

Pattern of Rheumatic Heart Disease in Western Nepal - an Echocardiographic study: a single centre experience

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Introduction

Valvular heart diseases are the leading causes of morbidity and mortality, causing significant increase in global burden of disease.¹ Major causes of valvular heart disease are the Rheumatic Heart Disease (RHD) and the degenerative heart disease worldwide. It is estimated that about 80% of the disease burden lies in the developing country.² Most of the cases of rheumatic heart disease in the developed countries occur among the particular groups such as socioeconomically deprived or indigenous populations.³ The main reason for the decreasing trend in the developed countries are the improved living conditions and early recognition and treatment of sore throat.⁴ Valvular involvement occurs differently in developed countries, mostly being degenerative. Rheumatic heart disease mostly affects the young age group and therefore has significant impact on the overall productivity with significant economic burden to the society.⁵

There are various tools to evaluate the RHD. Echocardiography has established itself as an easy, cost effective, non-invasive tool for the evaluation of presence and to grade the severity of the valvular involvement in RHD.⁶

There has been a lot of studies done on the pattern of valvular involvement in RHD which has shown various patterns.

Abstract

Background and aims: Rheumatic heart disease (RHD) is a preventable but chronic debilitating sequela to the acute rheumatic fever. It takes several years for manifestations, however can present early in places with high prevalence. Most common valve involved are mitral and aortic. Echocardiography is simple tool to diagnose the presence as well as quantify the valvular lesion. This study aims at identifying the pattern of valvular involvement in RHD in community heart center in western Nepal.

Methods: This was a retrospective analysis of the patients presenting with Rheumatic heart disease over the period of two years from July 2020 to July 2022.

Results: Altogether 563 echocardiograms with diagnosis of RHD were recorded over the period of two years. The mean age was 33.59±12 years. The commonest age group involved was 21-40years (56.66%). Overall, there was female preponderance over male, 77.4% vs 22.6%. Isolated MR was the commonest among the isolated lesion (64.44%). Multivalvular lesion was more common than isolated lesions 76.03% vs 23.97%. Isolated mitral stenosis (MS) and isolated mitral regurgitation (MR) was more common in female 82.1% and 75.8% respectively whereas isolated aortic regurgitation (AR) was more common in male (55%). Involvement was in the order of MS+MR>AR+MR>MS+AR>AS+AR>MS+AS>AS+MR in the cases of multivalvular lesion. Mean mitral valve area was .2±0.39 cm². Among the MS, 65(19.69%) had mild, 145(43.93%) had moderate and 120(36.36%) had severe lesion and all were common in female and the age group 21-40years. Mild, moderate and severe MR was more common in female while severe AR was found only in male. Overall, 271(48.13%) had pulmonary hypertension and was more common in severe MS.

Conclusion: Valvular heart disease is common and the most common lesion is RHD in developing country like ours. This study shows that RHD is more common in female and middle age group. Multivalvular lesion is more common than the isolated lesions.

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Identification of valvular pattern is important because of the therapeutic implications and prognosis. This study aims at finding the valvular pattern and severity in the patient with RHD in a single center community hospital located in western Nepal.

In one of the studies done in tertiary hospital in western Nepal the incidence of RHD was 4.8% on echocardiography.⁶

There are previous studies showing the cost effectiveness of echocardiography as a screening tool in various research purpose and has shown that the use of echocardiography is at least cost neutral.⁷

Echocardiography now has been recommended for the initial evaluation, not only for the diagnosis but also the pattern and severity of cardiac lesions in RHD. Clinical evaluation only has been shown to miss various lesions, particularly the indolent ones and also when multiple valves are involved.⁸

Method:

This study was a retrospective single center study carried out in the department of cardiology of Gautam Buddha Community Heart Hospital, which is peripheral referral center.

A total of 563 echocardiogram of the patients with RHD were included for the analysis over the period of two years. Prior permission was acquired from the institutional review committee. Repeat echocardiogram of the same patient was excluded. Detail valvular involvement was recorded. Echocardiogram was done by GE VIVID e95 in accordance with the American society of echocardiogram. Rheumatic heart disease cases were identified according to the World Heart Federation criteria.

Continuous variables were expressed as mean ± SD, while categorical variables were expressed as frequency and percentages. Data was analyzed using SPSS for windows version 18.0.

