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ORIGINAL RESEARCH

VALVULAR HEART DISEASE

Valvular Heart Disease Care in Pakistan

Impact of the Multidisciplinary Valve Heart Team

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ABSTRACT

BACKGROUND Patients with complex valvular heart disease (VHD) should be evaluated by a multidisciplinary heart team (HT). In low- and middle-income countries, referral practices are more variable, permitting any physician to refer patients directly to a cardiac surgeon without prior formal evaluation by a cardiologist with expertise in VHD.

OBJECTIVES The goal of the study was to examine the demographics of VHD patients seen in a large heart valve center in a low- and middle-income country and to assess the impact of the multidisciplinary HT in patients referred for valve surgery.

METHODS Over a 20-month period, all patients with VHD seen in the National Institute of Cardiovascular Diseases (Karachi, Pakistan) outpatient cardiovascular surgery clinic were referred to the heart valve center and assessed by a multidisciplinary HT. The multidisciplinary HT developed individualized plans for each patient.

RESULTS A total of 2,003 patients (52.8% female, mean age: 43.9 ± 14.4 years) were enrolled. Rheumatic heart disease was identified as the predominant cause of mitral valve disease, whereas bicuspid valve was the most common cause of significant aortic stenosis. All patients had been referred for valve surgery. Based on the HT's evaluation, 1,521 patients (76%) were deemed suitable for surgery, 335 patients (17%) were recommended for medical therapy, and 147 patients (7%) were considered candidates for transcatheter treatments. Notably, the HT reclassified the management strategies for 24% of the patients, all of whom had initially been referred for surgical intervention.

CONCLUSIONS The integration of collaborative decision-making through a multidisciplinary HT led to individualized and tailored treatment strategies, with a significant proportion of patients receiving alternative interventions or medical management instead of surgery. (JACC Adv. 2024;3:101378) © 2024 The Authors. Published by Elsevier on behalf of the American College of Cardiology Foundation. This is an open access article under the CC BY-NC-ND license (http://creativecommons.org/licenses/by-nc-nd/4.0/).

Valvular heart disease (VHD) is a significant contributor to cardiovascular morbidity, death, and disability. Understanding its epidemiology as well as regional and temporal trends is critical for therapeutic improvement and effective public health policy creation for prevention.[1] VHD epidemiology varies greatly across the globe, with functional and degenerative forms being more

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ABBREVIATIONS AND ACRONYMS

CAD = coronary artery disease

CT = computed tomography

HT = heart team

LMICs = low- and middle-income countries

NICVD = National Institute of Cardiovascular Diseases

RHD = rheumatic heart disease

TEE = transesophageal echocardiography

TTE = transthoracic echo

VHD = valvular heart disease

prevalent in high-income nations and rheumatic heart disease (RHD) predominating in low- and middle-income countries (LMICs). This distribution is reflected in the fact that 41 million people globally suffer from RHD, which is still by far the most prevalent form of VHD.[2]

The heart team (HT) concept, initially developed for the management of complex coronary artery disease (CAD), is increasingly advocated for the treatment of complex VHD as endorsed by societal guidelines.[3] A multidisciplinary HT, which includes a cardiac surgeon, structural interventionalist, and imaging specialists, is required to make decisions about the patient's management based on individual factors such as anatomical and physiological characteristics, comorbidities, local expertise, and availability of equipment in addition to the patient's preference.[4] Unfortunately, the HT concept is not widely applied to VHD in Pakistan, and often patients are referred to surgery directly by their primary care physicians, cardiologists without VHD expertise, and sometimes even by other specialists without any expertise in the field. The patients often have not had a high-quality echocardiogram since there is no national echo accreditation program or requirement currently.

A dedicated Valve Center of Excellence was established at the National Institute of Cardiovascular Diseases (NICVD), the largest leading cardiac facility in the country, to address these problems in addition to streamlining patient care. All patients are seen free of cost. The valve registry, which is a record of all patients seen in the valve clinic, will help solve key research gaps regarding VHD prevalence, disease presentations, severity of disease, and treatment outcomes in the LMIC setting such as Pakistan.

Although societal guidelines strongly advocate for a HT approach in the management of VHD,[3] the efficacy of this approach has not been systematically studied or reported in large patient cohorts. Therefore, our objective was to evaluate the impact of a HT approach on the evaluation and management of complex VHD cases, particularly in an LMIC setting.

METHODS

STUDY DESIGN AND PARTICIPANT ENROLLMENT. Over a 20-month period from September 25, 2022, to June 1, 2024, 2,003 patients referred to the outpatient surgery clinic for VHD were seen in the heart valve center at NICVD, where a comprehensive evaluation was conducted. Imaging modalities such as transthoracic echo (TTE), transesophageal echocardiography (TEE), cardiac computed tomography (CT), cardiac magnetic resonance imaging, left heart catheterization, and right heart catheterization were performed when indicated. The HT at the clinic then came up with an individualized plan for each patient. Follow-up data were maintained postprocedure.

STUDY POPULATION. All adult patients (age >18 years) with VHD were referred from the cardiac surgical clinic to the heart valve clinic and included in the registry.

