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Original Article

Determining the Frequency of Non-Obstructive Coronary Artery Disease in Elective Angiography Cases

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ABSTRACT

Cardiovascular disease particularly ischemic heart disease has emerged as a leading cause of death. Atherosclerosis in epicardium results in CAD without the restriction of coronary circulation but the other processes that may disrupt the myocardial supply and demand in patients exhibiting angina symptoms or indications may be suspected of having non-obstructive CAD. **Objective:** To find out the prevalence of non-obstructive CAD in patients enrolled for elective angiography. **Methods:** A cross-sectional descriptive analysis was done in the Cardiology department in King Edward Medical University and Mayo Hospital, Lahore. The duration of study was for six months from 01-08-2022 to 01-02-2023. After approval from hospital ethical committee, 150 patients were enrolled in the study with informed written consent. Demographics including Name, age, BMI, confounding factors like (diabetes, hypertension, smoking and family history) and address were noted. All selected patients underwent coronary angiography via right femoral artery approach by a consultant cardiologist. Non-obstructive coronary artery disease was assessed as per operational definition. All the information was noted on pre-designed proforma (attached). **Results:** A total of 150 patients were selected for the study. It showed that out of 150 patients, 2.7% (n=4) fall in age group of 18-40 years and 97.3% (n=146) were in age group of 41-60 years, average age was 51.94±5.26 years and the BMI was 27.96±6.44 kg/m². There were 62.7% (n=94) male and 37.3% (n=56) females. Frequency of diabetes mellitus was 34.7% (n=52), hypertension was 24.7% (n=37), smokers 16.7% (n=25), family history was 12.7% (n=19) and frequency of non-obstructive CAD was 27.3% (n=41). **Conclusions:** It is to be concluded that a considerable percentage of patients enrolled for elective coronary angiography had non-obstructive CAD.

INTRODUCTION

CAD is mainly recognized by an inadequate supply of blood and oxygen to myocardium. It is caused by blockage of the coronary arteries and due to an imbalance between supply and demand for oxygen. The most important feature is the formation of plaques in coronary artery that hinders the blood flow [1]. The atherosclerotic plaque that causes non-obstructive (CAD) is not expected to impede blood flow or cause angina symptoms. Despite the fact that these lesions are rather common—they show up in 10% to 25% of individuals having coronary angiography—the medical literature has labeled their existence as "insignificant" or "no significant CAD" [2]. "Non-obstructive CAD is easily

ignored and left untreated due to its prolonged asymptomatic period and hence increases the risk of abrupt clinical coronary events that resemble those of obstructive CAD [3]. Initially, it was believed that non-obstructive CAD was a benign illness, but it is recently discovered that patients with non-obstructive CAD have greater risk of cardiovascular related disease and death [4]. The 2013 guidelines for Stable Coronary Artery Disease (ESC-SCAD) from the European Society of Cardiology suggested non-obstructive CAD as a distinct kind of CAD [5]. It is discovered that approximately 40% of all individuals who undergo angiography are known to have

non-obstructive coronary CAD or normal coronary arteries. This is a group that, despite its great incidence, is rarely given a clear diagnosis, is commonly mislabeled and managed inappropriately, and, for the most part, still exhibits symptoms [6]. According to a research by Iqbal et al., 25.8% of individuals undergoing elective angiography had non-obstructive CAD [7]. In Pakistan, cardiovascular related diseases are becoming one of the main reason of mortality [8]. The increasing death rate has encouraged the opening of cardiac catheterization laboratories across the nation, in both the public and private sectors. Cardiac catheterization is used as a golden standard for the diagnosis of CAD but the concern is that it is being overused in individuals with stable CAD[9].

This study was focused to find out the prevalence of non-obstructive CAD in patients who undergo coronary angiography without the prior diagnosis of heart disease and also to assess the clinically important symptoms, risk factors and the outcomes of noninvasive testing in patients having both non-obstructive and obstructive CAD.

METHODS

A cross sectional analysis was conducted in the Department of Cardiology in King Edward Medical University and Mayo Hospital, Lahore. The duration of study was for six months from 01-08-2022 to 01-02-2023. Non-probability consecutive sampling was used to select participants. Study enrolled 150 patients by using WHO sample size calculator with 8% margin of error, 95% confidence level and taking expected prevalence of non-obstructive CAD as 25.8%. Individuals of all genders, aged 18 to 60 years and without the history of cardiovascular disease, were admitted for coronary angiography. Patients with a history of myocardial infarction, previous percutaneous coronary intervention (PCI), coronary artery bypass graft (CABG) surgery, or the need for emergency or urgent cardiac catheterization were excluded from the study. After approval from hospital ethical committee (ref no. CPSP/REU/CRD-2020-066-2407, dated 30-07-2022), 150 patients were enrolled in the study, presenting in department of Cardiology, KEMU/ Mayo Hospital, Lahore with informed written consent. Demographics including Name, age, BMI, confounding factors like (diabetes, hypertension, smoking and family history) and address were noted. All selected patients underwent coronary angiography via right femoral artery approach by a consultant cardiologist. Non-obstructive CAD was assessed as per operational definition. All the information was noted on pre-designed proforma (attached). All the data were analyzed by using SPSS version 28.0. Numerical variables like age and BMI were calculated as mean + S.D. Frequency and percentage were calculated for qualitative

