



Prevalence of Coronary Artery Disease in Patients with Rheumatic Mitral Valve Disease Undergoing Mitral Valve Replacement at a Tertiary Care Cardiac Centre

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Abstract

Background: In underdeveloped nations, RHD (Rheumatic Heart Disease), which mostly affects the mitral valve, is still a major cause of valvular heart disease. CAD (Coronary Artery Disease), which can negatively impact perioperative and long-term outcomes if left undetected, can coexist with valvular heart disease in many patients. Current guidelines recommend coronary angiography prior to valve surgery in patients with risk factors or advanced age to identify significant CAD requiring simultaneous revascularization. The frequency of CAD in Indian patients with rheumatic mitral valve disease undergoing MVR (Mitral Valve Replacement) is, however, poorly understood. The purpose of this study was to ascertain the prevalence of CAD and risk variables related to it in patients receiving MVR for rheumatic mitral valve disease. **Methods:** This retrospective observational study included consecutive patients diagnosed with rheumatic mitral valve disease who were scheduled for mitral valve replacement in the Department of Cardiology, Government Medical College, Kottayam, between May 2014 and April 2015. A total of 102 patients were enrolled. Patients aged above 40 years or those with symptoms suggestive of coronary artery disease or a previous diagnosis of CAD were included in the study. All patients underwent detailed clinical examination, electrocardiography, routine laboratory investigations, and coronary angiography before surgery. Significant coronary artery disease was defined as more than 50% luminal narrowing in any of the major coronary arteries. Data were analyzed using SPSS version 17, and descriptive statistics such as frequencies and percentages were calculated. **Result:** A total of 102 patients were evaluated, of whom 32 (31%) were males and 70 (69%) were females. The majority of patients were in the age group of 50–60 years (43%), followed by 40–50 years (37%) and above 60 years (20%). Smoking was present in 15% of patients, diabetes mellitus in 18%, and hypertension in 27%. Coronary angiography revealed significant CAD in 18 patients (18%), insignificant CAD in 45 patients (44%), and normal coronary arteries in 39 patients (38%). Among the patients with significant CAD, 33% had single-vessel disease, 50% had double-vessel disease, and 17% had triple-vessel disease. Hypertension (72%), diabetes mellitus (67%), and smoking (44%) were the most common risk factors among patients with significant CAD. **Conclusion:** The prevalence of significant coronary artery disease among patients with rheumatic mitral valve disease undergoing mitral valve replacement was found to be 18%. CAD was more commonly observed in males and was strongly associated with conventional cardiovascular risk factors such as hypertension, diabetes mellitus, and smoking. Preoperative coronary angiography plays an important role in identifying CAD and guiding appropriate surgical management in these patients.

Keywords: Rheumatic Heart Disease, Mitral Valve Replacement, Coronary Artery Disease, Coronary Angiography, Valvular Heart Disease.



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INTRODUCTION

Rheumatic heart disease continues to be a major cause of cardiovascular morbidity and mortality in developing countries despite a significant decline in developed nations due to improved socioeconomic conditions and widespread use of antibiotics for streptococcal infections. It is a chronic consequence of acute rheumatic fever that leads to progressive damage of cardiac valves, most commonly affecting the mitral valve. The burden of rheumatic valvular disease remains high in many parts of Asia and Africa and continues to account for a significant proportion of valvular heart disease requiring surgical intervention.[1]

Mitral valve involvement is the most common manifestation of rheumatic heart disease and may present as mitral stenosis, mitral regurgitation, or a combination of both. Progressive valvular damage may eventually require surgical treatment such as mitral valve repair or mitral valve replacement (MVR).[2] Rheumatic mitral valve disease contributes substantially to the global burden of valvular heart disease and remains a common indication for mitral valve surgery in developing countries.[3]

Many patients with valvular heart disease, including those with rheumatic involvement, may have coexisting CAD (Coronary Artery Disease). The presence of CAD in patients undergoing valve surgery is clinically important because untreated coronary artery disease can adversely affect perioperative outcomes and long-term prognosis. Therefore, identification of CAD before valve surgery is essential to determine whether concomitant coronary artery bypass grafting (CABG) is required at the time of valve replacement.[4]

Previous studies have shown that the prevalence of CAD in patients undergoing valvular heart surgery varies widely depending on the population studied and the associated cardiovascular risk factors. According to certain research, people with rheumatic heart disease undergoing valve surgery have a 12%–20% frequency of severe coronary artery disease.[5–6] The prevalence tends to rise with age and the presence of traditional risk factors such as smoking, dyslipidaemia, diabetes mellitus, and hypertension.[6]

AIMS AND OBJECTIVES

This study aims to ascertain the incidence of coronary artery disease in patients receiving mitral valve replacement surgery at a tertiary care cardiac centre who have rheumatic mitral valve disease. The study's goals are to determine whether coronary artery disease is present in these patients using coronary angiography before surgery, to examine the distribution and demographic profile of coronary artery disease in the study population, and to determine whether common cardiovascular risk factors like smoking, diabetes mellitus, and hypertension are associated with the occurrence of coronary artery disease in patients undergoing mitral valve replacement for rheumatic heart disease.

