Original Article

Angiographic examination in patients with Myocardial Infarction with and without ST segment elevation

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ABSTRACT

Introduction: Identifying the risk factors for myocardial infarction and determining the relationship between these factors and severity and location of coronary artery disease can help physicians to make diagnostic and therapeutic decisions, while providing a suitable context for effective action to modify risk factors in the society. Background and Method: In this cross-sectional study, 384 patients with myocardial infarction with and without ST elevation admitted to Bouali Hospital during 2016 and 2017 were studied. Demographic data and findings in the angiography including the number of vessels and the type of coronary artery involved were studied. Then, the risk factors and angiographic and demographic characteristics of STEMI and NSTEMI people were determined and compared with each other. Results: 85.5% of the STEMI cases had involvement of one vessel and 52.1% of NSTEMI cases had involvement of two vessels. According to results of Chi-square and Cramer test, these differences are significant. Most STEMI cases had RCA involvement (38.3%) and LCX involvement (29%). However, NSTEMI cases mostly had RCA+LCX (36.2%) and LAD+RCA+LCX (21.3%) involvement. According to statistical tests, these differences are significant (P-value=0.000, vi Cramer=0.524). Both groups of patients with myocardial infarction were over 55 years of age and men. However, the number of NSTEMI cases with BMI higher than the normal range was significantly more than STEMI cases. Discussion and Conclusion: The prevalence of multiple vessel involvement of RCA and LCX is higher in NSTEMI cases than STEMI cases.

Keywords: Myocardial infarction, Risk factors, Angiographic profile.

Introduction

Coronary artery disease is the first cause of mortality in most modern societies. In addition, this disease results in high morbidity, inability and loss of labor and production, and it is the first cause of health expenditure. Clinical spectrum of coronary heart disease range from silent ischemia (asymptomatic) to chronic stable angina, unstable angina, acute myocardial infarction, ischemic cardiomyopathy, sudden cardiac death, arrhythmias, and cardiogenic shock, and therefore causes high health and medical costs [1-3]. Cardiovascular diseases is expected to remain worldwide as the leading cause of mortality (36% of all deaths) by 2020 [4]. Annually, 17 million people worldwide die from cardiovascular diseases. These diseases account for 10 million out of 40 million deaths occurring annually in developing countries; in addition, they are one of the main causes of disability [5]. In Iran, cardiovascular diseases are the most common causes of mortality [6]. In a study done in Birjand in 2003, cardiovascular diseases with 24.1% of deaths were identified as the most important cause of death [7]. In the cardiovascular disease group, myocardial infarction is the most common cause of mortality and disability [8]. Myocardial infarction is a process in which part of the myocardial muscle fades due to cut or decrease of coronary blood flow. Myocardial infarction is usually caused by acute obstruction of a coronary artery and sudden discontinuation of blood flow and oxygen to the heart muscle. It is one of the most common causes of hospitalization in industrialized countries; annually, 1.1 million

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people in the United States experience this disease and about 30% of these people die from its complications. The main cause of heart diseases, particularly myocardial infarction, is myocardial arteriosclerosis of coronary artery [9]. Several risk factors have been suggested for coronary artery diseases, including hypertension, hyperlipidemia, family history of heart diseases, smoking, etc. [10, 11]. PCI, which is usually performed as angioplasty or stenting without previous fibrinolysis, is more effective when it is performed in an emergency and in the first few hours of MI. Compared to fibrinolysis, PCI is usually preferred when diagnosis is suspected, there is cardiogenic suspicion (particularly in patients under the age of 75), there is a risk of bleeding or pain for at least 2-3 hours. In this case, the clot is riper. The goal of thrombolytic therapy is to lyse coronary artery clot and thus to achieve a sufficient coronary blood flow. The choice of thrombolytic therapy requires that the patient suffers from chest ischemic pain with ECG evidence indicating acute infarction (ST elevation) and does not have thrombonetic contraindication [12]. Venous thrombolytic therapy has been routinely started in the mid-1980; studies have shown that its most beneficial effect on survival of patients is when it is received at the first hour of onset of symptoms that is called the golden time for thrombolytic therapy. Initially, the standard time was between 20 and 30 minutes after reaching the hospital, but now the treatment starts within 60 minutes from the time of emergency call [13]. Diagnosis of coronary heart disease and its severity is important in any period, whether it is still in the preclinical stage or when the patient is in the post-MI phase and the risk of mortality is high. With timely diagnosis, disease burden can be reduced and treatment process can be improved [14]. Therefore, this study tends to examine demographic and angiographic characteristics in patients with myocardial infarction with and without ST segment elevation in Bouali Hospital during 2016 and 2017.

