

## To determine the pattern and severity of cardiac valves involvement in children with rheumatic heart disease

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Received – 01 April 2016

Initial Review – 25 April 2016

Published Online – 04 June 2016

### ABSTRACT

**Background:** Rheumatic heart disease (RHD) is the most common cardiovascular disease in children and young adults and is a major public health problem in developing world. **Objectives:** To determine the relative frequency and severity of the cardiac valve lesions in children, diagnosed as RHD. **Materials and Methods:** This prospective observational study was conducted from January 2013 to December 2014 in the Department of Pediatrics and Cardiology of teaching institution. Children less than 15 years of age fulfilling the selection criteria of RHD were evaluated by transthoracic echocardiography for pattern and degree of valvular involvement, according to the American Heart Association/American College of Cardiology guidelines. **Results:** A total of 45 patients (23 males and 22 females) were studied. The most common age group was 10-12 years, 91.11% cases belonged to lower socio-economic class. The most common lesion was mitral regurgitation (MR) (91.11%) with female predominance (51.22%) followed by atrial regurgitation (AR) (51.11%) with female (56.53%) predominance, mitral stenosis (MS) (26.66%) with male (58.33%) predominance, and tricuspid regurgitation (24.44%) with female (63.64%) predominance. Out of 45 cases of RHD, 29 cases (64.44%) had combined valvular lesions, out of which 14 cases (48.28%) had both MR and AR. **Conclusion:** RHD is still a common problem in our country. In our study, the most of the patients had combined valvular lesions. The predominant lesion was MR followed by aortic regurgitation and MS. Regurgitant lesions were seen predominantly in females while stenotic lesions were seen in males. Echocardiography should be done routinely for patients with RHD, focusing on younger population, to facilitate diagnosis and definitive treatment before complications set in.

**Key words:** Aortic regurgitation, Aortic stenosis, Echocardiography, Mitral regurgitation, Mitral stenosis, Rheumatic heart disease

Rheumatic heart disease (RHD) is the most common cardiovascular disease in children and young adults. Although incidence has been declined in developed countries, it is still a major public health problem in developing world. In India, the prevalence of RHD varied from 0.2 to 1.1/1000 population (2000-2010) [1]. The prevalence of RHD varies from 0.67 to 4.54/1000 children in different Indian states [2]. Two-dimensional, M-Mode and color Doppler echocardiography is the current gold standard for accurately identifying and quantifying the type and severity of valvular involvement in RHD [3,4].

As most valvular lesions with timely interventions hold a good prognosis for the patients, the knowledge of the severity of valvular lesions in RHD patients is very important. This study is, therefore, designed to determine the pattern and severity of valvular involvement in children with RHD using echocardiography presenting to our tertiary center, which will help in assessing the problem and development of appropriate public health program for the early detection, treatment, and prevention of this disease.

### MATERIALS AND METHODS

This prospective observational study was conducted from January 2013 to December 2014 in the Department of Pediatrics of a tertiary care teaching institution with the help of the Department of Cardiology. Institutional Ethics Committee approval was obtained before starting the study. The patients fulfilling the selection criteria have been taken from the outpatient and inpatient department of “Kamla Nehru Hospital,” Bhopal. An informed consent was obtained from the parents of all the recruited patients before enrollment in the study.

Children less than 15 years of age having suspected or definite RHD or previous history suggestive of rheumatic fever with a murmur were included. The patient more than 15 years of age with congenital heart disease, post-operative cases of heart disease, and patients suffering from collagen vascular disease were excluded from the study.

Patients fulfilling the selection criteria were studied in detail according to a specifically designed Pro forma. After taking thorough history and doing complete physical examination, relevant laboratory investigations, X-ray chest, and electrocardiogram were done. The selected patient was further evaluated by transthoracic echocardiography and two-dimensional; M-Mode and Doppler echocardiographic features were evaluated to assess the mitral and other intracardiac valves for evidence of RHD. All echocardiograms are recorded in supine and left lateral position taking all five standard examination views and additional views whenever necessary [5]. The World Heart Federation criteria were used to classify the types and degrees of valvular involvement [4].

All data were analyzed using SPSS version 13.0 software, to derive the descriptive frequencies regarding the distribution of valvular lesions among the patient population in terms of age, sex, and socio-economical status.

