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Original Research Article

A study of clinical and etiological profile of mitral valve dysfunction

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ABSTRACT

Background: Heart valve diseases are a leading cause of cardiovascular morbidity and mortality globally; putting a significant strain on healthcare resources. In developing countries, rheumatic heart disease (RHD) remains the most common type of heart valve disease. Mitral valve disease is the most frequent of the valvular heart diseases. Mitral valve disease is a distressing and painful condition, and requires immediate attention before they result in death.
Methods: This was a prospective observational study done from September 2019 to February 2021, at the Department of General Medicine, Goa Medical College and Hospital, Bambolim, Goa: A tertiary care hospital in Goa.
Results: Out of the 50 patients enrolled in the study 44% patients had MS ,18% had MR and 38%had MR+MS. Mean age of the study population was 41 to 50 years of which 54% patients were females. All isolated Mitral Stenosis patients were rheumatic origin. Of the 9 MR patients, predominant form of MR was ischemic (66.66%), followed by rheumatic (22.22%) and MVP (11.11%). 19 patients had MR+MS, predominant form was rheumatic (84.21%). It was also observed that 42% each of total patients had pulmonary hypertension and congestive cardiac failure, 40% had pulmonary edema, while 30% had atrial fibrillations complications.
Conclusions: Our study revealed that the most common valve dysfunction observed is mitral stenosis, with a female preponderance and its most common etiology being rheumatic. Further it was also observed that the most common complication is pulmonary hypertension and congestive cardiac failure.

Keywords: Mitral valve dysfunction, Mitral regurgitation, Mitral stenosis, Rheumatic heart disease

INTRODUCTION

Heart valve diseases are a leading cause of cardiovascular morbidity and mortality globally, with rheumatic heart disease (RHD) remaining the most common type of heart valve disease.[1] Prevalence of valvular heart disease as a whole is 2.5% increasing markedly after the age of 65 years. The ox valve study reported that for people over the age of 65 years, the prevalence of heart valve disease will increase from 1.5 million people currently, to double that in 2046 and to many as 3.3 million people by 2056. Mitral valve disease is the most frequent of the valvular heart diseases, especially among the elderly, with a frequency of more than 10% in those over the age of 75 years.[2] MR accounts for 32% and MS 12% of all types of heart valve disease.[3] We have three types of mitral valve diseases: mitral stenosis (MS), mitral regurgitation (MR), and mitral valve prolapse (MVP).

Mitral regurgitation is classified as either primary (a structural or degenerative abnormality of the mitral valve apparatus) or secondary (a disease of the left ventricle, which interferes with the function and integrity of the mitral valve apparatus) regurgitation of the mitral valve.[4,5]

Rheumatic disease is the most common cause of MS, but severe calcification of the mitral annulus with extension

into the leaflets can restrict left ventricular inflow, especially in the elderly.[4,6]

RHD affects approximately 15–20 million people worldwide, with an estimated prevalence of 300,000 new cases and 233,000 case fatalities per year, with Southeast Asia reporting the highest fatality rates (7.6 per 100,000).[7]

According to Carapetis et al, "Rheumatic heart disease is the leading cause of cardiovascular death in children and young people in developing countries, causing at least 200 000–250 000 premature deaths per year".[8,9]

According to the 2008 Population Reference Bureau, 80–85 percent of children under the age of 15 (about 2 billion) live in locations where rheumatic heart disease is endemic.[10]

Rheumatic heart disease is characterized by valvular damage caused by an abnormal immune response to group A streptococcal infection, usually during childhood.[11] Acute rheumatic fever affects the joints, skin, brain, and heart and usually develops three weeks after group A streptococcal pharyngitis.[12] Early echocardiography-based detection of silent rheumatic heart disease (showing no clinical signs) with mild valve lesions by active surveillance programs may be of considerable value since secondary prophylaxis can prevent adverse outcomes.[13-15]

Mitral valve dysfunction often requires intervention and secondly important changes has occurred as regards to presentation and complication. Better understanding of clinical history coupled with diagnostic imaging, interventional cardiology surgical approaches have resulted in accurate diagnosis and appropriate selection of patients for therapeutic interventions.