Materials and Methods

The present study is clinical/applied research in terms of objective. The method used in this study is descriptive/empirical. The method is observational/analytical. The statistical population include patients with myocardial infarction with and without ST segment elevation in Bouali hospital during 2016-2017. Based on the following formula, 384 qualified people were recruited.

$$n = \frac{\left(z_{1-\alpha/2}\right)^2 p(1-p)}{d^2}$$

The instrument used in this study is data collection form and patients' files. The demographic data of these patients is collected by data collection form. In the end, frequency of findings in the angiography, including the number of vessels involved and the type of coronary artery involved, are determined.

Results

Angiographic Characteristics

According to Table 1, 85.5% of STEMI cases had involvement of one vessel and 52.1% of NSTEMI cases had involvement of two vessels. According to results of Chi-square test in Table 2, these differences are significant; NSTEMI cases had involvement of multiple vessels and STEMI cases had involvement of one vessel. According to Table 3, most STEMI cases had involvement of RCA (38.3%) and LCX (29%), while NSTEMI cases mostly had concurrent involvement of RCA+LCX (36.2%) and LAD+RCA+LCX (21.3%). Based on statistical tests, these differences are significant (p-value=0.000, vi Cramer=0.524).

Table 1: cross-table of the number of involved vessels in STEMI and NSTEMI groups

			site of stemi and nstemi in ekg		Total
			STEMI	NSTEMI	
Number of diseased vessels	1	Count	248	25	273
		% within site of stemi and nstemi in ekg	85.5%	26.6%	71.1%
	2	Count	39	49	88
		% within site of stemi and nstemi in ekg	13.4%	52.1%	22.9%
	3	Count	3	20	23
		% within site of stemi and nstemi in ekg	1.0%	21.3%	6.0%
Total		Count	290	94	384
		% within site of stemi and nstemi in ekg	100.0%	100.0%	100.0%

Table 2: chi-square test for the number of vessels involved in STEMI and NSTEMI groups

	Chi-Square Tests		
	Value	df	Asymptotic Significance (2-sided)
Pearson Chi-Square	131.682[a]	2	.000

Likelihood Ratio	123.584	2	.000
Linear-by-Linear Association	129.915	1	.000
N of Valid Cases	384		

a. 0 cells (0.0%) have expected count less than 5. The minimum expected count is 5.58.

Table 3: frequency of patients with myocardial infarction based on the type of vessel involves

Type of diseased vessel * site of stemi and nstemi in ekg Crosstabulation

			site of stemi and nstemi in ekg		Total
			STEMI	NSTEMI	
Type of diseased vessel	LAD	Count	49	8	57
		% within site of stemi and nstemi in ekg	16.9%	8.5%	14.8%
	RCA	Count	111	11	122
		% within site of stemi and nstemi in ekg	38.3%	11.7%	31.8%
	LCX	Count	84	6	90
		% within site of stemi and nstemi in ekg	29.0%	6.4%	23.4%
	RCA+LCX	Count	16	34	50
		% within site of stemi and nstemi in ekg	5.5%	36.2%	13.0%
	LAD+LCX	Count	17	8	25
		% within site of stemi and nstemi in ekg	5.9%	8.5%	6.5%
	LAD+RCA	Count	10	7	17
		% within site of stemi and nstemi in ekg	3.4%	7.4%	4.4%
	LAD+RCA+LCX	Count	3	20	23
		% within site of stemi and nstemi in ekg	1.0%	21.3%	6.0%
Total		Count	290	94	384
		% within site of stemi and nstemi in ekg	100.0%	100.0%	100.0%

Angiographic Characteristics Based on Age

According to Table 4, 34.4% of patients with involvement of one vessel aged 55-64 years, 34.1% of people with involvement of two vessels and 43.5% of people with involvement of three vessels aged 75-85 years. Based on Chi-square test and Cramer test in Table 5 and 6, these differences are significant and the severity of this relationship is low (p-value=0.000, phi and vi Cramer=0.226).

