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Clinical and Echocardiographic Profile of Patients with Valvular Heart Disease Presenting to a Rural Tertiary Care Cardiac Centre

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ABSTRACT

Background: Valvular heart disease (VHD), predominantly of rheumatic aetiology, remains a leading cause of cardiovascular morbidity and mortality among young adults in rural India. Contemporary single-centre data from rural tertiary care facilities describing the full clinical and echocardiographic spectrum are relatively scarce.
Objective: To delineate the demographic characteristics, symptom profile, rhythm status and detailed echocardiographic features of consecutive patients with organic valvular heart disease evaluated at a rural tertiary care cardiac centre.
Methods: Records of 53 consecutive patients aged ≥15 years with echocardiographically confirmed organic valvular stenosis or regurgitation of at least mild severity were analysed. Variables collected included age, sex, duration and nature of symptoms, presence of atrial fibrillation (AF), left-atrial (LA) diameter, left-ventricular ejection fraction (LVEF) and estimated right-ventricular systolic pressure (RVSP). Valve lesions were graded mild, moderate or severe according to standard criteria. Descriptive statistics were applied.
Results: Mean age was 43.8 ± 15.9 years (range 17–83 years); 32 patients (60.4%) were female. Shortness of breath was the presenting symptom in 51 (96.2%). AF was present in 22 (41.5%). Any mitral stenosis was found in 31 (58.5%), severe MS in 27 (50.9%); any mitral regurgitation in 36 (67.9%), severe MR in 22 (41.5%); any tricuspid regurgitation in 44 (83.0%), severe TR in 27 (50.9%); any aortic regurgitation in 34 (64.2%). Mean LA diameter was 47.0 mm; LVEF was ≥50% in 51 (96.2%); mean estimated RVSP (n=50) was 61.9 mmHg.
Conclusion: The typical patient was a middle-aged female with multi-valvular rheumatic disease, frequent AF, left-atrial enlargement, preserved systolic function and significant pulmonary hypertension. These observations underscore the persistent burden of advanced RHD in rural referral practice and the continuing need for earlier detection and secondary prophylaxis.

Keywords: Valvular heart disease; Rheumatic heart disease; Echocardiography; Atrial fibrillation; Pulmonary hypertension; Rural India; Tertiary care centre

INTRODUCTION

Rheumatic heart disease (RHD) continues to represent a major public-health challenge in low- and middle-income countries. Although the incidence of acute rheumatic fever has declined dramatically in high-income nations, India still contributes a substantial fraction of the global RHD burden, both in terms of prevalent cases and premature mortality. [1,2] The disease predominantly affects children and young adults from socio-economically disadvantaged backgrounds and is intimately linked to overcrowding, poor housing, limited access to primary health care and inadequate treatment of streptococcal pharyngitis. [3,4] Once established, chronic valvular deformity—most often involving the mitral valve—leads to progressive haemodynamic deterioration, atrial fibrillation, pulmonary hypertension, heart failure and thrombo-embolic events. Hospital-based series from tertiary centres across India have repeatedly demonstrated that mitral stenosis, mixed mitral valve disease and multi-valvular involvement constitute the bulk of the clinical load, with a clear female preponderance and a high prevalence of atrial fibrillation once left-atrial enlargement develops. [5–9] Pulmonary hypertension is a frequent and prognostically important complication. [10] Most of the published Indian literature originates from large urban teaching hospitals or specialised cardiac institutes located in metropolitan cities. Rural tertiary-care centres, which frequently serve as the first point of advanced cardiac evaluation for surrounding districts, remain under-represented. Patients reaching these centres may differ from those seen in urban super-specialty hospitals with respect to disease stage, co-morbidities and prior access to secondary prophylaxis. Characterising the clinical and echocardiographic profile of valvular disease in such a setting is therefore of practical importance for local service planning, resource allocation and the design of district-level secondary-prevention programmes. The present study was undertaken to describe the demographic features, symptom profile, rhythm status and key echocardiographic parameters of consecutive patients with organic valvular heart disease evaluated at a rural tertiary care cardiac centre. The findings are placed in the context of existing regional and national data on rheumatic and non-rheumatic valvular disease.