This study was undertaken to establish the incidence and patterns of valvular heart disease as studied by Echo. Although pathological examination of valves remains the gold standard in morphological analysis, with the current advances in techniques, comparable information on the anatomy and hemodynamic effects of valve disease can be obtained by Echo.

METHODS

This prospective observational study was done from September 2019 to February 2021, over a period of 16 months, at the Department of medicine, Goa Medical College and Hospital, Bambolim, Goa, India: a tertiary care hospital in Goa. This study was approved by the ethics committee of the institution and was conducted in accordance with the declaration of Helsinki and other ethical guidelines.

All patients admitted in the department of medicine, Goa Medical College who gave consent for this study were screened for inclusion in the study. A written informed consent was taken from each patient. Those patients who met the below inclusion criteria were enrolled in this study. Patient confidentiality was maintained.

Sample size

The sample size was 50 patients.

Inclusion criteria

Patients aged 13 years and above with mitral valve disease, have capacity to understand and sign an informed consent, in case of MS – MVA ≤2 cm^2, and in case of MR - regurgitant volume ≥50 ml and regurgitant fraction ≥40% were included.

Exclusion criteria

Patients with age less than 13 years, those unwilling to give consent, pregnant lactating women, and patients with other valvular disease were excluded.

Each patient provided a detailed history of their cardiac symptoms such as exertional dyspnoea, paroxysmal nocturnal dyspnoea, palpitation, angina, and syncopal episodes. Episodes of acute pulmonary oedema were confirmed by the patient's description of sudden onset of dyspnoea treated by hospitalization and administration of nasal oxygen and parenteral drugs, or, when available, by reviewing the patient's medical records. A history of cerebrovascular accidents/transient ischemic attacks, rheumatic fever, infective endocarditis, and other medical co morbidities was also sought.

When available, all of the patients' medical records were verified in order to look for any significant ailments in the past.

Each patient was thoroughly examined to rule out AF, pulmonary arterial hypertension (evidenced by clinical features such as left parasternal heave, palpable epigastric pulsations due to a hypertrophic right ventricle, a loud pulmonary component of the second heart sound, and a pulmonary regurgitation murmur), and congestive heart failure. Each participant had baseline haematological and biochemical investigations, as well as electrocardiography (ECG) (to rule out MI and right and left ventricular enlargements) and chest radiography (to know about the chamber enlargement). In each participant, detailed transthoracic colour Doppler echocardiography was performed using standard techniques. The area of the mitral valve was measured using 2D planimetry and pressure half-time methods.

The echo score developed by Wilkins et al was used to assess mitral valve degeneration.[16] To determine the presence of pulmonary arterial hypertension (PAH), the modified Bernoulli equation was used to calculate pulmonary artery systolic pressure from tricuspid regurgitation jet velocity and diastolic pressure from pulmonary regurgitation jet velocity. Based on the

tricuspid regurgitation gradient, the right ventricular systolic pressure was calculated. Significant PAH was classified as right ventricular systolic pressure greater than 50 mmHg and right ventricular systolic dimension greater than 2.6 cm.

Because the current study is observational in nature, all descriptive statistics such as mean, standard deviation, and percent distribution for continuous variables and median, IQR, and percent distribution for categorical variables were presented. Wherever possible, non-parametric tests were used.

The analysis is carried out with the help of the statistical package for social sciences (SSPS).

RESULTS

A total number of 50 patients, meeting the inclusion criteria, admitted in the department of general medicine, Goa Medical College during the period of September 2019 to February 2021, were studied.

Of the 50 patients enrolled in the study 44% patients had MS, 18% patients had MR, 38% patients had both MR and MS (Table 1).

Table 1: Division of cases.