Results:

Altogether 563 echocardiographically confirmed cases of rheumatic heart disease were include for the study. The mean age was 33.59±12 years. There was female predominance with female 436 (77.4%) and male 127(22.6%). The age distribution is shown in figure 1 and table 1. This shows RHD more common in the middle age group of 21 to 40 years 319 (56.66%).

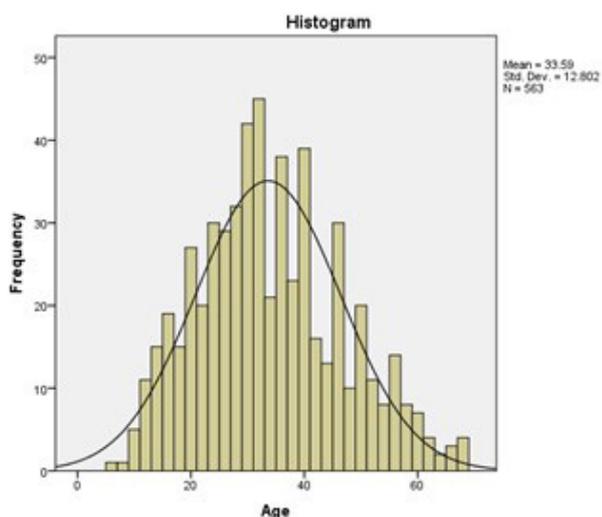


Fig 1. Age distribution of patients with RHD

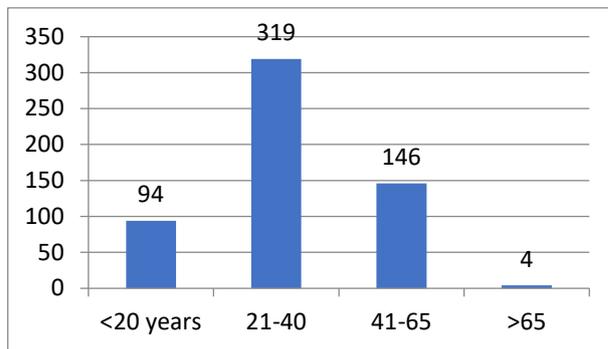


Table 1. Age distribution of patients with RH

| RHD | Age group | | | | P-value |
|----------------------|-----------|-------|-------|-----|---------|
| | ≤20 | 21-40 | 41-65 | >65 | |
| Mitral Stenosis | 14 | 196 | 117 | 3 | <0.05 |
| Mitral Regurgitation | 82 | 52 | 119 | 4 | 0.21 |
| Aortic Stenosis | 0 | 29 | 18 | 0 | <0.05 |
| Aortic Regurgitation | 45 | 159 | 77 | 2 | 0.897 |

Table 2: age distribution according to the valvular involvement

There was isolated valvular involvement as well as in various combination. The overall patterns of valvular involvement are shown in table 2. As shown in Table 3, the common age of presentation with valve lesion is middle age groups.

| VHD | Total | Male (%) | Female (%) |
|-------------|-------|----------|------------|
| Isolated MS | 39 | 17.9 | 82.1 |
| Isolated MR | 87 | 24.2 | 75.8 |
| Isolated AR | 9 | 55 | 45 |
| MS | 330 | 18.5 | 81.5 |
| MR | 456 | 22.6 | 77.4 |
| AS | 47 | 23.4 | 76.6 |
| AR | 283 | 25.8 | 74.2 |
| MS+MR | 238 | 18.9 | 81.1 |
| MS+AS | 35 | 20 | 80 |
| MS+AR | 173 | 20.2 | 79.8 |
| AS+AR | 46 | 23.9 | 76.1 |
| AS+MR | 31 | 22.6 | 77.4 |
| AR+MR | 219 | 25.6 | 74.4 |
| MS+MR+AS+AR | 22 | 22.7 | 77.3 |

Table 3. Patterns of valvular involvement in RHD

These data shows that the mitral valve disease was more common. It was more in female than in male both in isolation or in combination and this was statistically significant. Multivalvular lesions were more common than the valve lesion in isolation 76.02% vs 23.97% as shown in fig 2. Most common isolated lesion was MR (64.44%). Isolated aortic stenosis was not found. Multivalvular involvement was in the order of MS+MR>AR+MR>MS+AR>AS+AR>MS+AS>AS+MR. Both isolated MS and MR was more common among female and isolated AR was common in male.

