2018. Patients were grouped according to the number of risk factors into; patients with a single risk factor and patients with multiple risk factors. Coronary angiography results were categorized into; insignificant coronary lesion and significant coronary lesion according to the percentage of stenosis (with a cut-off point of 50% occlusion). Categorical data were analyzed using the chisquare statistical test for quantitative data and, the P value of less than 0.05 was considered significant.

Results: Total number of patients was 250 with the male being 198 and female 52.The mean age was 62.66±11 years. Stable angina (SA) was the most common presentation in (65.2%) of the patients. Total of77.6% of patients had multiple risk factors and Hypertension being the highest prevalent risk factor in (74.4%) of the patients and positive family history was the least prevalent in both gender (12.8%). The left anterior descending artery (LAD) was the most common site for significant coronary lesions (stenosis>50%) in 75.2% of the patients. Majority of the patients were having multiple obstructive lesions in more than one coronary artery with 62.8%. There was a significant relationship between the presence of multiple risk factors and the occurrence of multiple obstructive coronary lesions with a P value = 0.016 (P<0.05). Conclusion: The significant relationship was observed and further studies are recommended in large patients' population to ensure the relationship between coronary angiographic findings and ischemic heart disease risk factors. Most of the risk factors seen in this study were modifiable-type risk factors. Therefore, more concentration on preventive strategies are also recommended.

1 I.

Background schemic Heart Disease (IHD) is the most common form of heart diseases. This disease occurs due to the imbalances between the supply and demand of oxygen to the myocardium resulting in myocardial ischemia (1). The presentation of ischemic heart disease patients varies according to the extent of the coronary arteries involved (2). The majority of patients present with stable angina (SA) which characterized by predicted chest pain on exertion. Other patients present with the acute coronary syndrome (ACS), which can be either unstable

angina (UA), non-ST segment elevation myocardial infarction (NSTEMI) or the most advanced stage when the patient presents with ST-segment elevation myocardial infarction (STEMI) which indicate completely occluded coronary artery (2,3). Acute coronary syndrome occurs as a result of atherosclerotic plague rupture in most cases. This rupture can lead to thrombus formation and subsequently subtotal occlusion to one of the major coronary arteries (2).

Coronary heart disease (CHD) is the cause of death to one-third of people with age above 35 years old and a leading cause of disability in a developed country (4). It is the leading cause of mortality in half of the middle-age men and in one-third of women in the same age among all American adults. According to the American Heart Association update regarding heart disease statistics in 2016, it was estimated that every 42 seconds an American would be suffering from a myocardial ischemia and infarction (4) Cardiovascular disease (CVD) is one of the major causes of mortality in developing countries and is the most common cause of death in developed countries (5,6,7). Ischemic heart disease is a subtype of CVD which considered as a major cause of death worldwide (7,8). It is the second leading cause of disability all over the world. In Oman, ischemic heart disease was the leading cause of morbidity and the fourth common cause of mortality among 45-60 years old patients in 2006 (9).

There are many well-known risk factors that are related to ischemic heart disease. These risk factors are classified into two categories. Modifiable risk factors include smoking, dyslipidemia (DLP), hypertension (HTN), diabetes mellitus (DM), obesity, physical inactivity, and unhealthy diet. Non-modifiable risk factors includeage, gender, and genetic predisposition to ischemic heart disease (10)(11)(12). Women are less prone to have ischemic heart disease in their reproductive age and this is due to female's protective sex hormones and their tendency to prevent atherosclerotic plague formation (13). However, postmenopausal women have a similar risk as well as men to develop ischemic heart disease (13)(14)(15).

Many tests are used to diagnose ischemic heart disease nowadays. Starting from the non-invasive test such as blood test to invasive once such as cardiac PET scan and coronary guide wire sensor technology with a large list of various tests in between (16,17). However, Coronary angiography (CAG) is the standard gold method to assess the coronary vessels patency. It uses X-ray imaging with a contrast dye to visualize the coronaries to detect the blockage (16). Coronary angiography is a definitive diagnostic procedure that involves cardiac catheterization (18)(19)(20)(21).The findings of coronary angiography can be classified into two categories according to the percentage of occlusion. Non-obstructive stenosis (occlusion of less than 50%) and obstructive stenosis (occlusion of more than 50%) (19,22).

The ischemic heart disease risk factors may exhibit their effect on the coronary angiographic findings in patients with ischemic heart disease. Few studies were conducted, and the results showed that there is a significant relationship between the angiographic findings and ischemic heart disease risk factors (23). The results indicate that there is a significant relationship between the presence of multiple risk factors and the aggressive coronary angiographic findings. In other words, the more cluster risk factors the patient has, the more aggressive pattern will be seen in their coronary angiography (21,23). Studies show that there is a relationship between coronary arteries involvement and cardiovascular risk factors in patients underwent coronary angiography. According to recent study published in 2018, it indicates that there is a significant association between the extent of coronary artery stenosis with different risk factors such as age, male gender, diabetes mellitus, smoking and positive history of cardiac disease among Iranian population (19).

