

FREQUENCY OF CORONARY ARTERY DISEASE IN PATIENTS UNDERGOING OPEN HEART VALVULAR SURGERY BETWEEN 30 AND 45 YEARS OF AGE

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Contribution

All the authors contributed significantly to the research that resulted in the submitted manuscript.

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ABSTRACT

Objective: This study was conducted to determine the frequency of atherosclerotic coronary artery disease in patients with rheumatic heart disease aged between 30-45 years undergoing valve replacement surgery.

Methodology: It was a descriptive study of six months duration, conducted at National Institute of Cardiovascular Disease, Nazimabad, Karachi Pakistan. Patients with rheumatic heart disease (n=100) who were between 30 to 45 years of age and are scheduled for valve surgery underwent diagnostic coronary angiogram to delineate coronary arteries. Significant coronary artery disease was considered to be present if one or more coronary arteries showed 70% or more luminal stenosis.

Result: The average age of the patients was 39.43 ± 5.51 years. There were 54% male and 46% were female. Majority of the patients had Mitral Stenosis (MS) 54(54%) followed by Mitral Regurgitation (MR) 36(36%), Aortic Stenosis (AS) 22(22%), Aortic Regurgitation (AR) 18 (18%). Of the total 100 patients, 2 (2%) patients were found to have significant (CAD). These two patients with CAD had diagnosis of aortic stenosis.

Conclusion: Our results suggest that the overall frequency of coronary artery disease in patients 30-45 year of age, with rheumatic heart disease is much lower than reported in Western literature.

Key Words: Coronary artery disease, Rheumatic valvular heart disease, Coronary angiography, Valve replacement surgery.

INTRODUCTION

It is widely acknowledged that atherosclerotic coronary artery disease (CAD) is the leading cause of death in both developed and developing countries.^{1,2}

Cardiovascular disease (CVD) is responsible for about 30% of all deaths worldwide each year. Surprisingly, nearly 80% of these deaths occur in developing countries.³ In Eastern Europe, cardiovascular mortality is above nine per 1000 population per year.⁴

The major risk factors include age, male sex, diabetes mellitus, hypertension, positive family history, smoking, and dyslipidemia. The disease can be asymptomatic in its most severe form. About 30%-40% of patients who present with acute coronary syndrome (ACS) have had no prior warning symptoms to suggest the presence of underlying disease.^{5,6}

Studies in West shows that migrants from South Asian countries have higher prevalence of CAD at younger age as compare to native whites.^{1,7-9} CAD is responsible for over 50% of all deaths in Pakistani males of working age and about 90% of all sudden death.¹ There is high prevalence (23.6% in population of ages between 40-50 years) of premature CAD in Pakistan.¹

According to American Heart Association guidelines coronary angiography is indicated prior to open heart valvular surgery in asymptomatic patients' age 35 years or more with coronary risk factors or in patients with symptoms suggestive of angina.¹⁰ It is also recommended in patients with established coronary heart disease and in asymptomatic men age 45 years or more and in postmenopausal women without coronary risk factors.¹¹

This study assessed the frequency of CAD among patients aged between 30-45 years who are referred for valve replacement surgery. The coronary angiography is justified by the diagnosis of coronary obstruction, especially the asymptomatic and significant prevalence of CAD in these patients. The associated coronary obstruction would indicate myocardial revascularization during the valve replacement.¹²

Although the AHA guidelines recommend routine preoperative coronary angiography prior to open heart valvular surgery in asymptomatic patients aged ≥ 45 years, but it has level of evidence of 'C',¹³ which means that this is based on solely on the experts' opinion, on case studies, with no other well-established basis. The rationale of this study is to know the prevalence of CAD in our local population of patients with valvular heart disease. This will help us to plan our future diagnostic strategy regarding routine coronary angiography in these patients prior to open heart valvular surgery.

The aim of this study was to determine the frequency of atherosclerotic coronary artery disease in patients aged between 30-45 years undergoing surgery for valvular heart disease.