CLINICAL ASSESSMENT. A detailed history was obtained by interviewing the patient to assess symptoms and comorbidities. This was followed by measurement of vitals including the patient's blood pressure, heart rate, oxygen saturation, height, and weight. All patients underwent initial TTE assessment, followed by TEE, cardiac CT, or catheterization as needed based on clinical indications. This sequential approach ensured comprehensive evaluation and tailored management for each patient. A team comprising of 2 cardiac imaging experts, 4 cardiothoracic surgeons, and 2 interventional cardiologists rotated through valve clinics held 3 times weekly. This team assessed VHD patients and determined the optimal therapeutic strategy, considering systemic disorders, socioeconomic status, gender, and geographical location, all of which affect outcomes in resource-limited settings. The HT used collaborative decision-making to decide whether patients would have surgery, transcatheter intervention, or medical treatment customized to their particular circumstances. The registry information was recorded into REDCap.

TRANSTHORACIC ECHOCARDIOGRAPHIC PROTOCOL. All patients underwent a thorough 2-dimensional and 3-dimensional TTE using the General Electrics (GE) E95 ultrasound machine as needed to assess valve morphology, function, and hemodynamics. This entailed examining valve leaflets, annulus diameters, gradients across the valves, and regurgitant volumes to establish the severity of stenosis and regurgitation, as well as any chamber enlargement or dysfunction. Left ventricular (LV) ejection fraction was assessed by visual estimation and Simpson's biplane method. Right ventricular (RV) function was assessed using visual estimation, tricuspid annular plane systolic excursion, and measuring fractional area change (FAC) occasionally.[5] Severity of VHD was defined according to the current American Heart Association guidelines.[3]

TRANSESOPHAGEAL ECHOCARDIOGRAPHY. In patients with unsatisfactory TTE images, a thorough

TEE was performed using the GE E95 ultrasound machine to determine the severity and etiology of valvular disorders, particularly mitral regurgitation (MR) and aortic regurgitation (AR), as well as to measure the aortic dimensions and annulus when TTE images were unreliable. All patients with suspected vegetations, abscesses, or endocarditis underwent a TEE for confirmation. We followed a complete TEE protocol that included collecting multiple standard images to assess different aspects of cardiac anatomy and function.[6] This includes reviewing the morphology and function of all valves, especially prosthetic valves, excluding intracardiac shunts, and determining suitability for structural procedures such as percutaneous mitral balloon commissurotomy (PMBC). A 3-dimensional TEE was utilized where needed to further define the mechanism of VHD.

COMPUTED TOMOGRAPHY. We performed cardiac CT using a Siemens 128-slice CT scanner, which involved obtaining high-resolution pictures of the heart and aorta at various stages of the cardiac cycle using electrocardiography gating. All patients with bicuspid aortic valve (BAV), dilated aorta, small aortic annulus, suspected abscesses, and aneurysms got CT scans. We routinely used contrast injection to improve the visibility of blood vessels and cardiac tissue. Furthermore, improved reconstruction techniques and gating approaches were used to synchronize picture acquisition with the cardiac cycle, reducing motion artifacts and ensuring accurate evaluation, particularly for coronaries.

CARDIAC CATHETERIZATION. Prior to surgery, all patients over the age of 40 years, those with symptoms or at high risk for CAD, underwent coronary angiography. Right cardiac catheterization was performed if indicated.

ETHICS. The study was granted approval by the institutional review board (approval number: IRB-32/2023), and it was conducted in accordance with the principles outlined in the Helsinki Declaration. All enrolled patients provided verbal consent to participate in the ongoing registry.

STUDY OBJECTIVES. To evaluate the impact of multidisciplinary HT evaluation on treatment recommendations for patients with complex VHD initially referred for cardiac surgery.

STATISTICAL ANALYSIS. Study data were entered and analyzed using IBM SPSS version 21. Categorical response variables are summarized as frequency and percentages, while continuous variables are summarized as mean ± SD. Mean pressure gradients and mitral valve area across different severity levels of mitral stenosis (MS), as well as mean pressure gradients and aortic valve area across severity levels of aortic stenosis were illustrated using box plots. A 1-way analysis of variance was conducted to assess the mean differences, with statistical significance determined at a P value threshold of <0.05. No missing data imputation techniques were applied, particularly for echocardiographic parameters such as ejection fraction, right ventricular function, and tricuspid annular plane systolic excursion.