To the best of our knowledge there is no similar studies have been conducted in Oman. Therefore, the main aim of this study is to investigate the relationship between the angiographic findings and risk factors among Omani patients with ischemic heart disease presented at Sultan Qaboos University Hospital.

2 II.

3 Materials & Methods

A retrospective cohort study was conducted in the period between January to December 2018 in Sultan Qaboos University Hospital (SQUH) in Muscat, Sultanate of Oman. The access authorization to the hospital electronic medical records was provided by the Hospital Information System (HIS).All Omani patients who are known to have ischemic heart disease (IHD) and underwent coronary angiography at SQUH in the period between January to December 2018where included in this study. Participants with no history of ischemic heart disease, non-Omani patients, patients with no documented data in their medical history were excluded.

Data collection was performed by accessing the Track Care system. Demographic and clinical characteristics including age, gender, history of smoking, hypertension, diabetes, family history of cardiac diseases, history of hospitalization as a result of cardiovascular diseases, history of coronary angiography (CAG) and the severity of coronary artery involvement were gathered.

In the first step, demographic and clinical data about patient's risk factors were collected using medical history & clinical notes. Patients were categorized according to their presentation in 3 groups: group one; patients with ST-segment elevation myocardial infarction (STEMI), group two; patients with non-ST-segment elevation myocardial infarction (NSTEMI) or unstable angina (UA) and group three those with stable angina (SA). The patients were further divided according to the number of risk factors into; patients with a single risk factor and patients with multiple risk factors.

In the second step of the data collection, the coronary angiographic findings were obtained by reviewing the

Cath Lab angiography reports. Angiography results were grouped into two groups; insignificant coronary lesion group (non-obstructive occlusion of less than 50% stenosis) and significant coronary lesion group (obstructive occlusion of more than 50% stenosis). The main concern of this angiographic findings was looking primary at the changes on three major epicardial coronary arteries which are the left anterior descending (LAD), right coronary artery (RCA), and the left circumflex artery (LCx).

The data were analyzed by using IBM Statistical Package for the Social Sciences (SPSS) 23 computer program. The mean and standard deviation for age was obtained by using Frequency tables. Categorical data was analyzed using chi-square statistical test for quantitative data and P value of less than 0.05 was considered significant. The confidence interval in this study was 95%.

The present study was approved by the Ethics Committee of the College of medicine and health sciences at Sultan Qaboos University. There was no need for a consent statement as the study was done by accessing the Track Care system only without patient's direct participation. Patient's confidentiality was respected when dealing with data files; by using coding numbers referred to each patient without including their names or any personal information when studying and analyzing the data.

4 III.

5 Results

The demographic data for the included patients in the study are shown in Table 1. There was a total number of 250 patients with a mean age of 62.66 $\pm$ 11 years. The minimum age was 30 years and 89 years was found to be the maximum age observed among our ischemic heart disease patients. Male patients were 198 (79.2%) patients and female were 52 (20.8%) patients. All the included 250 patients were Omani. Among the 250 patients included in the study, there was 52 patients have a single risk factor while 198(79.2%) patients were found to have multiple risk factors. Amongst all the patients, 163 (65.2%) were presented with stable angina (SA), 27(10.8%) presented with STEMI, and 60(24%) with NSTEMI. The most frequent significant (obstructive $>$ 50%) lesion was seen at the left anterior descending artery (LAD) (75.2%) in both genders followed by the right coronary artery (RCA) (59.2%) and lateral circumflex artery (LCx) (55.2%) respectively. Figure 1 represents the prevalence of risk factors among the included patients. As it is shown; Hypertension was the highest prevalent risk factors among ischemic heart disease patients in both gender with 186 patients have it (74.4 %) followed by diabetes 162(64.8%), dyslipidemia 125(50%), smoking 49(19.6%), and positive family history 32(12.8%) which was the least prevalence. Table 2 evaluates the relationship between the angiographical findings and the risk factors groups. As it is shown that there is significant relationship between the presence of multiple risk factors and the occurrence of obstructive occlusion (stenosis$>$50%) in the LAD artery with a P value $<$ 0.05 (P=0.049). However, this relationship was insignificant in the other two coronary arteries (LCx and RCA) with a P-value $>$ 0.05. In the final analysis, we tested the relationship between the presence of multiple risk factors and the occurrence of multiple obstructive occlusion (stenosis$>$50%) in more than one coronary artery using a chi-square test. The result showed a significant relationship with a P-value $<$ 0.05 (p=0.016) as it is shown in table 3.

6 Discussion

The current study was carried out to investigate the relationship between different ischemic heart disease risk factors and the coronary angiographic findings among Omani patients. This finding will play an important role in the prevention of ischemic heart disease.

The baseline characteristics of our study group showed that out of the 250 patients included in this study, 198 (79.2%) patients were males and 52 (20.8%) patients were females. This is in agreement with worldwide prevalence. This is probably due to female's protective sex hormones which make them less prone to have ischemic heart disease in their reproductive age as it is indicated in other studies as well (13,14). The mean and standard deviation of patients were 62.66$\pm$11 years which almost equal to the mean age that found in Panduranga and his colleague's study (2).