Table 4: cross table of the number of vessels involved in patients with myocardial infarction (with and without ST segment) based on age

			Number of diseased vessels			Total
			1	2	3	
age category	<45	Count	5	5	1	11
		% within Number of diseased vessels	1.8%	5.7%	4.3%	2.9%
	45-54	Count	34	4	2	40
		% within Number of diseased vessels	12.5%	4.5%	8.7%	10.4%
	55-64	Count	94	19	2	115
		% within Number of diseased vessels	34.4%	21.6%	8.7%	29.9%
	65-74	Count	76	21	3	100
		% within Number of diseased vessels	27.8%	23.9%	13.0%	26.0%
	75-85	Count	53	30	10	93
		% within Number of diseased vessels	19.4%	34.1%	43.5%	24.2%
	>85	Count	11	9	5	25
		% within Number of diseased vessels	4.0%	10.2%	21.7%	6.5%
Total		Count	273	88	23	384
		% within Number of diseased	100.0%	100.0%	100.0%	100.0%

vessels

Table 5: Chi-square test for the relationship between the number of involved vessels and age in patients with myocardial infarction (with and without ST segment)

	Value	df	Asymptotic Significance (2-sided)
Pearson Chi-Square	39.351[a]	10	.000
Likelihood Ratio	37.589	10	.000
Linear-by-Linear Association	17.435	1	.000
N of Valid Cases	384		

Table 6: phi and vi Cramer test for the relationship between the number of involved vessels and age in patients with myocardial infarction (with and without ST segment)

Symmetric Measures

		Value	Approximate Significance
Nominal by Nominal	Phi	.320	.000
	Cramer's V	.226	.000
N of Valid Cases		384	

Angiographic Characteristics Based on Gender

According to Table 7, unlike LAD and RCA arteries, LCX involvement in women is more than men (54.4% vs. 45.6%). On the other hand, 78% of cases with LAD and RCA involvement, 68% of LAD and LCX involvement, 64.7% of LAD and RCA involvement, 78.3% of RCA, LAD, and LCX involvement were men. Based on Chi-square and Cramer tests in Table 8 and 9, these differences are significant and weak (λ^2=19.95, P-value=0.003, phi=0.228).

Table 7: cross table of coronary artery involved based on gender of patients with myocardial infarction

			Type of diseased vessel						
			LAD	RCA	LCX	RCA+LCX	LAD+LCX	LAD+RCA	LAD+RCA+LCX
sex	female	Count	26	55	49	11	8	6	5
		% within Type of diseased vessel	45.6%	45.1%	54.4%	22.0%	32.0%	35.3%	21.7%
	male	Count	31	67	41	39	17	11	18
		% within Type of diseased vessel	54.4%	54.9%	45.6%	78.0%	68.0%	64.7%	78.3%

Table 8: Chi-square test for the relationship between coronary artery involved and gender of patients with myocardial infarction

Chi-Square Tests

	Value	df	Asymptotic Significance (2-sided)
Pearson Chi-Square	19.956[a]	6	.003
Likelihood Ratio	20.847	6	.002
Linear-by-Linear Association	8.110	1	.004
N of Valid Cases	384		

Table 9: Cramer test for the relationship between coronary artery involved and gender of patients with myocardial infarction

Symmetric Measures

		Value	Approximate Significance
Nominal by Nominal	Phi	.228	.003
	Cramer's V	.228	.003
N of Valid Cases		384	

Angiographic Characteristics Based on Family History of Heart Disease

According to Table 10, LCX, LAD, and RCA coronary arterial involvement alone was higher in people with a family history of heart disease. In contrast, concurrent arterial involvement was significantly higher in those with a family history of heart disease. The percentages for people with a family history of heart disease and involvement of multiple vessels are as follows (λ^2=21.492, P-value=0.003, phi=0.227): RCA+LCX (62%); LAD+LCX (56%); LAD+RCA (82.4%); LAD+RCA+LCX (60.9%)

Table 10: cross table of coronary artery involved based on family history of heart disease in patients with myocardial infarction