Group	Number of cases (%)
Patients with MS	22 (44)
Patients with MR	9 (18)
Patients with MR+MS	19 (38)

Amongst the age groups studied, a majority were between 41 and 50 years. Out of 50 patients, 2 (1 in group 1, 1 in group 3) were below 30 years, 6 (3 in group 1, 3 in group 3) were between 31 and 40 years, 15 (7 in group 1, 3 in group 2, 5 in group 3) were between 41 and 50 years, 14 (6 each in group 1 and 3, 2 in group 2) were between 51 and 60 years, 7 (3 each in group 1 and 3, 1 in group 2) were between 61 and 70 years, 6 (2 in group 1, 3 in group 2, 1 in group 3) were more than 70 years. Mean age was 41 to 50 years (Figure 1).

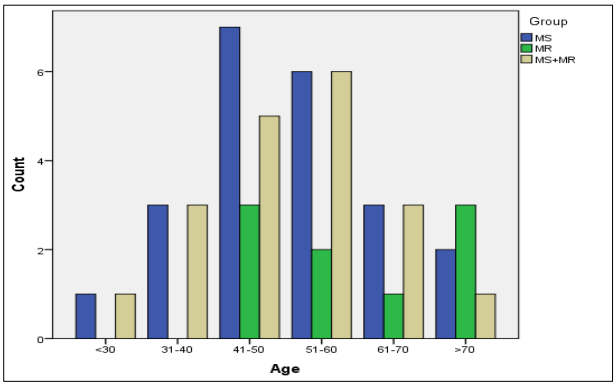

Figure 1: Age wise distribution of cases.

There were 14 females and 8 males with MS, 3 female and 6 males with MR and 10 females and 9 males with MS+MR. Of the total 50 patients, 27 (54%) patients were female, 23 (46%) were male patients (Figure 2).

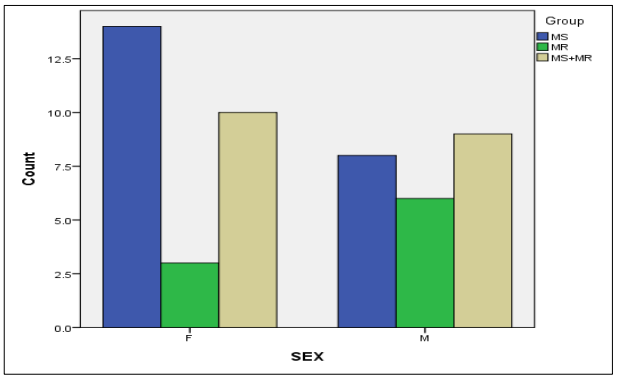

Figure 2: Sex wise distribution of cases.

Out of 22 MS patients, 1 male patient was below 30 years, 3 (1 female and 2 male) were between 31 and 40 years, 7 (6 female and 1 male) were between 41 and 50 years, 6 (4 female and 2 male) were between 51 and 60 years, 3 (2 female and 1 male) were between 61 and 70 years, 2 patients (1 male and 1 female) more than 70 years. A steady increase in the incidence of MS can be seen with each decade with a peak occurring at 41 to 50 years. Nearly two-thirds being females. All isolated MS patients were rheumatic origin (Figure 3).