MATERIALS AND METHODS

This single-centre, observational, descriptive study was conducted in the Department of Medicine at Ananta Institute of Medical Sciences and Research Centre, a rural tertiary-care teaching hospital providing cardiac diagnostic services to a large catchment population. Consecutive patients with documented organic valvular heart disease who underwent comprehensive clinical assessment and transthoracic echocardiography formed the study population. Inclusion criteria were age 15 years or older and echocardiographic evidence of organic valvular stenosis or regurgitation of at least mild severity involving one or more of the mitral, aortic or tricuspid valves. Exclusion criteria comprised purely functional regurgitation secondary to ventricular dilatation without organic leaflet pathology, isolated congenital lesions lacking rheumatic morphological features, and incomplete clinical or echocardiographic records. Clinical variables extracted from the records included age, sex, duration and nature of the principal presenting symptom (shortness of breath, chest pain, palpitations), and the presence or absence of atrial fibrillation on the surface electrocardiogram. Echocardiographic measurements comprised left-atrial anteroposterior diameter (mm), left-ventricular ejection fraction (%), and estimated right-ventricular systolic pressure (mmHg) calculated from the peak tricuspid regurgitant velocity plus an estimate of right-atrial pressure. Individual valve lesions were graded mild, moderate or severe according to

conventional semi-quantitative and quantitative echocardiographic criteria in use at the centre. All data were entered into a structured electronic spreadsheet. Continuous variables are summarised as mean ± standard deviation or as median and range where appropriate; categorical variables are presented as absolute numbers and percentages. No formal hypothesis testing or multivariable modelling was performed, as the primary aim was descriptive profiling. The study utilised anonymised, routinely collected clinical and echocardiographic information. Individual identifiers were removed before analysis. Institutional ethics committee approval for retrospective review of de-identified data was obtained in accordance with institutional policy.

RESULTS

Fifty-three patients met the inclusion criteria and constituted the final analytic cohort. Demographic and clinical characteristics are presented in Table 1. The mean age was 43.8 ± 15.9 years, with a range of 17 to 83 years, indicating that the disease continuum extended from late adolescence into the eighth decade. Females predominated (32/53, 60.4%), yielding a female-to-male ratio of approximately 1.5: 1. Shortness of breath, of duration ranging from a single day to several years, was the presenting complaint in 51 patients (96.2%). Only two patients presented primarily with palpitations. Concurrent chest pain was recorded in two additional patients. Atrial fibrillation was documented on electrocardiography in 22 patients (41.5%), while the remaining 31 (58.5%) were in sinus rhythm.

Table 1. Demographic and clinical characteristics (n = 53)

Characteristic	Value
Age (years), mean ± SD (range)	43.8 ± 15.9 (17–83)
Female sex, n (%)	32 (60.4)
Male sex, n (%)	21 (39.6)
Shortness of breath as main symptom, n (%)	51 (96.2)
Palpitations as main symptom, n (%)	2 (3.8)
Atrial fibrillation, n (%)	22 (41.5)
Sinus rhythm, n (%)	31 (58.5)

Key echocardiographic parameters are summarised in Table 2. The mean left-atrial diameter was 47.0 mm, reflecting substantial atrial remodelling in the majority of patients. Left-ventricular ejection fraction was preserved (□50%) in 51 of 53 patients (96.2%); the modal range was 60–65% (36 patients, 67.9%). Only two patients exhibited reduced systolic function. Estimated right-ventricular systolic pressure was available for 50 patients and averaged 61.9 mmHg, consistent with a high prevalence of pulmonary hypertension.