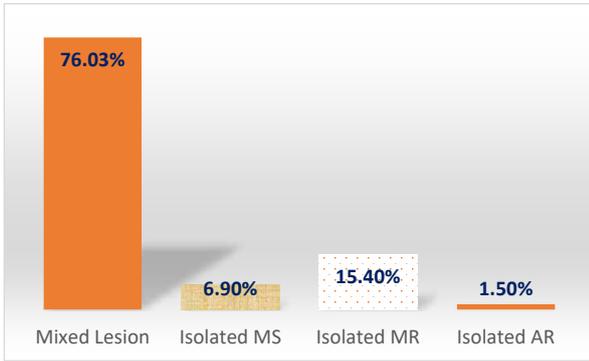


Fig 2: Mixed and isolated lesions in RHD

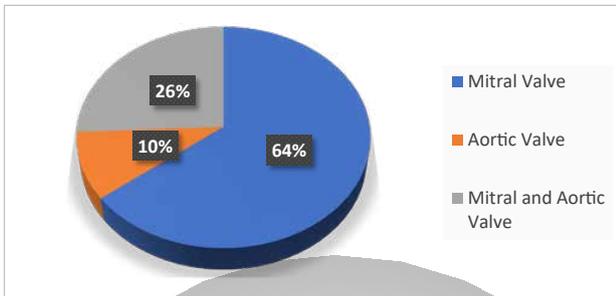


Fig 3: Valvular involvement in RHD

Isolated valve lesion

Table 4 and 5 shows the distribution of cases according to the age group and isolated valve lesion. Isolated AS was not found in our study. Isolated MS and MR was more common in female 82.1% and 75.8% respectively. In both cases, they were more in age group of 21-40 years. Isolated AR was common in male 55% and was more common in age group of <40 years.

| RHD | Age group | | | | P-value |
|-------------------------------|-----------|-------|-------|-----|---------|
| | ≤20 | 21-40 | 41-65 | >65 | |
| Isolated Mitral Stenosis | 5 | 26 | 8 | 0 | 0.59 |
| Isolated Mitral Regurgitation | 29 | 47 | 11 | 0 | <0.05 |
| Isolated Aortic Regurgitation | 4 | 4 | 1 | 0 | 0.11 |

Table 4: Age distribution of isolated valve lesion

| RHD | Male | Female | P-value |
|-------------------------------|------|--------|---------|
| Isolated Mitral Stenosis | 7 | 32 | 0.47 |
| Isolated Mitral Regurgitation | 21 | 66 | 0.7 |
| Isolated Aortic Regurgitation | 5 | 4 | <0.05 |

Table 5: Sex distribution of isolated valve lesion

Mitral Stenosis:

As stated above, MS was more seen among the female cohort in isolation or in combination. The mean mitral valve area was 1.2±0.39 cm². Total 330 patients had mitral stenosis. Among them

65(19.69%) had mild, 145(43.93%) had moderate and 120(36.36%) had severe mitral stenosis. Among all the grades of severity, all was more common in females which was also statistically significant. According to the age all spectrum of severity was more common among the age group of 21-40 years old.

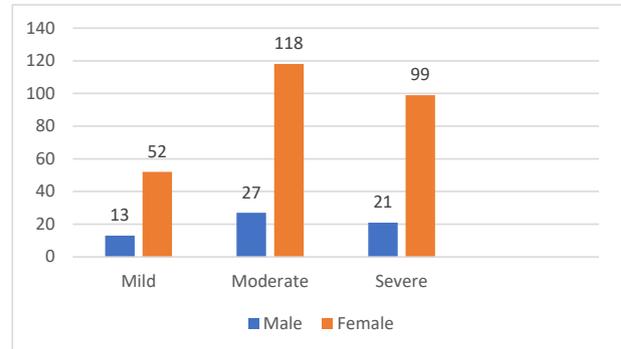


Fig 4: Distribution of cases according to the severity of MS

| Mitral stenosis | Age group | | | | P-value |
|-----------------|-----------|-------|-------|-----|---------|
| | ≤20 | 21-40 | 41-65 | >65 | |
| Mild | 2 | 46 | 17 | 0 | <0.05 |
| Moderate | 7 | 85 | 52 | 1 | |
| Severe | 5 | 65 | 48 | 2 | |

Table 6: Distribution of Mitral Stenosis severity according to the age group

Mitral Regurgitation:

Altogether 456 patients had MR in isolation and in combination. The presence of MR was more in female (77.4%, p<0.05). Among them 47.80% had mild, 18.64% had moderate and 10.96% had severe MR. All spectrum of severity was more common in females. All spectrum of severity of MR was more common in the age group of 21-40 years.