TABLE 1 Distribution of Demographic and Clinical Characteristics of the Study Cohort (N = 2,003)

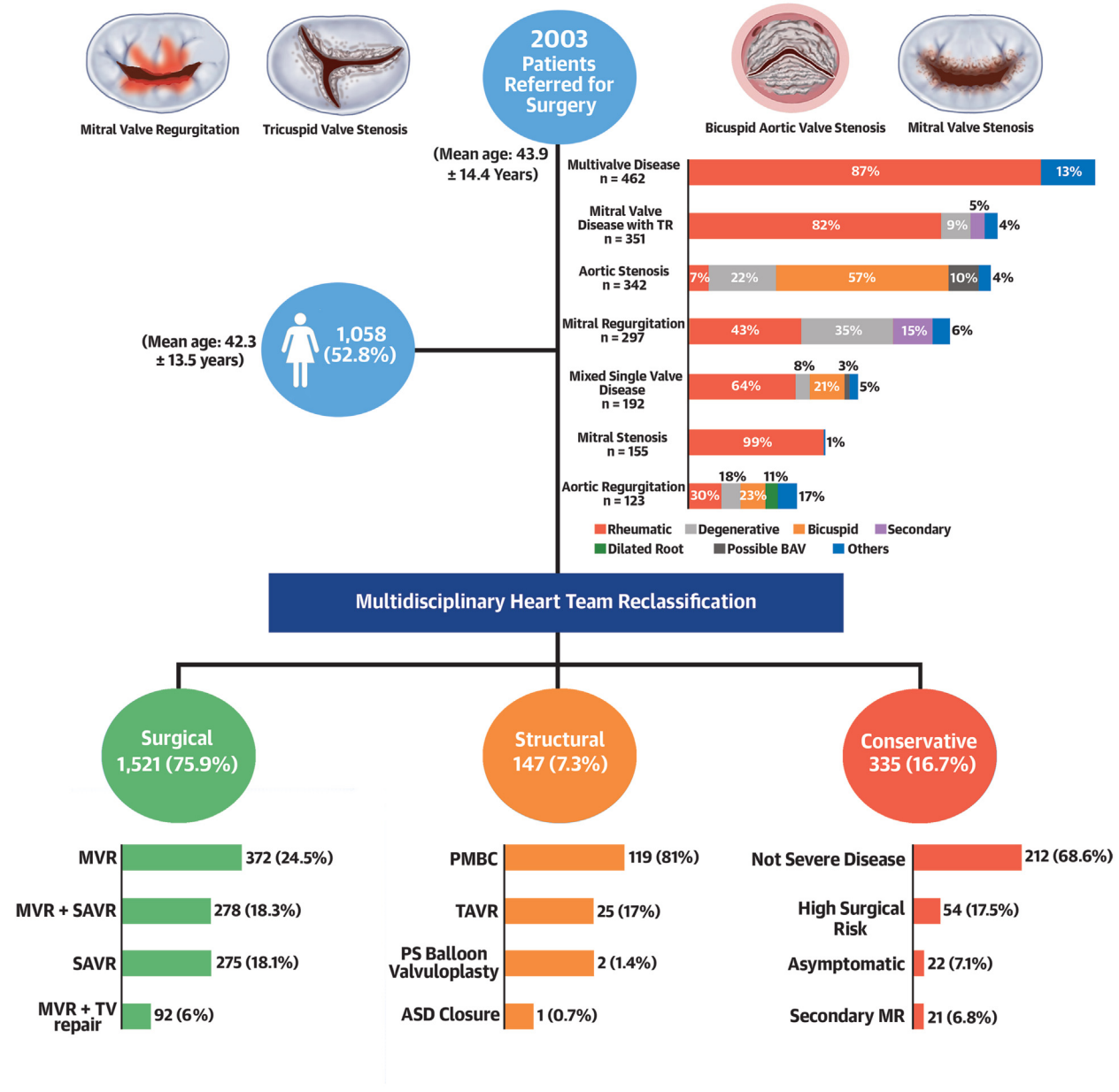
Sex	
Male	945 (47.2%)
Female	1,058 (52.8%)
Age (y)	43.9 ± 14.4
<20 y	92 (4.6%)
21-30 y	325 (16.2%)
31-40 y	452 (22.6%)
41-50 y	476 (23.8%)
51-60 y	386 (19.3%)
>60 y	272 (13.6%)
Symptoms	
Dyspnea	1731 (86.4%)
Angina/chest pain	456 (22.8%)
Syncope	79 (3.9%)
Palpitations	389 (19.4%)
Comorbid conditions	
Diabetes	187 (9.3%)
Hypertension	433 (21.6%)
Smoking	139 (6.9%)
Chronic kidney disease	28 (1.4%)
Mean systolic blood pressure (mm Hg)	121.8 ± 21.5
Mean diastolic blood pressure (mm Hg)	70 ± 15.1
Mean heart rate (beats/min)	77.8 ± 18.3
Mean oxygen saturation (%)	98 ± 1.7
Mean height (cm)	159.2 ± 14.7
Mean weight (kg)	60.9 ± 14.9
Previous history of CVA	56 (2.8%)

Values are n (%) or mean ± SD.
CVA = cerebrovascular accident.