variables like age group, gender, hypertension, diabetes mellitus, family history, smoking and non-obstructive coronary artery disease. Data for age, BMI, gender, diabetes mellitus, hypertension, smoking, family history were stratified. After the stratification, chi-square test was used to determine p value (less than 0.05 as significant).

RESULTS

Total 150 patients were selected on the basis of inclusion criteria to find out the frequency of non-obstructive CAD in patients who undergo for elective angiography. Distribution of demographics showed that out of 150 patients, 2.7 % (n=4) were in age group of 18-40 years and 97.3 % (n=146) were in age group of 41-60 years, average age was calculated as 51.94±5.26 years and 62.7 % (n=94) were male and 37.3 % (n=56) were females. Frequency of diabetes mellitus was 34.7 % (n=52). Frequency of hypertension was 24.7 % (n=37). Frequency of smoking was 16.7 % (n=25). Frequency of family history was 12.7 % (n=19). Distribution of BMI was 27.96±6.44 kg/m². Frequency of non-obstructive CAD was 27.3 % (n=41) (Table 1).

Table 1: Distribution of demographics (N= 150)

Variables	Frequency(%)	
Age Group	18-40 years	4 (2.7)
	41-60 years	146 (97.3)
Gender	Male	94 (62.7)
	Female	56 (37.3)
Diabetes Mellitus	Yes	52 (34.7)
	No	98 (65.3)
Hypertension	Yes	37 (24.7)
	No	113 (75.3)
Smoking	Yes	25 (16.7)
	No	125 (83.3)
Family History	Yes	19 (12.7)
	No	131 (87.3)
Non-obstructive coronary artery disease	Yes	41 (27.3)
	No	109 (72.7)
BMI (Mean± SD)		27.96±6.44 kg/m ²

The data for age, gender, diabetes mellitus, hypertension, smoking, family history was stratified by using chi-square test (Table 2). Family history had a significant difference (p=0.000) gender (p=0.187), hypertension (p=0.678), Body mass index (p=0.415), diabetes mellitus (p=0.565), age group (p=0.301), and smoking status (p=0.221) had non-significant differences.

Table 2: Stratification for non-obstructive coronary artery disease with respect to age group (N= 150)

Variables	Non-obstructive coronary artery disease Frequency (%)			p-value
	Yes	No	Total	
Age group				
18-40 years	2 (50.0)	2 (50.0)	4 (100.0)	0.301
41-60 years	39 (26.7)	107 (73.3)	146 (100.0)	
Total	41 (27.3)	109 (72.7)	150 (100.0)	
Gender				
Male	22 (23.4)	72 (76.6)	94 (100.0)	0.187
Female	19 (33.9)	37 (66.1)	56 (100.0)	
Total	41 (27.3)	109 (72.7)	150 (100.0)	
Diabetes Mellitus				
Yes	16 (30.8)	36 (69.2)	52 (100.0)	0.565
No	25 (25.5)	73 (74.5)	98 (100.0)	
Total	41 (27.3)	109 (72.7)	150 (100.0)	
Hypertension				
Yes	9 (24.3)	28 (75.7)	37 (100.0)	0.678
No	32 (28.3)	81 (71.7)	113 (100.0)	
Total	41 (27.3)	109 (72.7)	150 (100.0)	
Smoking				
Yes	4 (16.0)	21 (84.0)	25 (100.0)	0.221
No	37 (29.6)	88 (70.4)	125 (100.0)	
Total	41 (27.3)	109 (72.7)	150 (100.0)	
Family History				
Yes	16 (30.8)	6 (31.6)	19 (100.0)	0.000
No	25 (25.5)	103 (78.6)	131 (100.0)	
Total	41 (27.3)	109 (72.7)	150 (100.0)	
BMI Group				
17-25kg/m ²	9 (21.4)	33 (78.6)	42 (100.0)	0.415
>25kg/m ²	32 (29.6)	76 (70.4)	108 (100.0)	
Total	41 (27.3)	109 (72.7)	150 (100.0)	