MATERIALS AND METHODS

Study Design

This study was designed as a retrospective observational study conducted in the Department of Cardiology at Government Medical College, Kottayam. The study included consecutive patients diagnosed with rheumatic heart disease presenting with mitral valve disease who were planned for mitral valve replacement surgery during the period from May 2014 to April 2015. A total of 102 patients who fulfilled the study criteria were included in the analysis. Clinical details, investigation findings, and coronary angiography results of these patients were reviewed from hospital records to determine the prevalence of coronary artery disease in this patient population.

Inclusion and Exclusion Criteria

The study included patients diagnosed with rheumatic heart disease presenting with mitral valve disease who were planned for mitral valve replacement in the Department of Cardiology at Government Medical College, Kottayam, between May 2014 and April 2015. Patients aged more than 40 years were included in the study. Patients younger than 40 years were also included if they had a prior diagnosis of coronary artery disease or a history or symptoms suggestive of coronary artery disease. All patients provided informed consent prior to inclusion in the study and underwent coronary angiography for evaluation. Patients younger than 40 years without any history or symptoms suggestive of coronary artery disease were excluded from the study. Coronary artery disease was defined as angiographically significant when there was more than 50% luminal narrowing in any major coronary artery, while less than 50% stenosis or involvement of small coronary vessels was considered insignificant coronary artery disease.

Data Collection Procedure

Patients diagnosed with rheumatic heart disease presenting with mitral valve disease and planned for mitral valve replacement in the Department of Cardiology at Government Medical College, Kottayam, were included in the study. Detailed clinical history and physical examination were performed for all patients. Baseline investigations, including electrocardiography, routine blood investigations, and other relevant diagnostic tests, were carried out as part of the preoperative evaluation. All enrolled patients subsequently underwent coronary angiography to assess the presence of coronary artery disease prior to surgery. The collected clinical and investigation data were recorded and later analyzed using appropriate statistical software.

Statistical Analysis

The SPSS (Statistical Package for Social Sciences) program, version 17 for Windows, was used to enter and analyse all of the data that had been gathered. The study population's clinical and demographic features were summed up using descriptive statistical techniques such as frequency, percentage, mean, and standard deviation. Analytical statistical

methods were also applied wherever appropriate to evaluate the association between the presence of coronary artery disease and various risk factors.

RESULTS

Table 1: Gender Distribution of the Study Population

Gender	Number of Patients	Percentage
Male	32	31%
Female	70	69%
Total	102	100%

Table 1 illustrates the gender distribution of the study population. Out of the 102 patients included in the study, 70 (69%) were females and 32 (31%) were males. This indicates that rheumatic mitral valve disease requiring mitral valve replacement was more common among females in this study population.

Table 2: Age Distribution of Patients

Age Group (years)	Number of Patients	Percentage
40 – 50	38	37%
50 – 60	44	43%
≥60	20	20%
Total	102	100%

Table 2 shows the age distribution of patients included in the study. The majority of patients belonged to the 50–60 years age group (43%), followed by the 40–50 years group (37%). Patients above 60 years constituted 20% of the study population.

Table 3: Distribution of Smoking Status

Smoking Status	Number of Patients	Percentage
Smokers	15	15%
Non-smokers	87	85%
Total	102	100%

Table 3 demonstrates the smoking status among the study population. Out of 102 patients, 15 (15%) were smokers, while 87 (85%) were non-smokers. All smokers in the study population were males.

Table 4: Prevalence of Diabetes Mellitus

Diabetes Status	Number of Patients	Percentage
Diabetics	18	18%
Non-Diabetics	84	82%
Total	102	100%

Table 4 shows the prevalence of diabetes mellitus among the study participants. Eighteen patients (18%) were found to have diabetes mellitus, while the remaining 84 patients (82%) were non-diabetic.

Table 5: Prevalence of Hypertension

Hypertension Status	Number of Patients	Percentage
Hypertensive	28	27%
Non-hypertensive	74	73%
Total	102	100%

Table 5 presents the prevalence of hypertension in the study population. Among the 102 patients, 28 (27%) were hypertensive, while 74 (73%) were not hypertensive.