			Type of diseased vessel						
			LAD	RCA	LCX	RCA+LCX	LAD+LCX	LAD+RCA	LAD+RCA+LCX
History of heart disease	no	Count	33	69	58	19	11	3	9
		% within Type of diseased vessel	57.9%	56.6%	64.4%	38.0%	44.0%	17.6%	39.1%
	yes	Count	24	53	32	31	14	14	14
		% within Type of diseased vessel	42.1%	43.4%	35.6%	62.0%	56.0%	82.4%	60.9%
Total		Count	57	122	90	50	25	17	23
		% within Type of diseased vessel	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%

Angiographic Characteristics Based on BMI

According to Table 11, most people with LAD, RCA, and LCX arterial involvement alone had normal BMI. In contrast, most people with involvement of two coronary arteries had first-degree obesity and 47.8% of those who had three coronary arteries involved had second-degree obesity (λ^2=301.328, P-value=0.000, phi=0.886).

Table 11: cross table of coronary artery involved based on BMI in patients with myocardial infarction

			Type of diseased vessel						
			LAD	RCA	LCX	RCA+LCX	LAD+LCX	LAD+RCA	LAD+RCA+LCX
BMI	19.8-24.9	Count	35	75	58	8	4	3	2
		% within Type of diseased vessel	61.4%	61.5%	64.4%	16.0%	16.0%	17.6%	8.7%
	25-29.9	Count	19	41	27	11	7	2	1
		% within Type of diseased vessel	33.3%	33.6%	30.0%	22.0%	28.0%	11.8%	4.3%
	30-35	Count	3	5	3	26	12	10	3
		% within Type of diseased vessel	5.3%	4.1%	3.3%	52.0%	48.0%	58.8%	13.0%
	35-40	Count	0	1	1	5	1	2	11
		% within Type of diseased vessel	0.0%	0.8%	1.1%	10.0%	4.0%	11.8%	47.8%
	40+	Count	0	0	1	0	1	0	6
		% within Type of diseased vessel	0.0%	0.0%	1.1%	0.0%	4.0%	0.0%	26.1%

Angiographic Characteristics Based on Underlying Diseases

According to Table 12, involvement of multiple vessels was higher in hyperlipidemia (63%) and involvement of single vessel was higher in non-hyperlipidemic cases (56.8%) (λ^2=11.79, P-value=0.000, phi=0.205). Coronary arterial involvement of LCX, LAD, and RCA alone and LAD+RCA and LAD+LCX was higher in non-hyperlipidemic cases. In contrast, RCA+LCX and LCX+RCA+LAD involvement was higher in hyperlipidemia cases (λ^2=17.672, P-value=0.007, phi=0.215).

Table 12: cross table of coronary artery involved based on hyperlipidemia in patients with myocardial infarction

			Type of diseased vessel						
			LAD	RCA	LCX	RCA+LCX	LAD+LCX	LAD+RCA	LAD+RCA+LCX
Hyperlipidemia	no	Count	36	80	54	22	13	9	6

	% within Type of diseased vessel	63.2%	65.6%	60.0%	44.0%	52.0%	52.9%	26.1%
yes	Count	21	42	36	28	12	8	17
	% within Type of diseased vessel	36.8%	34.4%	40.0%	56.0%	48.0%	47.1%	73.9%

Logistic Regression to Determine Regressors of the Number of Involved Vessels

In this study, logistic regression analysis was performed for predicting group membership, in which the number of involved vessels (single vessel and multiple vessel) was selected as dependent variable and age, gender, family history of heart disease, BMI, and history of hyperlipidemia were selected as independent variables. A total of 384 people were included in the analysis and the model was significant (λ^2=253.558, sig=0.000, df=6). Based on the results obtained from Table 14, independent variables are able to predict 71.1% of variation in the dependent variable (the number of coronary arteries involved). The results of the Mnibus test in Table 15 show that the variables considered are able to predict the dependent variable (the number of coronary artery involved) (λ^2=253.558, sig=0.000).

The results obtained from model fitting in Tables 16 and 17 show that independent variables can predict 48 to 70% of the variations in dependent variable. Moreover, total accuracy in classification of people based on the number of vessels involved is 87%. Therefore, age, gender, results of ECG, BMI and family history of heart disease and hyperlipidemia can be used to predict the number of involved vessels. The risk of involvement of more than a vessel will increase with variation from female to male, a family history of heart disease and hyperlipidemia, and an increase in BMI. Undoubtedly, ECG results can also be used to predict this.