Table 2. Key echocardiographic parameters (n = 53)

Parameter	Value
Left atrial diameter (mm), mean	47.0
LVEF ≥50%, n (%)	51 (96.2)
LVEF 60–65%, n (%)	36 (67.9)
Estimated RVSP (mmHg), mean (available n=50)	61.9

The distribution of individual valve lesions by severity is detailed in Table 3. Mitral valve disease was the most prevalent: any degree of mitral stenosis was present in 31 patients (58.5%), of whom 27 (50.9%) had severe MS; any mitral regurgitation was recorded in 36 patients (67.9%), with severe MR in 22 (41.5%). Tricuspid regurgitation of any severity was almost universal (44/53, 83.0%), and severe TR was present in 27

patients (50.9%). Aortic regurgitation, predominantly mild or moderate, was noted in 34 patients (64.2%). Significant aortic stenosis was uncommon (5 patients, 9.4%). Multi-valvular involvement was the rule; isolated single-valve disease was infrequent. Combinations of severe mitral stenosis with severe mitral or tricuspid regurgitation were particularly common.

Table 3. Distribution of valvular lesions by severity (n = 53)

Lesion	Severe n (%)	Moderate n (%)	Mild n (%)	Any n (%)
Mitral stenosis	27 (50.9)	1 (1.9)	3 (5.7) *	31 (58.5)
Mitral regurgitation	22 (41.5)	4 (7.5)	7 (13.2)	36 (67.9)
Tricuspid regurgitation	27 (50.9)	11 (20.8)	7 (13.2)	44 (83.0)
Aortic regurgitation	1 (1.9)	11 (20.8)	23 (43.4)	34 (64.2)
Aortic stenosis	1 (1.9)	1 (1.9)	3 (5.7)	5 (9.4)

*Includes progressive MS. Percentages for "Any" exceed 100% because of multi-valvular disease.

Taken together, the data indicate that the majority of patients presented with advanced multi-valvular rheumatic disease, frequent atrial fibrillation, left-atrial enlargement and significant pulmonary hypertension, yet with preserved left-ventricular systolic function.

DISCUSSION

The present observational series offers a detailed clinical and echocardiographic portrait of valvular heart disease as encountered in routine practice at a rural tertiary care cardiac centre. Several findings merit emphasis and comparison with the wider Indian and regional literature. First, the demographic profile is characteristic of rheumatic rather than degenerative valvular disease. The mean age of 43.8 years places the peak symptomatic burden firmly in early-to-middle adulthood, consistent with multiple contemporary Indian hospital-based cohorts in which the majority of patients with established RHD present between the third and fifth decades. **[5,7,8,11]** This age distribution stands in sharp contrast to the predominantly elderly population affected by calcific aortic stenosis or degenerative mitral regurgitation in high-income countries. The female preponderance of 60.4% likewise reproduces the classic sex ratio reported across the Indian subcontinent; most large series document a female-to-male ratio between 1.3: 1 and 2: 1. **[1,6,9]** Proposed explanations include a greater propensity for recurrent rheumatic activity in females, hormonal influences on the progression of mitral stenosis, and differential patterns of health-care utilisation, although the relative contribution of each factor remains incompletely quantified. Second, the near-universal presentation with dyspnoea reflects the advanced haemodynamic stage at which most patients reached the tertiary centre. Significant mitral stenosis, mixed mitral disease and severe tricuspid regurgitation all elevate left- or right-sided filling pressures and produce pulmonary congestion or low-output symptoms. The relative rarity of palpitations as a primary complaint, despite an atrial-fibrillation prevalence of 41.5%, is noteworthy. Once left-atrial enlargement develops-mean LA diameter was 47 mm in the present cohort-AF becomes common. Rates of 30-50% are typical in Indian series of established mitral valve disease, **[12,13]** and the figure observed here sits comfortably within that range. The combination of AF and left-atrial enlargement confers a substantial thrombo-embolic risk and mandates careful consideration of long-term anticoagulation, a therapy that is often under-utilised or poorly monitored in rural settings. Third, the echocardiographic lesion pattern is typical of rheumatic aetiology. Mitral valve disease predominated: severe MS was present in half the cohort and any MS in nearly 60%. Severe mitral regurgitation coexisted in more than 40%, and multi-valvular