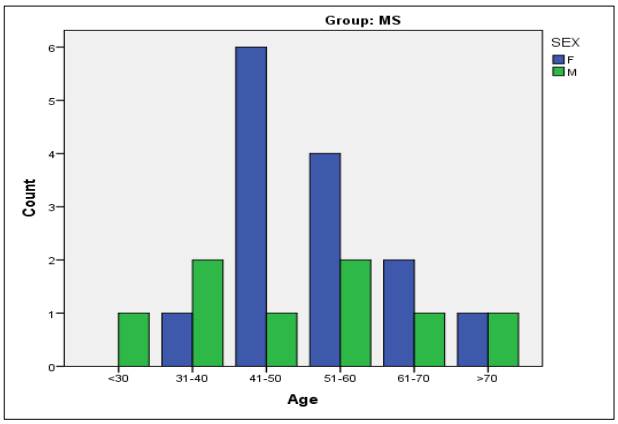

Figure 3: Age and sex wise distribution of mitral stenosis cases

Out of 9 MR patients, 3 (33.3%) (1 female, 2 male) were between 41 and 50 years, 2 (22.2%) (male) were between 51 and 60 years, 1 (11.1%) male was between 61 to 70 years, 3 (33.3%) (2 female and 1 male) were more than 70 years. A bimodal peak was seen in the incidence of MR. First peak was in the fourth decade and the second in older adult life (seventh decade). Out of 9 patients, 3 (33.3%) were females and 6 (66.6%) were male (Figure 4). The predominant form of MR is ischemic (66.66%), followed by rheumatic (22.22%), followed by MVP (11.11%) (Figure 5).

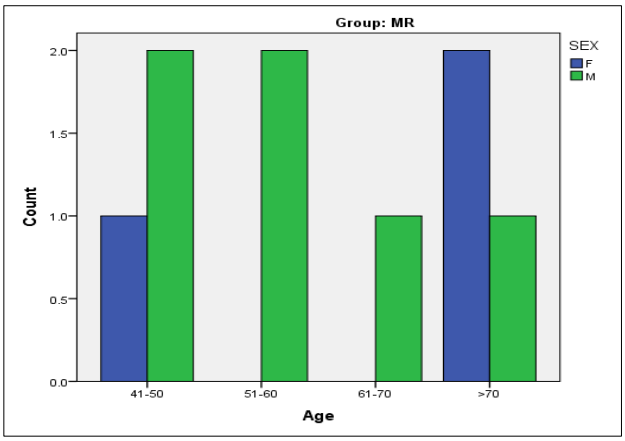

Figure 4: Age and sex wise distribution of mitral regurgitation cases.

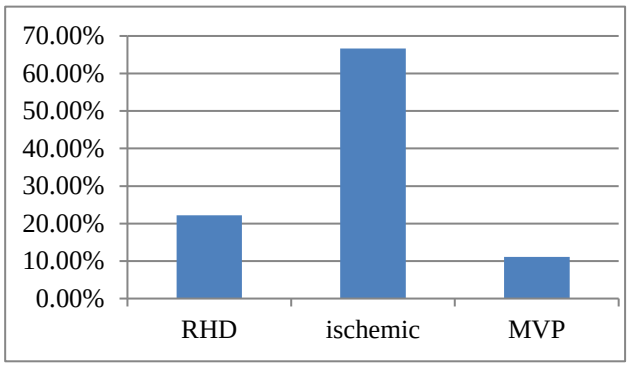

Figure 5: Etiological distribution of MR cases.

Out of 19 MR+MS patients, 1 (5.3%) female patient was below 30 years, 3 (15.8%) (2 females and 1 male) were between 31 and 40 years, 5 (26.3%) (3 females and 2 males) were between 41 and 50 years, 6 (31.6%) (3 females and 3 males) were between 51 and 60 years, 3 (15.8%) (3 male) were between 61 and 70 years, 1 (5.3%) (female) was more than 70 years. Out of 19 patients, 10 (52.63%) were females, 9 (47.36%) were male patients. Females contributed to maximum cases (Figure 6).

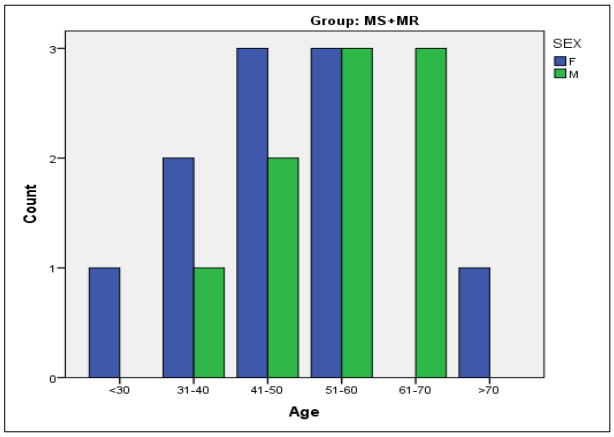

Figure 6: Age and sex wise distribution of MR+MS cases.