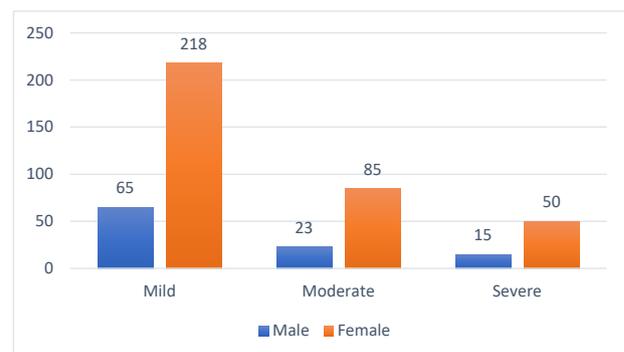


Fig 5: Distribution of cases according to the severity of MR

| Mitral regurgitation | Age group | | | | P-value |
|----------------------|-----------|-------|-------|-----|---------|
| | ≤20 | 21-40 | 41-65 | >65 | |
| Mild | 37 | 167 | 78 | 1 | <0.05 |
| Moderate | 20 | 53 | 33 | 2 | |
| Severe | 25 | 31 | 8 | 1 | |

Table 6: Distribution of Mitral Regurgitation severity according to the age group

Aortic Regurgitation

Altogether 283 patients had AR in isolation and in combination. Among them isolated AR was more common in male (55%) than female (45%). Overall AR was more common in female 47%. Among them 67.84% had mild, 29.68% had moderate and 2.4% had severe AR. Severe AR was present in male only. All spectrum of severity of AR was more common in the age group of 21-40 years. Severe AR was not found in patients above 65 years age.

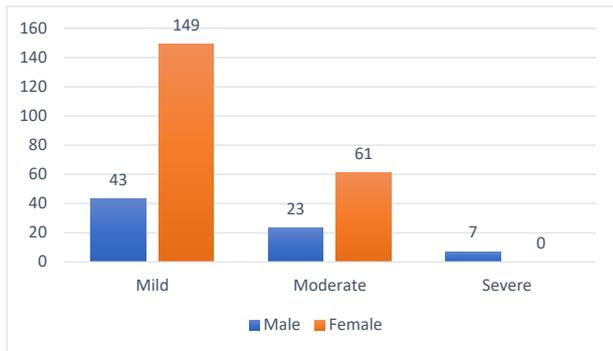


Fig 6: Distribution of cases according to the severity of AR

| Aortic regurgitation | Age group | | | | P-value |
|----------------------|-----------|-------|-------|-----|---------|
| | ≤20 | 21-40 | 41-65 | >65 | |
| Mild | 29 | 111 | 51 | 1 | <0.05 |
| Moderate | 12 | 46 | 25 | 1 | |
| Severe | 4 | 2 | 1 | 0 | |

Table 7: Distribution of Mitral Regurgitation severity according to the age group

Pulmonary Hypertension

a total of 271(48.13%) patients had pulmonary hypertension. Among them 73(26.93%) had mild, 98(36.16%) had moderate and 100(36.90%) had severe pulmonary hypertension. The presence of severe MS was a strong predictor of severe pulmonary hypertension.