DISCUSSION

The atherosclerotic plaque that causes non-obstructive CAD is not expected to impede blood flow or cause angina symptoms. Despite the fact that these lesions are rather common—they show up in 10% to 25% of individuals having coronary angiography [2, 10]. Cardiac catheterization is being considered by several cardiologists as the golden standard for diagnosing CAD [9]. The degree of epicardial illness mostly influences consensus guidelines for the diagnosis and treatment of stable ischemic heart disease. Therefore, treating consultants usually have challenges when dealing with patients who have non-obstructive CAD and exhibit symptoms of ischemia. Vasospastic angina (VSA) and microvascular angina (MVA) are difficult to diagnose during coronary angiography and are rarely found. Coronary vascular function is determined directly or either by using pharmaceutical agent. The incidence of non-obstructive CAD has been the subject of several earlier investigations, yet the findings are inconsistent. The frequency of non-obstructive CAD among patients

who undergo elective coronary angiography is determined in the current study. Age distribution of the patients was done, it showed that out of 150 patients, 2.7% (n=4) were in age group of 18-40 years and 97.3% (n=146) were in age group of 41-60 years, average age was 51.94±5.26 years and BMI was 27.96±6.44 kg/m². There were 62.7% (n=94) male and 37.3% (n=56) females. Frequency of diabetes mellitus was 34.7% (n=52), hypertension was 24.7% (n=37), smokers 16.7% (n=25), family history was 12.7% (n=19) and frequency of non-obstructive CAD was 27.3% (n=41). The mean age was reported as 55.4±13.2 years in a study conducted by Fazal et al., [11] and 51.78±13.26 years in another study by Ilyas et al [12]. In this study, the average height was 162.5±14.6 cm, the average weight was 65.4±10.4 kg, and the average body mass index calculated was 27.8±6.3 kg/m². These findings were comparable to those of Larsen et al., who reported a BMI of 27.2±5.1 kg/m² [13], while Petroni et al.'s study revealed a lower number with a BMI of 23.4 kg/m² [14]. According to Ilyas et al., there were 45 (45%) females and 55 (55%) males [12]. 16 (76%) of the patients had hypertension, according to Xue-chao et al. A recent study found that 34.7% of participants (n=52) had diabetes mellitus [15]. A study reported 125 (82.8%) patients had a negative family history of non-obstructive CAD, compared to 26 (17.2%) patients who had a positive family history. 16.7% of participants in the current study were smokers 16.7% (n = 25). 297 (64.7%) smokers were recorded in the study by Jahic et al [11, 16], whereas 28 (50%) smokers were reported in the study by Larsen et al [13]. Iqbal et al., reported 95 (25.8%) of patients having non-obstructive CAD [7]. Ouellette et al., had shown 125 (13.5%) patients with non-obstructive CAD [17]. A recent study that stratified confounders and effect modifiers with regard to non-obstructive CAD found that family history had a significant difference (p=0.000), but gender (p=0.187), hypertension (p=0.678), Body mass index (p=0.415), diabetes mellitus (p=0.565), age group (p=0.301), and smoking status (p=0.221) had non-significant differences. In addition to having more severe symptoms of chronic chest pain and a higher death rate, women are more likely to develop non-obstructive CAD than men [18, 19]. According to the Women's Ischemia Syndrome Evaluation cohort research, non-obstructive CAD and chest pain both makes the female more vulnerable to death, also shown that in spite of atypical symptoms and non-obstructive illness, female gender can be a risk factor [20]. Furthermore, information released by the Women's Health Initiative revealed that women are twice as likely as men to get a non-fatal MI if they experience non-specific chest discomfort [21]. The possible contributing factors may be the women have worse mental health and physical state, a lower degree of interstitial fibrosis, and a lower frequency of

plaque rupture than men [22]. Obstructive CAD is mainly responsible in producing myocardial ischemia and related anginal symptoms, so it has historically been the main focus in the management of CAD [23, 3]. The rationale for this investigation was provided by the realization that ruptured plaque, rather than occlusive plaque, is the cause of most MIs. Additionally, the majority of ruptured plaques result from non-obstructive CAD, indicating that non-obstructive CAD is linked to a significant risk for MI and all-cause mortality [24, 25].

CONCLUSIONS

The frequency of non-obstructive CAD in patients who undergo for elective angiography was determined in the current study. We discovered that 27.3% of people (n=41) had non-obstructive CAD. We can conclude that a significant proportion of individuals admitted for elective coronary angiography had non-obstructive CAD.

Authors Contribution

Conceptualization: HMRJ

Methodology: AT

Formal analysis: MAS

Writing-review and editing: TAB, WA, AS

All authors have read and agreed to the published version of the manuscript.

Conflicts of Interest

The authors declare no conflict of interest.

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