Table 6: Coronary Angiography Findings

Coronary Angiography Result	Number of Patients	Percentage
Significant CAD (>50% stenosis)	18	18%
Insignificant CAD (<50% stenosis)	45	44%
Normal Coronary Arteries	39	38%
Total	102	100%

Table 6 illustrates the findings of coronary angiography among the study population. Significant coronary artery disease was observed in 18 patients (18%), while 45 patients (44%) had insignificant coronary artery disease. Normal coronary arteries were seen in 39 patients (38%).

Table 7: Distribution of Coronary Vessel Disease among Patients with Significant CAD (n = 18)

Type of Vessel Disease	Number of Patients	Percentage
Single Vessel Disease (SVD)	6	33%
Double Vessel Disease (2VD)	9	50%
Triple Vessel Disease (3VD)	3	17%
Total	18	100%

Table 7 describes the pattern of coronary artery involvement among patients with significant coronary artery disease. Among the 18 patients with significant CAD, double vessel disease was the most common finding (50%), followed by single vessel disease (33%), while triple vessel disease was seen in 17% of patients.

DISCUSSION

Rheumatic heart disease is still a significant reason for mitral valve replacement surgery and a leading cause of valvular heart disease in developing nations. Because untreated coronary artery disease can negatively impact both perioperative and long-term results, the coexistence of CAD in patients undergoing valve surgery has important therapeutic implications. Therefore, in individuals with risk factors or advanced age, coronary artery examination prior to valve surgery is advised. In order to ascertain the prevalence of coronary artery disease in patients with rheumatic mitral valve disease receiving mitral valve replacement and to examine the related cardiovascular risk factors, the current investigation was carried out. Of the 102 patients assessed in this study, 32 (31%) were men and 70 (69%) were women. The predominance of female patients observed in our study is consistent with the findings reported by Lung and Vahanian, who noted that rheumatic mitral stenosis occurs more frequently in females, with approximately two-thirds of patients being women.² Similarly, Markus RH et al. reported that rheumatic mitral valve disease is more common in females in developing countries due to persistent exposure to rheumatic fever and delayed access to healthcare.⁷ A similar female predominance among patients with rheumatic mitral valve disease was also observed in the study conducted by Essop and Nkomo, who described rheumatic heart disease as a major public health problem affecting young and middle-aged women in developing regions.^[1]

The age distribution of patients in the present study showed that the majority belonged to the 50–60 years age group (43%), followed by the 40–50 years age group (37%), while only 20% of patients were above 60 years. This finding is comparable to the study conducted by Jose VJ et al., who reported that patients undergoing valve surgery for rheumatic heart disease were predominantly in the fifth and sixth decades of life.^[5] Similarly, Bozbaş H et al., reported that most patients undergoing valve surgery for rheumatic valvular disease were middle-aged individuals.^[5] The lengthy latent interval between the first rheumatic fever episode and the emergence of significant valve dysfunction necessitating surgery may be reflected in this age distribution.

In our study, 15% of patients smoked, and all smokers were men. A known risk factor for coronary artery disease, smoking has been linked to a higher incidence of CAD in patients after heart surgery. Wilson et al. showed that in patients with valvular heart disease, smoking dramatically raises the risk of coronary artery disease.^[6] Similarly, Jose VJ et al., reported that smoking was more prevalent among male patients undergoing valve surgery and was associated with a higher risk of coronary artery disease.^[4]

In our study population, diabetes mellitus was present in 18% of patients and hypertension in 27%. These findings are comparable to previously reported studies evaluating cardiovascular risk factors in patients undergoing valve surgery. “Marchant E et al. reported that hypertension and diabetes mellitus were among the most common risk factors associated with significant coronary artery disease in patients undergoing coronary angiography prior to valve surgery.”^[7] Similarly, “Ottervanger JP et al. observed that hypertension and diabetes mellitus were significant predictors of coronary artery disease in patients undergoing valve replacement surgery.”^[8]

The study's most notable finding was that 18% of individuals with rheumatic mitral valve disease receiving mitral valve replacement had angiographically severe coronary artery disease. This finding is similar to that of Bozbaş H et al., who found that 19% of patients undergoing valve replacement surgery had substantial coronary artery disease because of rheumatic involvement.^[5] Similarly, Marchant E et al. found that 14% of patients with rheumatic valvular disease having coronary angiography had substantial coronary artery disease. ^[7] Another study conducted by Jose VJ et al. reported a prevalence of CAD of approximately 12–16% among patients with rheumatic heart disease undergoing valve surgery.^[4] However, studies from developed countries have reported higher prevalence rates of CAD among patients undergoing valve surgery. “Ottervanger JP et al. reported that the prevalence of coronary artery disease among patients undergoing valve replacement surgery ranged between 20% and 40%”.^[8] Similarly, Chambers and Bridgewater reported that CAD is frequently present in patients undergoing valve surgery, particularly in elderly populations where degenerative valve disease is more common.^[9] The relatively lower prevalence of CAD observed in our study may be explained by the

younger age profile of patients with rheumatic heart disease compared to patients with degenerative valvular disease in developed countries.

