ORIGINAL ARTICLE

FREQUENCY OF CORONARY ARTERY DISEASE IN PATIENTS UNDERGOING VALVULAR HEART SURGERY: A RETROSPECTIVE OBSERVATIONAL STUDY

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Objectives: Valvular heart disease (VHD) significantly impacts patients' lives and often necessitates cardiac surgery. This study aimed to assess the frequency of ischemic heart disease in patients undergoing valvular heart surgery.

Methodology: This observational study analyzed the records of 204 consecutive patients presenting to the Peshawar Institute of Cardiology between January 2021 and December 2022. All patients underwent screening angiography before surgery according to the American College of Cardiology (ACC) criteria.

Results: Among the 204 patients studied, 57.4% were male, with a mean age of 53.16 ± 12.708 years. Hypertension was the most common comorbid condition (38.2%). Mitral valve pathology was the predominant indication for valvular surgery, while isolated aortic stenosis was the most common valvular lesion observed (25%). Out of the 204 patients who underwent screening angiography, 23% had significant coronary artery disease (CAD), defined as luminal narrowing >50%. Patients younger than 40 years had a lower prevalence of significant CAD (9.8%) compared to older patients (p = 0.003). Angiographic findings revealed single-vessel disease as the most common coronary lesion (16.7%), followed by double-vessel disease (12.7%), with triple-vessel disease observed in 5.4% of cases.

Conclusion: The frequency of coronary artery disease was lower in patients younger than 40 years compared to older patients. Noninvasive investigations such as CT coronary angiography may serve as an alternative to invasive coronary angiography as a screening tool prior to cardiac surgery in older patients, if needed.

Keywords: Valvular heart disease; Coronary artery disease; Cardiac surgery; Screening angiography; Ischemic heart disease

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INTRODUCTION

Valvular heart disease (VHD) remains a significant contributor to both mortality and morbidity, profoundly impacting patients' quality of life and physical well-being. Among cardiac pathologies, VHD stands out as the leading indication for surgical intervention. Despite advancements in cardiac surgical techniques and post-operative care, mortality rates associated with valvular surgeries remain considerable, particularly when concomitant coronary artery bypass grafting (CABG) is required.[1]

Current guidelines emphasize the importance of screening for coronary artery disease (CAD) in patients with VHD, particularly those presenting with symptoms suggestive of ischemic heart disease, objective evidence of ischemia, diminished left ventricular systolic function, history of CAD, or coronary risk factors such as male gender over 40 years of age and postmenopausal women, and chronic severe secondary mitral regurgitation (MR).[2]

Previous studies have reported varying incidences of CAD among patients with VHD, ranging from 9% to 40%.[3,4] However, with evolving trends in CAD and VHD, there arises a need to revisit these figures. While degenerative valvular diseases have become more prevalent in developed countries due to improvements in healthcare, rheumatic heart disease remains the primary etiology of VHD in our region.[5] Furthermore, our population exhibits a disproportionately high

prevalence of premature CAD, underscoring the importance of local data to inform clinical practice.[6]

Existing literature on the frequency of CAD in VHD patients within our national context is limited. Sheikh et al. shared data from a single private center a decade ago, highlighting the need for additional research to establish local prospective data.[7] Therefore, the objective of this study is to assess the frequency of CAD among patients undergoing surgical interventions for VHD at the Peshawar Institute of Cardiology. By shedding light on this aspect of VHD management within our population, this study aims to contribute valuable insights to clinical decision-making and improve patient outcomes.

METHODOLOGY

Study Design: This retrospective observational study was conducted at the Peshawar Institute of Cardiology.

Setting: The study was conducted at the Peshawar Institute of Cardiology, focusing on patients undergoing screening angiography before valvular surgery.

Participants: A total of 204 patients with valvular heart disease were included in the study. Patients of both genders meeting the American College of Cardiology (ACC) criteria for screening angiography before valvular surgery were included. Additionally, patients aged over 40 years and postmenopausal females, regardless of ischemic symptoms, were also included.

Variables: The variables studied included demographic data (such as gender and age), risk factors (hypertension, dyslipidemia, diabetes, and smoking), type of valvular lesion, presence of coronary artery disease (CAD), and number of vessels involved.

Data Sources/Measurement: Data were collected from the hospital database after obtaining approval from the institutional ethical committee. Echocardiography and angiography reports were reviewed to determine the presence of valvular heart disease and CAD, respectively. Angiographies were interpreted by trained cardiologists. Background data on risk factors were collected through a proforma. Hypertension, diabetes, and dyslipidemia were defined based on established criteria, and smoking status was determined based on self-reporting.