RESULTS

BASELINE CHARACTERISTICS. Between September 25, 2022, and June 1, 2024, a total of 2,003 patients were enrolled. Table 1 summarizes the demographics and clinical characteristics in detail. The mean age was 43.9 ± 14.4 years, with 52.8% of patients being female. Majority of patients were between the ages of 31 and 60 years, with the highest concentration in the 41 to 50-year group (23.8%). Hypertension (21.6%), diabetes (9.3%), smoking (6.9%), and chronic renal

CENTRAL ILLUSTRATION **Burden of Valvular Heart Disease and Impact of Multidisciplinary Valve Team Management in Low- and Middle-Income Countries**



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Significant (≥moderate severity) valvular heart disease patients. Others in multivalve disease include patients with severe aortic stenosis or aortic regurgitation due to bicuspid aortic valve or degenerative disease along with secondary mitral regurgitation. Others in mitral regurgitation include patients with infective endocarditis, congenital, hypertrophic cardiomyopathy with systolic anterior motion. ASD = atrial septal defect; MR = mitral regurgitation; MVR = mitral valve replacement; PMBC = percutaneous mitral balloon commissurotomy; PS = pulmonic stenosis; SAVR = surgical aortic valve replacement; TAVR = transcatheter aortic valve replacement; TR = tricuspid regurgitation; TV = tricuspid valve.

disease (1.4%) were the most common comorbidities. The mean systolic and diastolic blood pressures were 121.8 ± 21.5 and 70 ± 15.1 mm Hg, respectively. The average heart rate was 77.8 ± 18.3 beats/min.

SPECTRUM AND ETIOLOGY OF VHD. The burden of significant (≥moderate) VHD is shown in the **Central Illustration**. Among the isolated native left-sided valve diseases, aortic stenosis (AS) was the most

TABLE 2 Symptoms and Ventricular Morphology and Function Stratified by Valvular Involvement

Valvular Lesion	N	Symptoms			
		Dyspnea	Chest Pain	Syncope	Palpitations
Aortic stenosis	342	81.6% (279)	36.3% (124)	8.8% (30)	7.3% (25)
Aortic regurgitation	123	79.7% (98)	39.8% (49)	5.7% (7)	21.1% (26)
Mitral regurgitation	297	85.2% (253)	23.2% (69)	2% (6)	20.9% (62)
Mitral stenosis	155	91% (141)	20% (31)	1.9% (3)	19.4% (30)
Mitral valve disease with TR	351	90.6% (318)	11.1% (39)	1.1% (4)	27.9% (98)
Mixed single valve disease	192	87% (167)	24.5% (47)	3.6% (7)	17.7% (34)
Multivalve disease	462	89.6% (414)	17.5% (81)	3.9% (18)	21.4% (99)
Others	81	75.3% (61)	19.8% (16)	4.9% (4)	18.5% (15)

TABLE 2 Continued

Valvular Lesion	LV Dysfunction						LV Morphology	RV Function	RV Morphology
	Normal	Mild	Mild-Mod	Moderate	Mod-Severe	Severe	Dilated	Abnormal	Dilated
Aortic stenosis	28.8% (96)	39% (130)	6.6% (22)	5.7% (19)	7.8% (26)	12% (40)	12.6% (43)	11.4% (39)	2.9% (10)
Aortic regurgitation	12.9% (15)	27.6% (32)	15.5% (18)	12.1% (14)	16.4% (19)	15.5% (18)	67.5% (83)	14.6% (18)	7.3% (9)
Mitral regurgitation	21.8% (62)	50.9% (145)	9.8% (28)	5.3% (15)	6.7% (19)	5.6% (16)	33.3% (99)	10.8% (32)	5.7% (17)
Mitral stenosis	30.3% (44)	49% (71)	9% (13)	4.8% (7)	3.4% (5)	3.4% (5)	1.3% (2)	23.2% (36)	7.1% (11)
Mitral valve disease with TR	20% (67)	43% (144)	14.6% (49)	3.9% (13)	12.2% (41)	6.3% (21)	17.1% (60)	56.7% (199)	37% (130)
Mixed single valve disease	21.6% (40)	44.9% (83)	13% (24)	3.2% (6)	6.5% (12)	10.8% (20)	25.5% (49)	21.9% (42)	6.8% (13)
Multivalve disease	21.2% (94)	41.2% (183)	9% (40)	8.6% (38)	10.4% (46)	9.7% (43)	25.3% (117)	34.4% (159)	14.1% (65)
Others	28% (21)	56% (42)	4% (3)	4% (3)	4% (3)	4% (3)	6.2% (5)	13.6% (11)	34.6% (28)

Values are % (n).
LV = left ventricular; RV = right ventricular; TR = tricuspid regurgitation.

frequent (n = 342, 17%), followed by MR (n = 297, 14.8%), MS (n = 155, 7.7%), and AR (n = 123, 6.1%). Overall, mitral valve disease was more prevalent than aortic valve disease and often associated with other valve involvement. A total of 351 patients (17.5%) had mitral valve disease along with tricuspid regurgitation, 192 patients (9.6%) had mixed single valve disease, while a significant proportion of patients had multiple valve involvement (n = 462, 23%). RHD was the most common cause of mitral valve involvement, whereas BAV was the leading cause of significant (≥moderate) AS (57%). Of the MS patients, 99% had RHD (**Central Illustration**).

Table 2 shows the symptoms at presentation and associated ventricular remodeling and dysfunction associated with various valvular pathologies. Dyspnea was by far the most common symptom of all valvular lesions. Additionally, chest pain and syncope were common presentation of severe AS with significant proportion of patients with left ventricular dysfunction. Patients with mitral valve disease and significant tricuspid regurgitation had a high burden of right ventricular dysfunction. Approximately 4% of patients experienced syncope prior to presentation, with nearly all of these individuals having significant AS.