**RESULTS**

During the study period, a total of 45 cases (23 males and 22 females) of RHD were recruited. The majority of reported cases were in the age group of 10-12 years (51.11%), followed by 7-9 years (22.22%), 13-15 years (15.55%), and 4-6 years (11.11%) age group. No case was seen in 1-3 years age group. Youngest patients were of 5 years old comprising 6.66% (3 cases) of total study cases. The majority of the patients (91.11%) were from lower socio-economic class.

Out of 45 cases of RHD, 29 cases (64.44%) had combined valvular lesions, out of which 14 cases (48.28%) had mitral regurgitation (MR) and atrial regurgitation (AR), as shown in Table 1. MR was the most frequent valvular lesion affecting 41 (91.11%) cases of the total number of the patients. Of these, 20 (48.78%) were male and 21 (51.22%) were female. MR alone was found in 11 (24.45%) cases, 3 (6.67%) had combined MR and MS and rest 27 cases (60%) had MR in combination with other valvular lesions as shown in Table 1.

The next most common valvular lesion was AR, affecting 23 (51.11%) patients. Of these, 10 (43.47%) were male and 13 (56.53%) were female. Isolated AR was found in only

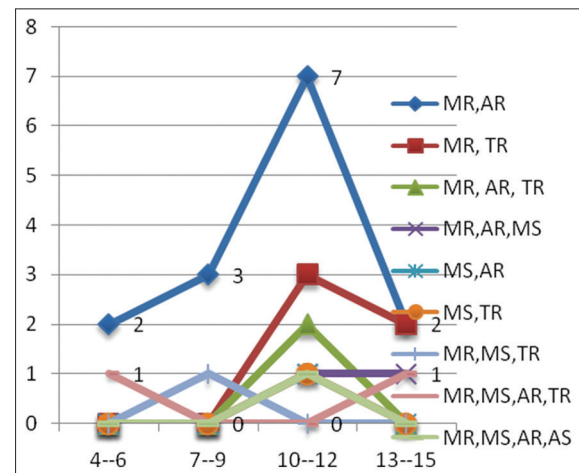
1 (2.22%) patient and in rest 22 (48.89%) patients, it was present in combination with some other valvular lesion. The presence of MS was seen in 12 (26.66%) cases including 7 (58.33%) male and 5 (41.67%) females; out of these, isolated MS was found in only 1 (2.22%) case while 3 (6.67%) had combined MR and MS, and 8 (17.78%) had MS in combination with other valvular lesions.

Tricuspid regurgitation (TR) was present in 11 (24.44%) patients including 4 (36.36%) males and 7 (6.64%) females but only in combination with other valvular lesions. Mild atrial stenosis (AS) was present in only 1 (2.22%) male child, in combination with other valvular lesions.

Out of 41 cases with MR, 17 (37.77%) had severe MR, while 18 (40%) and 6 (13.33%) patients had moderate and mild MR, respectively. Out of 23 cases with AR, 4 (8.88%) had severe AR while moderate and mild AR were present in 2 (4.44%) and 17 (37.7%) patients, respectively. Grades of severity of various valvular lesions are shown in Table 2. On analyzing, the cases according to age group, MR and AR and other group of combined valvular lesions were found to be commonly found in the age group of 10-12 years (Fig. 1).

**DISCUSSION**

RHD continues to be a major health problem in the developing countries. It accounts for a large percentage of cardiovascular



**Figure 1: Frequency distribution of different combination of valvular lesions as per age groups**

**Table 1: Frequency distribution of various valvular lesions in study population**

Valvular lesions	Total, n (%)	Valvular lesions	Total, n (%)
Isolated MR	11 (24.45)	Combined MR, AR, and MS	2 (4.45)
Isolated AR	1 (2.22)	Combined MR, MS, and TR	1 (2.22)
Isolated MS	1 (2.22)	Combined MS, and TR	1 (2.22)
Combined MR and AR	14 (31.11)	Combined MS, and AR	1 (2.22)
Combined MR and TR	5 (11.11)	Combined MR, MS, AR, and TR	2 (4.45)
Combined MR and MS	3 (6.67)	Combined MR, MS, AR, and AS	1 (2.22)
Combined MR, AR and TR	2 (4.45)	Total	45 (100)

**MR: Mitral regurgitation, MS: Mitral stenosis, AR: Atrial regurgitation, AS: Atrial stenosis, TR: Tricuspid regurgitation**

**Table 2: Grades of severity of valvular lesions in study population**

Valvular lesions	Severity (n (%))			Total
	Mild	Moderate	Severe	
MR	6 (13.33)	18 (40)	17 (37.77)	41 (91.11)
AR	17 (37.7)	2 (4.44)	4 (8.88)	23 (51.11)
MS	8 (17.77)	3 (6.66)	1 (2.22)	12 (26.66)
AS	1 (2.22)	-	-	1 (2.22)
TR	6 (13.33)	5 (11.11)	-	11 (24.44)