Bias: Efforts were made to minimize bias by ensuring data collection from a diverse patient population and by using standardized criteria for defining risk factors and disease states. However, potential biases inherent in retrospective studies, such as selection bias and information bias, may still be present.

Study Size: The sample size of 204 patients was determined to ensure adequate statistical power and robustness of the findings. A considerable number of patients were included to provide a comprehensive representation of the population under study, thereby enhancing the generalizability of the results. This sample size allows for a thorough exploration of the relationships between variables of interest, including the presence of valvular heart disease, coronary artery disease, and associated risk factors.

Quantitative Variables: Quantitative variables, such as age, were described using measures of central tendency (mean) and dispersion (standard deviation).

Statistical Methods: Statistical analysis was performed using IBM SPSS Statistics version 22. Descriptive statistics were used to summarize the data, including calculation of means and standard deviations for continuous variables and percentages for categorical variables. The Chi-square test was applied to assess the statistical significance of qualitative variables, with a p-value ≤ 0.05 considered significant. Results were presented in tabular form to facilitate interpretation and comparison.

RESULTS

Participants: A total of 204 patients were enrolled in the study, with 57.4% being male (117) and 42.6% female (87). The mean age of the participants was 53.16 ± 12.71 years (Table 1).

Descriptive Data: Among the 204 patients, severe aortic stenosis was the most prevalent isolated lesion necessitating valve replacement surgery, followed by severe mitral regurgitation. Isolated severe aortic stenosis was observed in 25% of patients, isolated severe aortic regurgitation in 5.4%, and mixed aortic valve disease in 9.8%. Similarly, mitral valve lesions were also prevalent, with isolated mitral regurgitation (23.5%) and mixed mitral valve disease (9.8%) being notable. Right-sided valvular lesions were less common, with tricuspid regurgitation found in 6.9% of patients.

Outcome Data: Of the 204 patients, 23.0% (47) were diagnosed with significant CAD on angiography. The highest prevalence of significant CAD was observed in patients with severe aortic stenosis, with 22 out of 51 patients (43.1%) exhibiting this condition (Table 2). Furthermore, around 9.8% of patients younger than 40 years had significant CAD, which was significantly lower compared to those older than 40 years (p =

0.003). Male patients tended to have a higher frequency of significant CAD compared to females, although this difference was not statistically significant.

Table 1: Baseline characteristics, types of valvular lesions, and angiographic data

	Summary
Total (N)	**204**
Gender	
Male	117 (57.4%)
Female	87 (42.6%)
Mean age (years)	53.16 ± 12.71
Risk factors	
Hypertension	78 (38.2%)
Diabetes	20 (9.8%)
Dyslipidemia	33 (16.2%)
Smoking	6 (2.9%)
Atrial fibrillation	65 (31.9%)
Echocardiography	
Mean LVEDD (mm)	51.97 ± 7.02
Mean LVEF (%)	54.12 ± 9.68
Pulmonary HTN	111 (54.4%)
Aortic stenosis	51 (25%)
Aortic regurgitation	11 (5.4%)
Mitral stenosis	27 (13.2%)
Mitral regurgitation	48 (23.5%)
Tricuspid regurgitation	14 (6.9%)
Tricuspid stenosis	1 (0.5%)
Mixed aortomitral valve disease	27 (13.2%)
Mixed mitral valve disease	20 (9.8%)
Mixed aortic valve disease	20 (9.8%)
Pulmonic stenosis	0 (0%)
Pulmonic regurgitation	0 (0%)
Angiography	
No CAD	133 (65.2%)
Significant CAD	47 (23%)
Nonsignificant CAD	24 (11.8%)
Number of vessels involved	
Single vessel disease	34 (16.7%)
Two vessel disease	26 (12.7%)
Three vessel disease	11 (5.4%)

Table 2: Valvular lesion among patients with significant CAD

Valvular lesion	Summary
Total (N)	**47**
Aortic Stenosis	22 (46.8%)
Aortic regurgitation	5 (10.6%)
Mixed aortic valve disease	1 (2.1%)
Mitral stenosis	6 (12.8%)
Mitral regurgitation	8 (17%)
Mixed mitral valve disease	4 (8.5%)
Mixed aortomitral disease	1 (2.1%)

Main Results: The study revealed important associations between valvular lesions and the presence of significant CAD. Patients with severe aortic stenosis had a notably high prevalence of CAD. Additionally, age was identified as a significant factor, with younger patients (<40 years) exhibiting a lower prevalence of CAD compared to older patients. Gender differences in the frequency of CAD were observed, although they did not reach statistical significance. Overall, the results underscore the importance of comprehensive evaluation and management of patients with valvular heart disease, particularly in the context of concomitant CAD (Table 3).