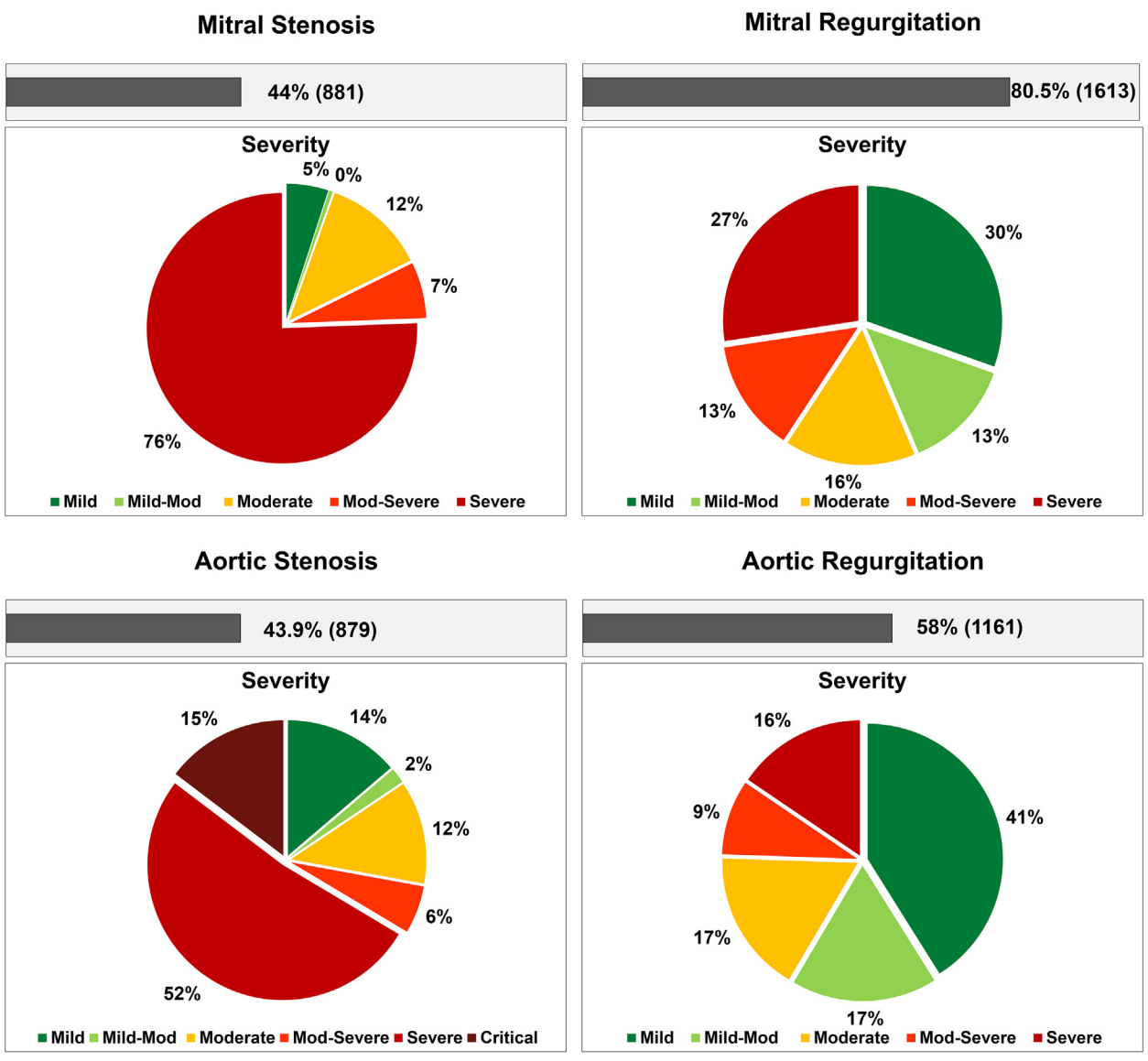
A total of 1,192 of the patients had RHD, and data on the use of penicillin prophylaxis was available for 886 patients, of which only 382 (43.1%) were compliant with it every month. **Figure 1** illustrates the severity distribution of left-sided valvular disease with mitral valve being the most frequently affected valve. The predominant lesions were stenotic, majority being in the severely stenotic category, whereas the majority of regurgitant lesions were mild.

Figure 2 displays mean valve area and mean pressure gradients (MPG) in patients with MS and AS. Mean MPG of patients with severe MS was 11.91 ± 4.75 mm Hg, while mean mitral valve area was 0.91 ± 0.27 cm^2. Mean MPG of patients with severe AS and critical AS were 57.78 ± 18.55 mm Hg and 80.53 ± 26.57 mm Hg, respectively. Mean aortic valve area for patients with severe AS and critical AS was 0.65 ± 0.21 cm^2 and 0.43 ± 0.14 cm^2, respectively.