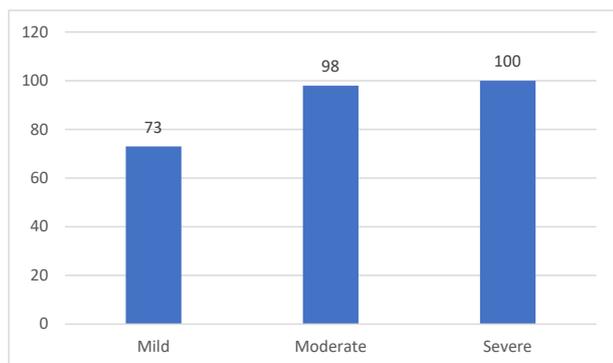


Fig 7. Presence of pulmonary hypertension and grade

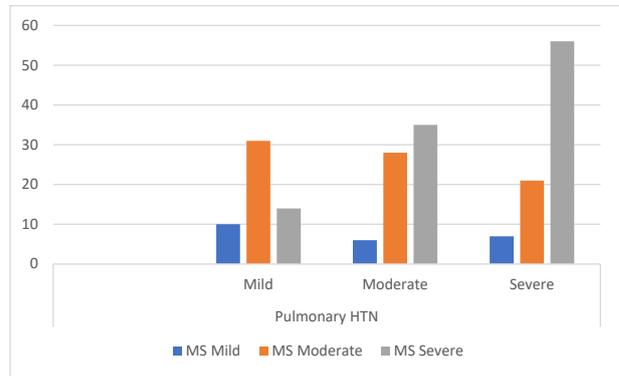


Fig 8 Spectrum of severity of MS with severity of Pulmonary Hypertension

Discussion:

This study was carried out in a community heart hospital in western Nepal which has now established itself as a referral central in this part.

Evaluation of RHD involves clinical and with the tools like echocardiogram. Due to the slow progressive nature of the valvular involvement in RHD, patient often presents late and early. Diagnosis is often missed as the patients usually limits the physical activity to avoid symptoms.⁹

Clinical evaluation includes auscultation and identification of presence of heart murmurs. This has limitations as auscultation should be done in optimal condition and has limitation of missing early and indolent type of lesions. Various studies done in past have established the superiority of echocardiogram over clinical examination.^{10,11}

The electrocardiogram is nonspecific with some finding of chamber enlargement and hypertrophies. Chest X-ray can demonstrate the cardiomegaly and the presence of pulmonary hypertension and pulmonary edema, again nonspecific to the RHD. Due to these limitations, echocardiography has been established as useful tool for not only diagnosis but also the patterns and severity of valvular involvement, physiological consequences and therapeutic implications.

The echocardiographic diagnosis of RHD is done in accordance to the criteria put forward by world heart federation, in patient with or without history of acute rheumatic fever.¹²

The mean age in our study was 33.59±12.08 which is similar to study done by R Koju et al which showed mean age of 32.82±15.3 years.¹³

Our study showed that the major age group affected was in middle age of 21-40 (56.66%). The results are similar to the various studies done in Nepal and abroad.^{6,14,15}

Maximum age was 68 years old and minimum was 6 years old. It is not uncommon to find RHD at age as low as 5 years in high prevalent countries of Asia.¹⁶

In a study done by S Lalitha et al which was an observational echocardiographic study done in a tertiary care center in Bengaluru, India, the youngest patient with RHD was four years old and the oldest was 80 years old.¹⁷

In a study done by R Malla et al in tertiary cardiac center in Kathmandu, age ranged from 4 years to 51 years.¹⁸

A study done by R Koju et al the minimum age was 8 years and maximum age was 64 years old.¹³

These studies points to the important fact that the children are exposed to the risk factors for the acute rheumatic fever and rheumatic heart disease in early age group in our part of the world. This has high socio-economic impact. This also exposes the poor health condition. This has certainly posed a big challenge for health authority to determine what might be the early age for primary prevention and intervention.

Different disease has been shown to have gender predilections and it has significant impact on the disease presentation diagnosis and outcome. Female sex is universal risk factor for autoimmune disease 19 and rheumatic fever is also an autoimmune damage to the heart valve triggered by the infection with group A beta-hemolytic streptococcus pharyngitis.²⁰

Different studies have shown the higher prevalence of RHD among female (77.4%) and the result of our study showed similar pattern. Several studies like Ram Chandra et al showed females had 73.2%, R Koju et al 76.5%¹³, R Nepal et al 71.3%¹⁴, S Lalitha et al 53%¹⁷, R Malla et al 59.01%¹⁸.

Mitral valve

This study showed the predominance of mitral valvular involvement. In our study, Mitral valve was involved in 80.99% and aortic valve was affected in 58%. The findings are similar to the other studies. In study done by R Nepal et al mitral and aortic valve was affected in 95.6% and 51.3% respectively.¹⁴ Study done PC Koirala et al showed that mitral valve was the most commonly affected valve (98.20%) followed by the aortic valve (53.90%).²

In study done by S Laudari et al mitral regurgitation in isolation or combination was present in 73.62% of patients.¹⁵

In a study done by SK Sanyal et al. chronic MR was more common in children as mitral stenosis was present as the age increase.²²