Table 3: Angiographic findings by the baseline characteristics

	No CAD	Non-significant CAD	Significant CAD	P-value
Age group (years)				
≤ 40	36(27.1)	1(4.2)	4(8.5)	0.003
>41	97(72.9)	23(95.8)	43(91.5)	
Gender				
Male	69(51.9)	16(66.7)	32(68.1)	0.096
Female	64(48.1)	8(33.3)	15(31.9)	
History of hypertension				
No	99(74.4)	10(41.7)	17(36.2)	<0.01
Yes	34(25.6)	14(58.3)	30(63.8)	
Type 2 diabetes mellitus				
No	128(96.2)	21(87.5)	35(74.5)	<0.01
Yes	5(3.8)	3(12.5)	12(25.5)	
History of Smoking				
No	130(97.7)	23(95.8)	45(95.7)	0.73
Yes	3(2.3)	1(4.2)	2(4.3)	
History of atrial fibrillation				
No	81(60.9)	20(83.3)	38(80.9)	0.01
Yes	52(39.1)	4(16.7)	9(19.1)	

DISCUSSION

Identification of coexistent significantly obstructive coronary artery stenosis in patients with VHD is crucial, as it necessitates consideration for concomitant coronary revascularization. Studies have consistently shown higher mortality rates in patients requiring concomitant coronary artery bypass grafting (CABG) alongside valve replacement compared to those undergoing isolated valve replacement. For instance, a retrospective analysis from the Society of Thoracic Surgeons (STS) database reported mortality rates of 4-6% for valvular surgeries, which increased to 7-13% when CABG was performed concurrently for coronary artery disease.[8]

Local studies have indicated varying prevalence rates of coronary artery disease among VHD patients. While one study found the prevalence to be around 31%, another larger study estimated it to be approximately 27%, consistent with the findings of our study.[3] However, differences in screening criteria may account for variations in reported prevalence rates. For example, Marchant et al. identified CAD in only 14% of VHD patients,[4] likely due to stricter criteria for angiography, limited to those with angina or ECG changes indicative of ischemia. Our study revealed that patients with severe aortic stenosis (AS) exhibited the highest frequency of significant coronary artery disease, with 47% of these patients presenting with CAD among those diagnosed with significant

coronary artery disease overall.[3,9] This aligns with findings from other studies but contrasts with Morrison et al., who found similar prevalence rates of CAD in both aortic and mitral valve diseases.[10]

Despite the rising incidence of premature coronary artery disease in the population, our study demonstrated a relatively low frequency of CAD in VHD patients aged less than 40 years. However, vigilant assessment for CAD should be maintained in younger patients with VHD, particularly those with risk factors or suggestive symptoms.[11,12] While male gender has historically been considered a risk factor for ischemic heart disease,[13] our study did not find a statistically significant difference in CAD frequency between genders, suggesting that females may be at equal risk for developing coronary artery disease.

The findings underscore the importance of identifying coexistent CAD in patients with VHD, particularly those undergoing valve replacement surgery. Given the higher mortality associated with concomitant CABG, careful assessment and management of CAD are imperative in this patient population.

While the results provide valuable insights into the prevalence of CAD among VHD patients in the study setting, generalizability to broader populations may be limited due to the single-center nature of the study. Large-scale multicenter studies are needed to confirm these findings and establish the prevalence of CAD in diverse patient populations with VHD. Nonetheless, the study contributes to the growing body of evidence supporting the importance of CAD screening in patients with VHD, emphasizing the need for comprehensive management strategies in this high-risk population.

LIMITATION

This study has several limitations, including its reliance on data from a single center, which may limit the generalizability of the findings. Additionally, the retrospective design of the study introduces inherent biases and may have influenced patient selection and data collection. Furthermore, the study's sample size may not have been sufficient to detect smaller differences in CAD prevalence among subgroups of VHD patients. Future research should aim to address these limitations through larger, multicenter studies with prospective designs.

CONCLUSION

In conclusion, our study highlights a notable difference in the frequency of CAD between patients younger than 40 years of age and those older than 40 years. Specifically, we observed a lower prevalence of CAD in younger patients, suggesting that noninvasive investigations such as CT coronary angiography may serve as viable alternatives to invasive coronary angiography for screening purposes before cardiac surgery, if necessary. This finding holds significant clinical implications, as it suggests that younger patients with valvular heart disease may benefit from less invasive screening methods, minimizing the risks associated with invasive procedures while still ensuring comprehensive assessment of CAD status.

AUTHORS' CONTRIBUTION

HU and AU: Concept and design, data acquisition, interpretation, drafting, final approval, and agree to be accountable for all aspects of the work. HU, AU, RJ, SA, IU, and MM: Data acquisition, interpretation, drafting, final approval and agree to be accountable for all aspects of the work.

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