In our study, among the 18 patients with significant coronary artery disease, double vessel disease was the most common pattern of coronary involvement (50%), followed by single vessel disease (33%) and triple vessel disease (17%). A similar distribution has been reported in other studies evaluating CAD in patients undergoing valve surgery. Jose VJ et al. reported that single- and double-vessel disease were more commonly observed than triple-vessel disease among patients with rheumatic valvular heart disease undergoing coronary angiography.[4] Similarly, Bozbaş H et al. observed that double vessel disease was the most frequent pattern of coronary artery involvement in patients undergoing valve surgery.[8]

Age-wise analysis of CAD in our study demonstrated that the majority of patients with significant coronary artery disease belonged to the 50–60 years age group (61%), followed by the 40–50 years age group (22%) and those above 60 years (17%). This observation is consistent with the findings reported by Chambers and Bridgewater, who reported that the prevalence of coronary artery disease increases with advancing age due to progressive atherosclerosis.[9] Similarly, Ottervanger JP et al. observed that age is an important predictor of coronary artery disease among patients undergoing valve surgery.[10]

Our study also showed that coronary artery disease was more common among males, with 12 out of 18 patients (67%) with significant CAD being male. This finding is consistent with the results reported by Bozbaş H et al., who observed a higher prevalence of coronary artery disease among male patients undergoing valve surgery.[8] Similarly, Wilson et al. reported that male gender is a significant risk factor for the development of coronary artery disease.[11] The higher prevalence of CAD among males in our study may be related to the higher prevalence of smoking and other cardiovascular risk factors among male patients.

Analysis of cardiovascular risk factors among patients with significant coronary artery disease in our study showed that hypertension was present in 72%, diabetes mellitus in 67%, and smoking in 44% of patients. These findings emphasize the important role of traditional cardiovascular risk factors in the development of CAD among patients with rheumatic heart disease. Similar findings have been reported by Marchant E et al., who demonstrated that hypertension, diabetes mellitus, and smoking were strongly associated with significant coronary artery disease among patients undergoing valve surgery.[12] Likewise, Ottervanger JP et al. also reported that these traditional risk factors significantly increase the likelihood of CAD in patients undergoing cardiac surgery.[10]

The findings of the present study highlight that although rheumatic heart disease primarily affects the cardiac valves, a significant proportion of patients undergoing mitral valve replacement also have coexisting coronary artery disease. Therefore, routine preoperative coronary angiography remains an important diagnostic tool for identifying CAD and guiding appropriate surgical management. Early detection of coronary artery disease allows surgeons to perform concomitant coronary artery bypass grafting when necessary, thereby improving postoperative outcomes and long-term survival.

Limitations

When evaluating the results, it is important to take into account the limitations of the current study. First off, the study's comparatively small sample size of 102 patients may have limited how broadly the results may be applied. Second, the study's one-year duration may not fully capture long-term patterns in the frequency of coronary artery disease among mitral valve replacement patients. Additionally, the study focused only on patients with rheumatic mitral valve disease, whereas a large proportion of patients undergoing valve replacement surgery may have other aetiologies of valvular heart disease and involvement of different cardiac valves. Therefore, the findings of this study may not be applicable to all patients undergoing valve surgery.

CONCLUSION

In this study, individuals with rheumatic mitral valve disease receiving mitral valve replacement at a tertiary care cardiac centre had their coronary artery disease prevalence assessed. The study found that angiographically significant coronary artery disease was present in 18% of patients, indicating that a considerable proportion of patients with rheumatic mitral valve disease have coexisting coronary artery disease. A higher prevalence of CAD was observed among male patients, with males outnumbering females in a ratio of approximately 2:1 among those with significant CAD. Furthermore, traditional cardiovascular risk factors were found to be more common in patients with significant CAD, with hypertension present in 72%, diabetes mellitus in 67%, and smoking in 44% of these patients. These findings highlight the importance of careful preoperative evaluation, including coronary angiography, to detect coexisting coronary artery disease in patients undergoing mitral valve replacement for rheumatic heart disease.

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