Out of 19 MR+MS patients, predominant form is rheumatic 16 (84.21%), followed by 1 (5.26%) patient each of degenerative, MAC and congenital (Figure 7).

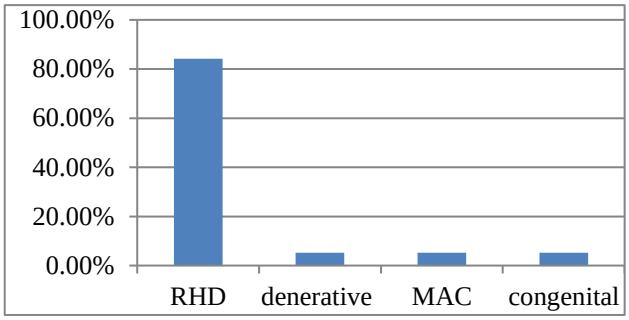

Figure 7: Etiological distribution of MR+MS cases.

Of all the complications studied, 21 (42%) patients had pulmonary hypertension, another 21 (42%) had congestive cardiac failure, 20 (40%) pulmonary edema, other complications being atrial fibrillation, embolic CVA and infective endocarditis (Figure 8).

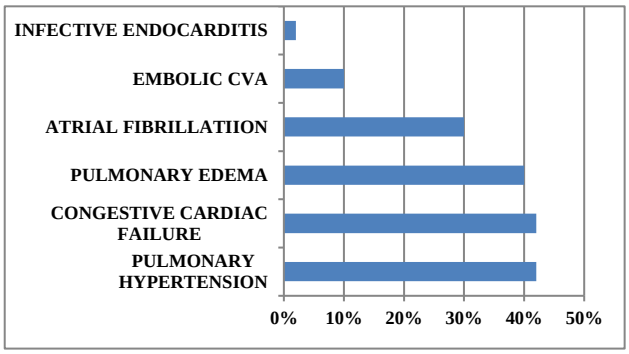

Figure 8: Complications.

DISCUSSION

The present study was undertaken in a tertiary care health center with the objective of systematically analyzing the etiology and clinical profile of mitral valve disease. Rheumatic fever and RHD continue to be major public health issues in India, resulting in significant cardiac morbidity and mortality. Despite some studies indicating a decrease in the prevalence of RHD in Indian school children, the prevalence of rheumatic fever and RHD in adults has not decreased significantly over the last two decades.[20,30]

In the present study, rheumatic heart disease contributed the most to the burden of mitral valve disease (80%). This is in comparison to study done by Ramakrishnan et al, wherein he found 72.4% of mitral valve disease is attributed to RHD.[28]

RHD continues to affect millions of children and young adults in the Indian subcontinent, with prevalence rates ranging from 4.54 to 6 per 1000, (Lalchandini et al;

Padmavati et al study)with estimates as high as 51 per 1000 in some studies (Bhaya et al study), despite recent large series of school surveys showing a decline in RHD prevalence (0.5-0.68 per 1000) (Misra et al; Jose, and Gomathi et al study).[31-35] Our findings contrast with those of another valvular heart disease echocardiographic study, the Euro Heart Survey, a multicenter study involving 5001 patients from 92 centres in 25 European countries. The most common lesions were AS and MR, both of which were caused by degenerative processes. This disparity reflects the disparity in the prevalence of valve disease among developed and developing countries (Iung et al study).[36]

The relationship between mitral valve disease and presentation still needs to be defined. In this perspective observational study, a total no of 50 patients, who fit in to the inclusion criteria were included.