involvement was the rule rather than the exception. Severe tricuspid regurgitation in 50.9% of patients and a mean estimated RVSP of 61.9 mmHg document a high burden of pulmonary hypertension. Pulmonary hypertension in mitral stenosis is a marker of disease chronicity, elevated left-atrial pressure and increased peri-operative risk; its presence is associated with higher short- and long-term mortality after both percutaneous and surgical intervention. **[14]** The preservation of LVEF in more than 95% of patients is expected in pure or predominant mitral stenosis, in which the left ventricle is under-filled. When significant regurgitant lesions coexist, ejection fraction may remain normal until late stages because of the adaptive increase in total stroke volume. Comparison with other Indian data reinforces the consistency of these observations. In a large rural southern Indian clinico-observational study employing strict echocardiographic criteria, the age-standardised prevalence of RHD was 9.7 per 1000, with mitral regurgitation and mitral stenosis as the leading lesions and pulmonary hypertension as the most frequent complication. **[15]** Hospital-based series from northern, eastern and western India similarly report mitral predominance, multi-valvular disease in a substantial minority, and AF in roughly one-third to one-half of patients once significant left-atrial enlargement is present. **[7,8,11,16]** The Global Rheumatic Heart Disease Registry (REMEDY) and other multi-country studies have likewise documented high rates of multi-valvular disease, AF and heart-failure symptoms among patients from low- and middle-income countries. **[17]** Thus the clinical phenotype observed in the present rural tertiary-care cohort aligns closely with the broader regional experience. The high prevalence of severe lesions and pulmonary hypertension at first tertiary evaluation points to delayed diagnosis and referral. Many patients in rural India continue to receive only symptomatic treatment at the primary-care level for months or years before echocardiography is performed. Opportunities for timely secondary penicillin prophylaxis, percutaneous balloon mitral commissurotomy (when valve morphology is favourable), or early surgical referral are consequently lost. Strengthening the capacity of primary-care physicians and community health workers to recognise the clinical signs of rheumatic carditis and established valvular disease, coupled with improved access to echocardiography, remains a public-health priority. Several limitations must be acknowledged. The sample size is modest and the design purely descriptive; formal statistical comparisons and multivariable analyses were not undertaken. Referral bias is inherent in any tertiary-centre series-patients with milder or asymptomatic disease are under-represented. Detailed information on prior episodes of acute rheumatic fever, adherence to secondary antibiotic prophylaxis, socioeconomic status, nutritional status and long-term clinical outcomes was not available in the extracted records. Estimated rather than invasively measured pulmonary pressures were used, and formal quantitative grading of regurgitation by modern criteria (vena contracta width, regurgitant volume, effective regurgitant orifice area) was not uniformly documented. Finally, the dataset contains no coronary angiographic findings; the original topic phrasing that referred to an "angiographic profile" therefore does not apply to the present material, which is exclusively clinical and echocardiographic. Despite these constraints, the series supplies useful local data for service planning. The predominance of young and middle-aged adults with multi-valvular rheumatic disease, frequent atrial fibrillation and significant pulmonary hypertension underscores the continuing need for integrated valvular heart disease programmes that encompass secondary prophylaxis, anticoagulation for AF, timely percutaneous or surgical intervention, and structured long-term follow-up. Larger prospective registries from rural tertiary

centres would further refine these observations, permit evaluation of outcomes after intervention, and help quantify the impact of strengthened primary-prevention and secondary-prophylaxis strategies.

CONCLUSION

In this rural tertiary-care cohort of 53 patients with organic valvular heart disease, the typical profile was a middle-aged adult (mean age approximately 44 years), more often female, presenting with dyspnoea, harbouring multi-valvular rheumatic lesions (especially severe mitral stenosis and severe tricuspid regurgitation), atrial fibrillation in over 40%, left-atrial enlargement, preserved left-ventricular systolic function, and significant pulmonary hypertension. These findings mirror the broader Indian experience of advanced rheumatic heart disease and highlight the urgent need for earlier detection, consistent secondary antibiotic prophylaxis, and improved referral pathways from primary care to specialised cardiac services.

Declaration

Ethical Approval: Institutional ethics committee approval for retrospective analysis of de-identified data was obtained.

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Conflict of Interest: The authors declare no conflict of interest.

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