RECLASSIFICATION OF TREATMENT STRATEGY BY HT EVALUATION. Of the 2,003 patients evaluated by the HT during the study period, 482 patients (24%) had changes in treatment recommendations: 16.7% of patients to conservative therapy and 7.3% to transcatheter structural interventions (**Figure 3**). The most commonly recommended operation was mitral valve replacement (MVR) (24.5%), followed by MVR + surgical aortic valve replacement (18.3%) and surgical aortic valve replacement (18.1%) (**Figure 4**).

The primary reasons for reclassification to conservative management included reimaging showing

FIGURE 1 Burden and Severity of Valvular Heart Diseases in the Study Cohort

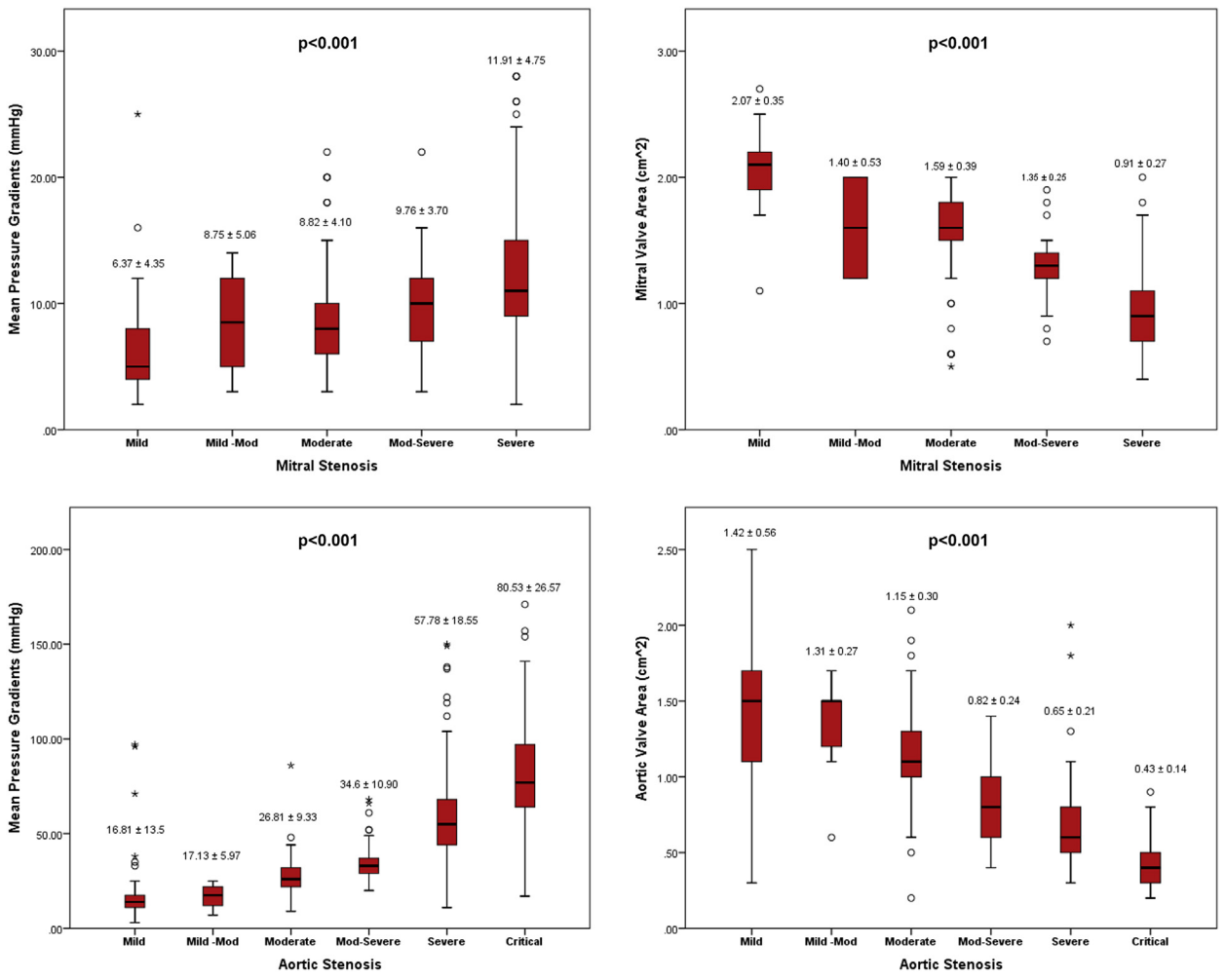


nonsevere valvular disease (63% of cases), high or prohibitive surgical risk, and functional MR. High-surgical risk, favorable anatomical conditions for transcatheter aortic valve replacement, and anatomy such as pliable valves with a Wilkins score <8 found suitable for PMBC were referred for transcatheter interventions (**Central Illustration**).