Out of 50 patients, 27 (54%) patients were female, 23 (46%) were male patients, the ratio being F:M=1.17:1. In the Ghogale et al study there were 124 patients, 72 were males and 52 were females, the ratio being 1.38:1.[23] In a study by Aurakzai et al, the male: female ratio was 1.17:1.10.[24] In a study by Adapa et al, there were 30 patients, 15 were females and 15 were males, the ratio being 1:1.[29]

Out of 50 patients enrolled in the study,2 were below 30 years, 6 were between 31 and 40 years, 15 were between 41 and 50 years, 14 were between 51 and 60 years, 7 were between 61 and 70 years, and 6 were more than 70 years. Mean age of presentation is 41 to 50 years. In the present study out of the 50 patients, 08 (16%) were in the age group of 10-40 years. In a study by Ramakrishna et al, in South India 33.50% of patients were younger than 40 years.[28] In a study by Meenakshisundaram et al, in Chennai the mean age of males is 23 years and that of females is 34 years.[37] In a study by Aurakzai et al in Pakistan the mean age of males was 42.3 years and mean age of females was 44.3 years.[24]

In the present study, Out of 50 cases 22 (44%) were of MS, 9 (18%) were of MR, 19 (38%) were MR+MS. MS is the dominant lesion which is similar to the study by Manjunath et al which accounted for 37.1%. In a study by Anand et al, MS accounted for 2943 (41.5%) cases in patients aged more than 18 years.[20]

In a study conducted in Pakistan by Aurakza et al, mitral regurgitation is the predominant lesion occurring in 7500(56%) out of 13414 and Mitral Stenosis is seen in 2729 patients (20.3%).[24]

All cases of MS are rheumatic in present study (100%) with females being 14 and males 8, F:M=1.75:1 correlating with other studies. Surgical pathologic series show rheumatic involvement in nearly 99 % of excised stenotic valves (Olson et al; Hanson et al study), which is consistent with the findings of Roberts large necropsy series (100%).[38-40] Congenital MS, which occurs in 1% of cases, is uncommon in adults, given that the median age at death is only 2 months (Ruckman et al study).[41] Degenerative calcification of the mitral annulus frequently causes MR, but only in 3% of cases can cause mitral valve Stenosis (Hammer et al study).[42]

According to Manjunath et al, rheumatic MS accounted for 97.4% with F:M=1.93:1, followed by congenital heart disease accounted for 1.5%, post mitral valve repair (0.8%), and sclera denegerative (0.3%).[18]

A steady increase in the incidence of MS can be seen with each decade with a peak occurring at 41 to 50 years correlating with study by Manjunath et al, where peak occurring at 30 to 39 years.

Out of 50 patients, isolated MR is seen in 9 patients accounting for 18% of total cases. The predominant form of MR is ischemic (66.6%) followed by RHD (22.2%) followed by MVP (11.1%). Out of 9 patients, 3 (33.3%) were females and 6 (66.6%) were male. This is in contrast to other studies were rheumatic was predominant and more common in females.

According to a study conducted by Kumar et al, most common etiology of mitral regurgitation is rheumatic (38.5%) followed by probable rheumatic (15%), mitral valve prolapse (13.5%), dilated cardiomyopathy (8%), infective endocarditis (6%), ischemic heart disease (5%), miscellaneous group (including rupture of chordae tendinae, aortaarteritis) (4.5%) and patients with indeterminate etiology (9.5%).[26]

In Manuel et al study, conducted in Spain to determine etiology of chronic mitral regurgitation, the most frequent cause of mitral regurgitation were rheumatic (26%), ischemic etiology (21%), mitral valve prolapse (21%) and dilated cardiomyopathy (18%).[27] In Manjunath et al study, The predominant form of MR was rheumatic (41.1%) followed closely by myxomatous mitral valve or mitral valve prolapse (40.8%).[18] In a surgical case series study by Olson et al, among the 260 cases of pure mitral regurgitation, the two most common causes were a floppy mitral valve (38%) and RHD (31%).[38]