Mitral regurgitation is the commonest lesion in Rheumatic heart disease which is often accompanied by the stenosis. Stenosis occurs due to long term scarring resulting in fusion of commissures and thus causing narrowing of mitral valve aperture.²³

Mitral regurgitation was the commonest lesion in our study in isolation and in combination. In study done by RC Kafle et al the commonest isolated lesion was mitral regurgitation 26.26%.⁶ The exact cause however is still not known why the mitral valve is more affected.^{24,25}

There was again female predominance in all form of mitral valve lesion MS, MR or in combination in our study. Mitral stenosis was seen in 81.5% and mitral regurgitation was found in 77.4% in females. The findings are similar to the study done by R Koju et al which showed MS in 84% and MR in 73% in females.¹³ Among the patients with MR, 47.80% had mild, 18.64% had moderate and 10.96% had severe MR. In another study done by R Nepal et al mild, moderate and severe MR was seen in 30%, 19% and 19% respectively.¹⁴ In study done by S Lalitha et al mild, moderate and severe MR was seen in 41%, 26% and 62%.¹⁷ This shows that we might be detecting patients at an early stage during the milder form which has good prognostic implications.

There are lots of causes of mitral stenosis but in our part of the world the mitral stenosis in isolation or in combination is almost always rheumatic in origin.²⁶

Mitral stenosis was more common among females. Mild MS was

seen in 65(19.69%), moderate in 145(43.93%) and severe mitral stenosis was present in 120(36.36%) of patients. In a study done by S Lalitha et al mild, moderate and severe MS was seen in 21%, 23.7% and 55% respectively.¹⁷ In study done by Rajesh et al mild moderate and severe MS was seen in 18%, 24% and 41% respectively.¹⁴

All spectrum of mild, moderate and severe was more in the middle age group of 21-40 years. This may be due to repeated episodes of clinical and subclinical streptococcal pharyngitis which is left untreated or partially treated as prophylaxis penicillin is often not easily available. This leads to early manifestations of severe form of valvular lesions.²⁷

Aortic Valve

Aortic valve involvement was less. Overall AS+AR was seen in 46(8.17%) of patients. AS was seen in 47(8.34%) and AR was seen in 283 (50.26%). Isolated AR in 9 (1.5%). Isolated AR was slightly more common in male (55%). Female accounted for 76.6% in AS and 74.2% in AR. The findings are similar to the study done in by PC Koirala et al²¹ and R Koju et al¹³.

Isolated Aortic disease in our study was limited to the aortic regurgitation and isolated AS was not found. Isolated aortic valve was involved in 1% in our study. In study done by R Nepal et al¹⁴ isolated aortic valve was affected in 2.8 % and similar findings were from S Laudari et al¹⁵. PC Koirala et al found isolated aortic valve involved in 1.9%²¹.

Overall AR was more common among female similar to the findings in the study done by CN Manjunath et al.⁵

Among the patients with AR, 67.84% had mild, 29.68% had moderate and 2.4% had severe form. In a study done by S Lalitha et al mild, moderate and severe AR was 64%, 24% and 12%¹⁷.

Mixed valvular lesion.

Most of the studies done in Nepal and elsewhere have consistently shown the multivalvular involvement in RHD. Our study showed that 428(76.03%) had some form of mixed valvular lesion whereas isolated valve lesion was in 135(23.97%) patients. Lesion involving the mitral valve only, mitral stenosis and mitral regurgitation was found in 363(64.45%) more than the only aortic valve lesion, aortic stenosis and aortic regurgitation 55(9.76%). Multivalvular involvement (involving both mitral and aortic valve) was seen in 145(25.75%). The results are comparable to the study done by R Nepal et al¹⁴.

In a study done by Faheem et al the mixed lesion was seen in 56.30%²⁸. RC Kafle et al showed 63.4%.⁶

In a study done by CN Manjunath et al the multivalvular lesion in 60% of cases.⁵

The commonest combined lesion was MS+MR, followed by AR+MR followed by MS+AR. The findings are similar to the study done by S Lalitha et al¹⁷ and Manjunath et al⁵.

Conclusion:

This study reinforces the fact that RHD is common more in middle age group and in female. The age of onset is early in our part of the world which can help to direct the primary prevention in early age groups. Multivalvular involvement is more common than isolated lesion and Mitral valve is more affected than the other valves.

Conflict of interest: none declared

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