DISCUSSION

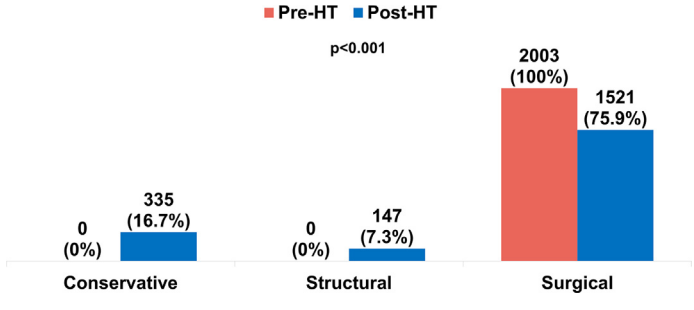
Managing VHD presents a considerable clinical challenge, especially in resource-constrained settings. The HT approach, which involves collaboration among various specialists to deliver patient-centered care, is increasingly recognized for its potential benefits. However, robust evidence supporting the effectiveness of this approach is still developing.[7,8] In our study of over 2,000 patients with complex VHD, we demonstrated that the HT approach is not only feasible but also significantly impactful, even within the constraints of an LMIC setting. One of the key findings from our study is the reclassification of 24% of patients in terms of their management strategy. By integrating various perspectives and expertise, the HT approach ensured that treatment decisions are well-informed

FIGURE 2 Box Plots: Mean Pressure Gradients and Mean Valve Area of Mitral Stenosis and Aortic Stenosis



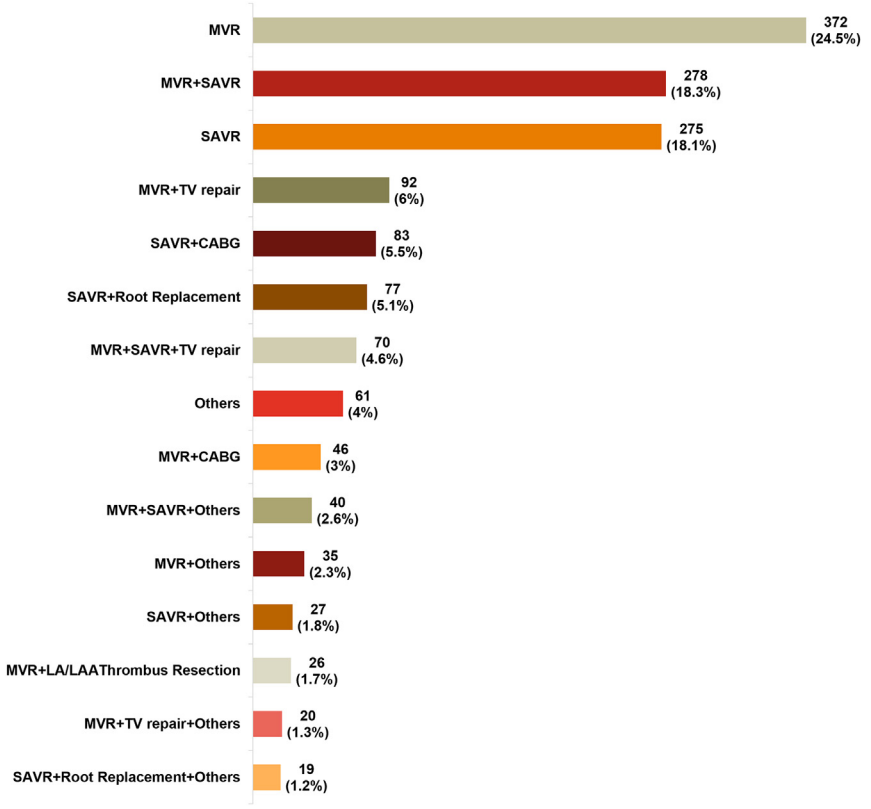
and tailored to each patient's unique clinical situation. Originally planned for surgery, almost a quarter of the patients were redirected to alternative treatments based on a comprehensive evaluation by the multidisciplinary team. This substantial rate of reclassification underscores the value of the HT approach in tailoring management plans to individual patient needs. The HT's ability to provide a nuanced and individualized approach was evidenced by the successful implementation of a wide range of treatment options, including surgical, percutaneous, and hybrid interventions. This adaptability is particularly crucial in an LMIC setting, where resource limitations and complex socioeconomic factors can significantly impact patient care.

FIGURE 3 Distribution of Management Plans Following Shared Decision-Making for Patients Initially Referred for Surgery



HT = heart team.

FIGURE 4 Distribution of Recommended Surgical Procedures



CABG = coronary artery bypass grafting; LA = left atrium; LAA = left atrial appendage; MVR = mitral valve replacement; SAVR = surgical aortic valve replacement; TV = tricuspid valve.