Our study found a significant prevalence of different risk factors. Most of the patients found to have multiple risk factors (79%) rather than a single risk factor (21%). Similarly, Mohammed. A. et al found that most of the Iraqi patients had a combination of risk factors (23).

The most frequent significant (obstructive $>$ 50%) lesion was seen at the left anterior descending artery (LAD) (75.2%) in both genders followed by the right coronary artery (RCA) (59.2%), and lateral circumflex artery (LCx) (55.2%) respectively. This is in agreement with a study done by Maroszy?ska. Et al. which found that the most common lesion location among their study group was the left anterior descending (LAD) artery (61.6%) followed by the right coronary artery (RCA) (27.4%) and left circumflex artery (LCx) (11.0%) (24). Moreover, Mohammed. A. et al. coronary angiographic findings show the most common vessel involved was the LAD (41.6%) followed by LCx (29.3%) then RCA (25.9%),and the least prevalence obstructive occlusion was observed in the left main stem LMS (3.2%) (23).

Among all ischemic heart disease patients included in our study, stable angina (SA) was the most common presentation (65.2%) followed by NSTEMI (24%) and STEMI (10.8%). In contrast, to Maroszy?ska. et al. found STEMI as the major ischemic heart disease presentation (57.6%) followed by unstable angina (UA) (26.3%) and

NSTEMI (16.1%) (24).Also, Mohammed. A. et al. found NSTEMI as the highest prevalent patient's presentation (44.5%) followed by STEMI (32.7%) and lastly stable angina (SA) (22.7%) (23).

The chi-square test was used to compare between two groups of angiographic findings in each coronary artery in term of presence of multiple and single risk factors. The results showed a significant association between the presence of multiple risk factors and the occurrence of obstructive coronary lesion in the left anterior descending artery (LAD) with a P-value <0.05. However, there was lack of statistically significant relationship when we applied the same test for the right coronary artery (RCA) as well as the left circumflex artery (LCx) with a P-value >0.05. This might be due to small sample size. We tested the relationship between the presence of multiple risk factors and the occurrence of multiple obstructive occlusions (stenosis >50%) in more than one coronary artery using chi-square test. The result showed a significant relationship with a P-value<0.05 (P=0.016). This result was similar to those found by Mohammed. A. et al. They noticed that there were more chance to have significant coronary lesions in patients with cluster risk factors with a P-value < 0.05. This result means that these severe angiographic findings are linked to the presence of multiple risk factors (23).

V.

7 Conclusion

The significant relationship between the coronary angiographic findings and ischemic heart disease risk factors were observed, and further studies are recommended in the large patient population to ensure the relationship between coronary angiographic findings and ischemic heart disease risk factors. Most of the risk factors seen in this study were modifiable-type risk factors. Therefore, more concentration on preventive strategies are also recommended. [1] [2]

Figure 1:

1

Variables (unit)		Number (%)	Mean ± SD	Minimum	Max
Nationality	Omani Non-Omani	250 (100%) 0 (0%)			
Age (years)		250 (100%)	62.66 ± 11	30	89
Gender	Male Female	198 (79.2%) 52 (20.8%)			
Risk factors	Single Multiple	52 (20.8%) 198 (79.2%)			
IHD presentation	STEMI	27 (10.8%)			
	NSTEMI	60 (24%)			
	SA	163 (65.2%)			
Coronary artery lesion based on angiography	LAD (significant)	188 (75.2%)			
	LAD (insignificant)	62 (24.8%)			
	RCA (significant)	148 (59.2%)			
	RCA (insignificant)	102 (40.8%)			
	LCx (significant)	138(55.2%)			
	LCx (insignificant)	112(44.8%)			

Figure 2: Table 1 :

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[2] Correlation between Angiographic Findings and Risk Factors among Omani Patients with Ischemic Heart-Disease at Sultan Qaboos University Hospital

2

Characteristics		Single risk factor	Multiple risk factors	P value
LAD findings	significant	36 (64.3%)	152 (78.4%)	P=0.04
	insignificant	20 (35.7%)	42 (21.6%)	
RCA findings	significant	28 (50%)	120 (61.9%)	P>0.05
	insignificant	28 (50%)	74 (38.1%)	
LCx findings	significant	27 (48.2%)	111 (57.2%)	P>0.05
	insignificant	29 (51.8%)	83 (42.8%)	

Figure 3: Table 2 :

3

	Variable		Risk factors group Single	Multiple	Total
Lesions group	Single	Count	29 51.8%	64 33.0%	93 37.2%
	Multiple	% within RFs group	27 48.2%	130 67.0%	157 62.8%
		Count			
		% within RFs group			
Total		Count	56 100.0%	194 100.0%	250 100.0%
		% within RFs group			

[Note: IIV.]

Figure 4: Table 3 :

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7 CONCLUSION

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