METHODOLOGY

The data source for our study was surgical unit of NICVD. Patients were enrolled during a period of six months. We included 100 patients in this descriptive study with non-probability purposive sampling. Consecutive patients of rheumatic valvular heart diseases (VHD), between 30-45 years of age, who were candidate of valve replacement surgery according to AHA guidelines, were included in this study. These included symptomatic patients with severe aortic stenosis (AS), patients with severe AS and LV dysfunction, symptomatic patients with severe aortic regurgitation (AR), asymptomatic patients with severe AR and LV systolic dysfunction or with severe LV dilatation, symptomatic patients with moderate to severe mitral stenosis (MS), with left atrial thrombus or concomitant moderate to severe mitral regurgitation (MR) or valve morphology is not favorable for balloon valvotomy, symptomatic patients with severe MR in the absence of severe LV dysfunction, asymptomatic patients with severe MR and mild to moderate LV dysfunction. Stenotic or regurgitant lesion of the heart valves as diagnosed on echocardiography, includes severe aortic stenosis, severe aortic regurgitation, severe mitral regurgitation, moderate-severe mitral stenosis with moderate-severe mitral regurgitation and/or left atrial thrombus and mixed valve disease.

To define the rheumatic valvular disease, the following echocardiographic criteria were considered:

1) In the mitral valve: thickening of the free border of the leaflets with or without commissural fusion and of the subvalvular apparatus with reduced mobility and posterior leaflet fixation, and

2) In the aortic valve: cusp thickening from the border to the base.

To identify without heart disease, patients with a history of myocardial infarction, previous percutaneous intervention, coronary artery bypass surgery, or valvular surgery were excluded, as were patients with diagnosis of non-rheumatic valvular heart disease or established coronary heart disease risk factors.

The enrolled patients underwent coronary angiography after informed written consent. Before the procedure, a complete history, physical examination, complete blood count, blood chemistries, chest radiograph, and ECG were obtained. Patients fast for at least 4-6 hours before the procedure.

Obstructive coronary disease was defined as stenosis of

50% or more of the diameter of the left main coronary artery or stenosis of 70% or more of the diameter of a major epicardial or branch vessel that was more than 3mm in diameter. For sensitivity analysis, we broadened the definition of obstructive coronary artery disease to include stenosis of 50% or more in any coronary vessel. Patients with no coronary artery disease which was defined as stenosis of less than 20% in all vessel, were also identified. Stenosis between 20-50% constituted mild or non-obstructive CAD. The degree of stenosis was determined by physicians at each site and was defined as the percentage reduction in diameter, as estimated from a comparison with the diameter of the normal reference vessel proximal to the lesion. Findings were noted on a structured proforma.

Data were entered and analyzed on Statistical packages for social science (SPSS version 10). The Frequency and percentage were computed for categorical variables like gender, age groups, diagnosis of CAD and atherosclerotic coronary artery disease. The quantitative measurements such as age and duration of disease were presented by their mean and standard deviation, 95% confidence interval, median with Interquartile range. Frequency of atherosclerotic coronary artery disease for VHD was also computed with respect to diagnosis, age and sex.

RESULTS

During a period of six month, patients with valvular heart diseases (VHD) diagnosed on echocardiography and

admitted for surgery for valvular heart disease at National institute of cardiovascular diseases were entered into the SPSS- version 10. Our final data set for analysis included 100 patients without known coronary artery disease who underwent cardiac catheterization.

The average age of the patients was 39.43±5.51 years (95%CI: 38.34 to 40.52).

Baseline characteristics are shown in Table.1. Table. 2 and 3 show the presence of coronary disease according to gender and age groups, respectively.

Out of 100 patients, 54% were male and 46% were female. The frequency of valvular lesion is shown in Table. 1

Atherosclerotic coronary artery disease was present in only two patients as shown in Table-III. All the patients had Aortic Stenosis, were male and of age ≥40 year.

DISCUSSIONS

In this prospective study, representative sample of patients with rheumatic valvular heart disease undergoing surgery in a tertiary care cardiac center from January 2008 through December 2009 , cardiac catheterization had a low diagnostic yield (2%). A minority of patients undergoing invasive (2%) had obstructive coronary artery disease (>50% stenosis of left main of >70% stenosis of a major epicardial vessel). The percentage was similar when the definition of obstructive disease was expanded to include

Table1: Baseline Characteristics of the Participants (n= 100)

Variable	% (Numbers)
Age (mean+SD)	39.43±5.51
Group-1 (30-35 years)	33 % (33)
Group-2 (36-40 years)	19 % (19)
Group-3 (41-45 years)	48% (48)
Gender	
Male	54%(54)
Female	46%(46)
Valve lesion	
Mitral stenosis	54% (54)
Mitral regurgitation	36%(36)
Aortic stenosis	22%(22)
Aortic regurgitation	18%(18)
Mixed aortic and mitral	20%(20)
Mixed mitral valve disease	04% (04)
Mixed aortic valve disease	01% (1)

stenosis of 50% or more of any coronary vessel. The low rate of coronary disease in this study may reflect the stricter inclusion criteria for the patient population under study. Our study excluded patients with a known history of coronary artery disease and those with risk factors for coronary heart disease. Thus, the definition of the patient population is critical in placing our findings in context. We believe that our inclusion of a narrower population is helpful for understanding and eventually improving the clinical decision making process that leads to the diagnostic use of cardiac catheterization.