The precise incidence and prevalence of VHD, particularly RHD, within Pakistan remains largely unknown. Furthermore, mismanagement, exacerbated by a lack of expertise and fragmented referral pathways, has been rampant. Patients who could benefit from transcatheter treatments are often directly referred for surgery, and vice versa, resulting in substandard care and outcomes. Between 1990 and 2019, the prevalence of nonrheumatic VHD in Pakistan increased by 14.1%, accompanied by a significant increase in death rates and disability-adjusted life years.[9] South Asia, which has 1.8 billion people spread across 8 nations, performs 250,000 to 300,000 cardiac surgeries each year, showing a need for additional cardiac surgeons and improved training programs.[10] The HT idea is critical, especially in LMICs like Pakistan, where there is a scarcity of trained cardiac surgeons and imaging experts. It is critical to improving patient outcomes and optimizing treatment techniques for VHD. Our understanding of the complexity of VHD has improved in recent years, owing to the increased use of multimodality imaging. Advances in surgical and percutaneous therapies have increased the demand for precise multimodality imaging to aid in patient and procedure selection.[11] The NICVD heart valve clinic, first of its kind in the region, takes a unique approach to shared decision-making based on specific patient needs. Some of the reasons for reclassifying the patients from surgical to medical or catheter-based treatments included misdiagnosis of etiology of valve disease, pliability and hence feasibility of PMBC, lack of assessment of other valve involvement, poor life expectancy, high/prohibitive surgical risk based on underlying comorbidities, frailty, and severe biventricular dysfunction.

The average age of patients was only 44 years, which is much younger than in the Euroheart valve survey (mean age 44 years vs 65 years).[12] When we compare our findings to those of Burzotta et al,[7] numerous key distinctions emerge that underscore the importance of patient demographics, underlying

etiology, and HT approach to decision-making in managing VHD. Similar to the Euroheart survey, the mean age in this study was 75 years, with AS being the most frequent valve lesion. In contrast, our study focused on a younger group with a higher prevalence of RHD and mitral valve involvement. The variability in patient profiles among studies, notably in terms of age, comorbidities, and VHD etiology, emphasizes the necessity of a HT in tailoring therapies. Because patients presented at younger ages than those in high income countries, they had less hypertension and CAD and hence required fewer coronary artery bypass grafting surgeries.

Approximately 40% of patients exhibited some degree of LV dysfunction, highlighting the importance of monitoring LV changes due to their significant impact on clinical outcomes. Additionally, 35% of the cohort had abnormal RV function, with RV dilation and reduced function being poor prognostic indicators that could significantly influence management strategies.[13] This high prevalence of ventricular dysfunction underscores the advanced stage of VHD at which many patients present. A large proportion of patients (23%) had multivalvular involvement, demonstrating the complexities of decision-making regarding VHD therapy. Patients with severe rheumatic MS and ≥ moderate AS or AR, for example, would often receive MVR + AVR, but it was occasionally planned to perform PMBC to allow young females to complete their families before implanting a mechanical valve. This is 1 example of providing individualized care in accordance with cultural norms, as determined in the multidisciplinary valve clinic, where all experts and the patient chose personalized care.

Patients were noted to have very high pressure gradients and very large chamber sizes compared to what is seen in the high-income countries. This is due to late presentations of disease due to lack of access as well as misdiagnosis and mismanagement. Our clinic ensured that patients were seen, imaged, and the final plan made during the same visit whenever possible. This has helped patients from rural areas tremendously since they save on transport costs back and forth and often do not have accommodation. The valve clinic also aims to prescribe and educate patients about secondary prophylaxis with penicillin. Penicillin G IM was prescribed monthly for secondary prophylaxis for all individuals with RHD. A very small number of patients (about 43%) having an indication for secondary prophylaxis were actually taking it. Barriers to compliance include lack of knowledge and awareness among prescribers and patients, cost, medication shortages, and pain at the injection site.

STUDY LIMITATIONS. The results of this report are to be interpreted within the context of several significant limitations inherent to the current registry. Foremost among these is the inavailability of outcome data, as we are still in the process of collecting information on how reclassification by the HT has impacted patient outcomes across different treatment categories. We also do not have precise details on the referral patterns to cardiac surgery. Furthermore, data on disease prevalence and surgical outcomes prior to the establishment of the HT are unavailable, limiting our ability to perform a meaningful pre- and post-HT comparison.

CONCLUSIONS

The implementation of a multidisciplinary heart valve team facilitated a collaborative approach to decision-making for patients with advanced complex VHD, resulting in personalized treatment strategies. This led to a notable shift in management, with nearly 25% of patients initially recommended for surgery being redirected to medical therapy or less invasive transcatheter procedures. The establishment of the NICVD Heart Valve Team Registry represents a significant advancement in enhancing the quality of care and outcomes for patients with VHD in Pakistan. This initiative complements ongoing research and quality improvement efforts, aiming to optimize patient management and clinical outcomes for patients with complex VHD.

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PERSPECTIVES

COMPETENCY IN SYSTEMS-BASED PRACTICE: VHD significantly impacts cardiovascular health and requires an understanding of its epidemiology and trends for effective prevention and treatment. The evolution of the HT concept influences diagnosis and treatment strategies, emphasizing shared decision making and preoperative risk assessment. Our data highlight the importance of the heart valve team concept for improving patient outcomes by reclassifying patients from surgical to nonsurgical management when appropriate.

TRANSLATIONAL OUTLOOK: Multidisciplinary heart valve clinics offer a unique approach to comprehensively managing complex VHD, particularly in resource-limited settings where referral patterns are not streamlined and cardiac imaging and structural intervention experts are not widely available.

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