**MR: Mitral regurgitation, MS: Mitral stenosis, AR: Atrial regurgitation, AS: Atrial stenosis, TR: Tricuspid regurgitation**

disease related admissions and is an important indication for cardiac surgery in India. Various Indian studies have reported the prevalence rate of approximately 0.67-4.54/1000 children [1,2]. Other studies conducted in the developing countries continue to show the high prevalence of the disease, which is in contrast to the virtual extinction of the disease in the developed world [6-8]. In our study, the majority of the cases (51.11%) belonged to school going (10-12 years) age group, which is comparable to the study done by Alkhalifa et al., where maximum number of cases were from the age group of 13-15 years [9]. The youngest patients in the present series were of 5 years of age; thus, showing early onset of RHD in our territory.

In our study, 95.2% cases belonged to lower socio-economic classes, which is similar to the results of other studies [10,11]. RHD is a disease of lower socio-economic status with the disease prevalence being directly proportional to the lack of education, poverty, overcrowding, and malnutrition. Hence, superior peripheral health facilities, social awareness campaigns and improved health education to the masses should be provided so that the disease can be prevented and all the suspected cases get medical attention for early identification and timely treatment.

Our study revealed that the most common lesions seen in patients with RHD were of regurgitant type and the most commonly involved valve being mitral valve, followed by aortic and tricuspid valves (MR > AR > TR). This is consistent with previously reported data from different countries [9-12]. Whereas, combined mitral, combined aortic and combined tricuspid valvular lesions were more common than their respective stenotic valve lesions [9-12]. The study found significant number of cases having TR; however, it was predominantly functional TR secondary to pulmonary hypertension. TR because of rheumatic involvement is uncommon, and is always associated with mitral valve disease [13]. We also found that regurgitant lesions were more common in females. Other studies show inconsistency with some showing typical picture of equal prevalence of RHD among males and females, while others depicting females as the dominant patient population [14-18].

In our study, 9 out of 12 cases (75%) of MS were from older (>10 years) age group. This can be explained by slow and undetected rheumatic process of MS due to the subtle signs, which results in late detection of these cases when the lesion becomes severe and the patient become symptomatic. This highlights the need of early detection and intervention of RHD to prevent these lesions. In a study by Alkhalifa et al., [9] isolated mitral valve involvement was found in 60% of the patients and MS was reported in 24% cases which is similar to our study results. However, the cases of severe MS were more (37.5%) than in our study (2.22%).

Isolated AS was not seen in this study which is similar to the results of other studies [10-13]. Isolated AS is not reported in childhood period as it takes much longer time to establish than the MS and it is often said that a case of AS in childhood is more often a case of congenital AS. Frequency of combined valvular lesions in our study is comparable to the study of Alkhalifa et al, in which frequency of MR with AR and MR with MS was 23% and 15%, respectively, in comparison to 31.11% and 6.67%, respectively, in our study [9].

The high prevalence and severity of RHD in our part of the world is a great cause of concern and calls for immediate and effective prophylactic measures to ensure a symptom-free life span for the patient. The data suggest that recurrences of RF are higher in patients with RHD and each recurring disease episode further damages the heart [7]. To counter these recurrent attacks effective secondary prevention is required, which relies on accurate case detection for the appropriate use of prophylactic antibiotics and regular medical surveillance.

Here, echocardiography plays an important role first, in early detection of RHD and second, in the monitoring of medical therapy because RHD at this stage would warrant lifelong prophylaxis [3-5]. Therefore, echocardiography should be recommended as a routine screening tool for investigation of RHD, and also for follow-up to guide in the timely intervention for severe valvular lesions. Those patients with advanced RHD sooner or later require surgery in the form of valvuloplasty or valve replacement.

## CONCLUSION

RHD is still a common problem. In our study, most of the patients had combined valvular lesions. The predominant lesions were MR followed by aortic regurgitation and mitral stenosis. Regurgitant lesions were reported predominantly in females while stenotic lesions in males.

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*Funding: None; Conflict of Interest: None Stated.*

**How to cite this article:** Goel M, Agrawal A, Kumar P, Dwivedi R, Yadav BS. To determine the pattern and severity of cardiac valves involvement in children with rheumatic heart disease. *Indian J Child Health.* 2016; 3(2):98-101.