This study was conducted considering the observation of significant prevalence of coronary artery disease in young asian population. The diagnosis of associated significant coronary obstruction would mandate myocardial revascularization during the valve replacement, regardless of the clinical presentation and the presence or absence of symptoms.

Valvular heart diseases (VHD) are among the common cardiac problems causing significant morbidity and mortality.¹⁴ In our asian population, RF is a leading cause of VHD especially affecting mitral valve in young people. This is in contrast to the studies from the developed.^{15,16} Studies from Lahore^{17,18} and Rahim Yar Khan,¹⁹ Pakistan also showed a high prevalence of RHD.

Coronary artery disease tends to occur at a younger age in Asians than in other ethnic groups with more severe and extensive angiographic involvement.²⁰ In Pakistan, it has been observed that rapid industrialization, life style modification and changes in dietary habits, has resulted in increased prevalence of CAD in the past three decades.

Coronary angiography is usually done routinely for patients with rheumatic VHD prior to their valve replacement surgery, if there is suspicion of CAD or if the person is above the age of 45 years.

Our findings showed that it is possible to clinically identify valvular patients with a lower probability of CAD and based on that, we suggest that the coronary angiography should not be indicated indiscriminately for all patients but for those presenting with clear evidence and higher predictive factors of the disease.

In our study the frequency of significant CAD in patients undergoing valve replacement surgery was 2% (Table-3), which is much lower than what has been reported in the western literature. But our findings are consistent with Indian literature which also shows low prevalence of CAD in these patients.²¹ A study performed in India during 1998-2002, showed that the prevalence of CAD in patients undergoing valve replacement surgery was 12.2%.²¹

The overall prevalence of CAD in patients undergoing valve replacement ranges from 5% to 50%.²¹ The prevalence of CAD in a study by Sarano et al. was 35.6%.²² The aortic stenosis is most often associated with the CAD. Mitral stenosis is least frequently associated with CAD.^{23,24} In patients with aortic valve disease the prevalence of CAD was in the range of 17-30% and for mitral valve disease, it ranged from 22-50%.²⁵ The age and gender are poor indices for indicating coronary angiography in valvular heart disease patients. An alternative explanation is that the low prevalence could be due to the demographic and clinical characteristics of this population. These patients are predominantly young, female sex, and fewer co morbidities.

Table 2: Atherosclerotic Coronary Artery Disease According to Gender (n=100)

Gender	CAD Present	CAD Not Present	Total
Male	2	52	54
Female	0	46	46
Total	2	98	100

Table 3: Atherosclerotic Coronary Artery Disease in According to Age Groups (n=100)

Age Groups	CAD Present	CAD Not Present
30 - 35	0	33
36 - 40	1	18
41 - 45	1	47

In our study, we found the prevalence of CAD in patients with aortic valve disease is 2% and for those with mitral valve disease it was 0%.

In our study 2 out of 100 patients showed CAD. They were male, aged ≥ 40 years and had aortic stenosis. Below the age of 40 years the CAD is non-existent. Female patients in the range of ≥ 30 to ≤ 45 years of age had no CAD.

In different studies, comparative analysis between the absence of risk factors with the presence of risk factors, it has been observed that patient with 2 or more risk factors, more frequently have CAD, whereas patients without CAD, have only one or no risk factors.²²

Our study done on small number of Pakistani population, suggest a lower frequency of associated CAD compared to western data. There could be several reasons for low prevalence in our population, first, patients with RHD usually come from low socioeconomic status. Second, RHD is in some way protective of CAD. Third, we included the young patients without significant risk factors for CAD.

Our study has several limitations. Patients in this institute may not be representative of whole population around the country. Moreover, patients with established coronary heart disease and its risk factors were excluded.

CONCLUSION

Our results suggest that in patients with rheumatic heart disease the overall prevalence of associated coronary artery disease is low. In our opinion, the routine indication of coronary angiography based solely on the age criteria might not be applied..

It is concluded that routine coronary angiography is not necessarily indicated in patients with rheumatic valvular heart disease who are younger than 40 years and have no coronary risk factors and typical chest pain.

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