Table 13: classification table

Classification Table[a,b]

Observed			Predicted: Number of diseased vessels – Single	Predicted: Number of diseased vessels – Multiple	Percentage Correct
Step 0	Number of diseased vessels	Single	273	0	100.0
		Multiple	111	0	.0
	Overall Percentage				71.1

Table 14: Omnibus Tests of Model Coefficients

		Chi-square	df	Sig.
Step 1	Step	253.558	6	.000
	Block	253.558	6	.000
	Model	253.558	6	.000

Table 15: model fitting

Model Summary

Step	-2 Log likelihood	Cox & Snell R Square	Nagelkerke R Square
1	208.248[a]	.483	.691

Table 16: coefficients of explaining the logistic regression model by independent variables

Variables in the Equation

		B	S.E.	Wald	df	Sig.	Exp(B)
Step 1[a]	Hyperlipidemia	.836	.369	5.139	1	.023	2.306
	History of heart disease	.862	.367	5.529	1	.019	2.368
	Sex	.930	.378	6.042	1	.014	2.533
	age category	.405	.157	6.629	1	.010	1.499
	site of stemi in ecg	.690	.098	49.87	1	.000	1.993
	Category of BMI	1.641	.207	62.64	1	.000	5.158
	Constant	-7.98	.901	78.47	1	.000	.000

Discussion

According to findings, Miquel Fiol et al. (2004) examined the diagnostic value of electrocardiogram based on ST segment in diagnosis of inferior myocardial infarction. For this purpose, angiographic and ECG findings of 63 patients were evaluated. The results showed RCA artery involvement in more than 95% of patients [15]. In a cross-sectional study in the USA, Miller et al. (2008) examined 4136 people and found that people with NSTEMI were more likely to have multiple vessels involved [16], which is consistent with our study.

In a study done by Sadanandan et al., 88 patients underwent angiography with the first MI, including inferior and anterior; then, angiographic findings and ECG indices were used to determine an algorithm for finding a culprit lesion, with 63% sensitivity and 100% specificity for LCX obstruction and 67% sensitivity and 82% specificity for RCA involvement. Anterior MI patients had 85% and 80% sensitivity and 77% and 82% specificity for proximal or distal obstruction, respectively [12]. Among 384 patients with myocardial infarction, there were 55 NSTEMI cases, which showed that 8.5% had LAD involved, 11.7% had RCA involved, 6.4% had LCX involved, 36.2% had LCX+RCA involved, 8.5% had LAD+LCX involved, 7.4% had LAD+RCA involved, and eventually, 21.3% had LAD+RCA+LCX involved; that is, 52.1% of NSTEMI cases had involvement of two vessels and 21.3% had involvement of three vessels. A total of 73.4% of NSTEMI cases have multiple vessels involved.

In a cross-sectional study, Nitter-Hauge et al. (1989) examined 874 patients with coronary artery disease; 95% of them had normal ejection fraction, and the results showed that prognosis was worse in cases where there were changes in ST segment [17].

Surender et al (2016) reviewed the demographic and angiographic characteristics of 820 people under 40 years of age with acute coronary syndrome. There were 611 patients with STEMI and 209 patients with NSTEMI. Single vessel involvement in the STEMI group was significantly higher in the opposite group (56.6% versus 36.6%), while involvement of more than one vessel was higher in the NSTEMI group (3.6% vs. 10.5%). In both groups, smoking was determined as the most important risk factor with a high prevalence of 65%. In this study, multiple vessel involvement was more common in the NSTEMI group (73.4% vs. 14.4%). In our study, 66% of cases of myocardial infarction smoked (75% in NSTEMI and 67% in STEMI).

In the current study, single vessel involvement was slightly higher in men than women (52.4% vs. 47.6%), while multiple vessel involvement was strongly higher in men than women (73% vs.27%). Celnikier-Hochner et al showed that gender was effective in involvement of coronary arteries and the number of arteries involved was higher in women than men [18]. However, Nasri and Masoumi did not support this effect. This can be due to higher age of the studied women compared to men.

The mean age of patients in three groups with three vessels, two vessels and single vessel involvement was significantly different, which is not unexpected due to time-sensitivity of risk factors and effect of age as an independent risk factor. In comparing risk factors in three groups, people with three vessels involved were more likely to have hypertension and diabetes than people with single vessel and two vessel involvement, while the level of serum lipids was not significantly different in three groups. This level of difference in results represents the need for further studies.