Out of 50 patients, MR+MS is seen in 19 patients accounting for 38% of total cases. The predominant form being RHD (84.21%) which is correlating with Manjunath et al study (97.8%).[18]

Out of 50 patients, 21 patients (42%) presented with congestive cardiac failure, 21 (42%) with pulmonary hypertension, 20 (40%) with pulmonary edema, 15 (30%) with atrial fibrillation, 5 (10%) with embolic CVA and 1 (2%) with infective endocarditis which is correlating with other studies (Table 2).

Table 2: Comparison of complications of different study.

Study	P. HTN(%)	CCF (%)	Pulmonary edema (%)	AF (%)	Embolic CVA (%)	I E (%)
Present study	42	42	40	30	10	2
Ghogale et al	55.65	33.8	12.09	3.23	4.03	4.84
Meenakshi et al	_	54	31	_	21	0.3
Chockalingam et al	42.4 <18y, 80.8>18y	-	-	5.9	0.4	0.6

In the Ghogale et al study the most common complications were pulmonary hypertension 69 (55.65%), followed by congestive cardiac failure (33.87%), acute pulmonary edema (12.09%), infective endocarditis (4.84%), cerebrovascular accident (4.03%), and left atrial thrombus (3.23%).[23]

In a study by Sundaram et al, in Chennai, India, various complication noticed were congestive heart failure (54%), acute pulmonary edema (31%), embolic episodes (21%) and infective endocarditic (0.3%).[37]

In a study by Chockalingam et al, in Chennai pulmonary hypertension was present in 42.4% in patients aged 18 years and 80.8% in patients aged 17 years, 5.9% had atrial fibrillation, 0.9% had left atrial thrombus, 0.4% had embolic cerebrovascular accidents, 0.6% had infective endocarditis.[20]

In a study by Ramakrishna et al, 32% of patients had atrial fibrillation, 12.3% of patient had cerebrovascular accident, 1.5% of patients had history of infective endocarditis.[28]

According to a study conducted by Padmaja et al at Gandhi Medical College and Gandhi Hospital, a tertiary care centre in Secunderabad. Out of the 30 patients 80% that is 24 patients presented with AF, 20% that is 6 patients presented with pulmonary artery hypertension.[29]

Limitations

The current study is not a population-based study and thus is subject to the various biases that such studies entail. A study based in a tertiary referral centre, for example, is more likely to include symptomatic lesions.

There may be a bias toward lesion severity patterns, as patients with more severe lesions are more likely to be overrepresented in studies conducted in tertiary care referral centres.

Although strict morphologic and clinical criteria were used to assign aetiology to a specific valve lesion, an Echo-based study has inherent limitations when compared to surgical or autopsy-based studies.

CONCLUSION

Heart valve diseases are a leading cause of cardiovascular morbidity and mortality globally, putting a significant strain on healthcare resources. In developing countries, RHD remains the most common type of heart valve disease.

In the current study, RHD contributed the most to the burden of mitral valve disease, with calcific degeneration, myxomatous disease, and congenital being the other major forms of valvular heart disease. Although recent school surveys in India continue to demonstrate a declining trend in the prevalence of RHD, rheumatic involvement is still the dominant form of valvular heart disease in India. There is predominance of MS over MR with preponderance of females in MS and Male preponderance in MR. Mean age of presentation is 41 to 50 years. Congestative cardiac failure and pulmonary edema being most common complication.

The described patterns are consistent with other studies along with the surgical and autopsy series described over several decades. Because this was a comprehensive evaluation of mitral valve disease across all age groups and genders, an understanding of natural history can be inferred retrospectively. Echo has nearly eliminated the need for invasive cardiac catheterization for the anatomic and hemodynamic assessment of valve lesions due to advancements in techniques and increasing operator experience. Echocardiography is now the most important modality of evaluation for patients with mitral valve disease.

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