Guo et al showed that increase in low density lipoprotein is a strong indication of the severity of coronary artery disease [19].

Masoumi and Nasri (2006) studied the relationship between risk factors of coronary artery disease and the number of vessels involved in angiography. The results indicated that hypertension and diabetes are the main risk factors for involvement of three heart vessels. Diabetic patients are considered as a high-risk group in relation to the number of arteries involved; this can be attributed to accelerated atherosclerosis in diabetic patients [20]. The results of this study regarding blood pressure are similar to the study conducted by Nataly et al in 2000 [21].

In a study by Uddin et al. (2005) examining risk factors in groups with single vessel involvement and more than one vessel involvement, the results showed a positive relationship between diabetes and incidence of coronary artery disease [22]. In our study, diabetic patients with history of hypertension were leading at all levels of vascular involvement compared to non-diabetic cases without hypertension. There was no relationship between the number of vessels and development of disease.

Javidi et al. found a direct relationship between diabetes and severity of coronary artery disease [23]. In other studies conducted by Friedman et al., the number of vessels involved and severity of coronary artery disease was higher in diabetic patients than non-diabetic cases. However, involvement was more severe among diabetic women than men, contrary to the study by Masoumi and Nasri, in which there was no difference between diabetic men and women [24].

Christopher et al (2015) examined the relationship between BMI and MI, stroke and diabetes. The results showed that the incidence of MI is higher in middle-aged people with high BMI [25]. In our study, approximately 52% of people with myocardial infarction were people with BMI above the normal range. Abdon et al (2015) examined the predictive role of family history in predicting mortality from cardiovascular diseases (CVD) and MI. To this end, 6,098 men were examined; they concluded that family history is an important risk factor for mortality due to cardiovascular diseases and MI [26]. In our study, only 47.4% of patients with a history of heart disease had MI.

In our study, the most important risk factors for developing myocardial infarction were gender, hypertension, diabetes and smoking, and BMI above normal range. Rohani et al (2003) found that the most important risk factors for myocardial infarction in both genders are stress, positive family history, smoking, and diabetes [27].

Reuterwall et al (1999) showed that smoking, diabetes, high blood triglyceride and cholesterol, abdominal fat accumulation, obesity, inactivity, hypertension and stress were important risk factors for myocardial infarction in men and women [28].

Simmon, Bullen et al. also reported that serum lipid disorder, hypertension, smoking, obesity, physical inactivity during work and leisure, diabetes, positive family history of coronary heart disease are risk factors for myocardial infarction in women and men [29].

Conclusion

Generally, this study tended to find answers for following problems:

1. Determine angiographic profile of patients with STEMI and NSTEMI myocardial infarction

In general, it can be concluded that the prevalence of multiple vessel involvement (RCA and LCX) is more in NSTEMI patients than the opposite group.

2. Determine demographic profile of patients with STEMI and NSTEMI myocardial infarction

In both groups of patients with myocardial infarction, there were people older than 55 years and men. In the NSTEMI group, the number of people with BMI higher than the normal range was significantly more than STEMI cases.

3. Determine the risk factors for myocardial infarction

Based on the results, it can be concluded that hypertension and positive family history are risk factors for myocardial infarction.

4. Determine risk factors for patients with STEMI and NSTEMI myocardial infarction

The number of diabetics in the STEMI group was significantly higher than the NSTEMI group. The prevalence of family history of heart disease and hyperlipidemia was significantly higher among NSTEMI patients than the other group. People were not significantly different in terms of other risk factors.

5. Determine predictive variables for determining the severity of coronary artery disease:

Age (odd-ratio = 1.499), gender (odd-ratio = 2.533), BMI (odd-ratio = 5.158), electrocardiogram findings (odd-ratio = 1.933), family history of heart disease (odd-ratio = 2.368) and hyperlipidemia (odd-ratio = 2.306). The listed variables will be able to predict 48 to 70% of variation in dependent variable with accuracy of 87%. Male gender, family history of heart disease, aging and BMI increase the severity of coronary artery disease. Hence, findings of our study and other studies showed that the effect of gender on severity of coronary artery disease (single vessel and multiple vessels) is still unknown and achievements of various studies are different. It is suggested to address this through a control-case study. A similar study, but prospectively, and comparison of the results can be another study vision.

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