

## AN ANALYSIS OF VALVULAR HEART DISEASE BY ECHOCARDIOGRAPHY- A TERTIARY CARE INSTITUTE STUDY

Perumal Jaisankar<sup>1</sup>, Alagarsamy Srinivasan<sup>2</sup>

<sup>1</sup>Senior Assistant Professor, Department of Cardiology, Thanjavur Medical College, Thanjavur.

<sup>2</sup>Senior Assistant Professor, Department of Cardiology, Thanjavur Medical College, Thanjavur.

### ABSTRACT

#### BACKGROUND

Diseases of heart valves constitute a major cause of cardiovascular morbidity and mortality worldwide. In developing countries, Rheumatic Heart Disease (RHD) continues to be the predominant form of valvular heart disease. The current study was undertaken at a Tertiary Care Institute with an objective of establishing distribution and different patterns of valvular heart diseases by echocardiography.

#### MATERIALS AND METHODS

17,625 consecutive first time Echocardiograms performed between January 2016 and December 2016 were analysed. Echo was performed by consultant cardiologists using Philips HD11XE and Aloka SSD4000 machine following ASE guidelines. Applying exclusion criteria of trivial and functional regurgitant lesions yielded a total of 632 cases of organic valvular heart diseases.

#### RESULTS

In our study 632 patients were diagnosed with valvular heart disease, out of which 428 patients (67.7%) were diagnosed with Rheumatic Heart Disease. Mitral valve was the most commonly affected followed by aortic and tricuspid valves. The least commonly affected valve was pulmonary valve. In Rheumatic heart disease, most common isolated lesion reported was MS with MR, most commonly reported in females between 21 - 40 years' age group.

#### CONCLUSION

In non-RHD group, mitral valve prolapse (21.3%) was the commonest lesion reported followed by calcific degenerative aortic valve (6.17%) and congenital bicuspid aortic valve (3.4%); 118 patients were reported with multivalvular lesion. MS + MR + AR was the commonest multivalvular lesion found in 65 patients (55.08%).

#### KEYWORDS

Valvular Heart Disease, Rheumatic Heart Disease, Mitral Regurgitation.

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#### BACKGROUND

Valvular Heart Diseases have a significant contribution to morbidity and mortality worldwide. In developed nations degenerative valvular disease predominates, while in developing countries like India Rheumatic fever with subsequent Rheumatic Heart Disease still continues to be a major health concern in both children and adults.<sup>1</sup> However, increasing life expectancy and atherosclerotic risk factors have increased the risk of age-related degenerative Valvular Heart Disease (VHD).<sup>2</sup> Hence, apart from Rheumatic heart disease, the incidence of other acquired heart disease like mitral valve prolapse syndrome, papillary muscle dysfunction, rupture of chordae tendineae, calcified mitral annulus, calcified aortic stenosis, aortic regurgitation due to

syphilis, connective tissue disorders affecting the valve are also on the rise. While pathological examination of valves obtained during surgery or autopsy remains the Gold Standard in morphological analysis, echocardiography is now emerging as a main tool in assessing valvular anatomy, morphology and haemodynamic effect of VHD.<sup>3</sup>

In India, there is a progressive decline in the prevalence rate of RF in school children.<sup>4,5,6</sup> The data suggests a decline from 5.3 to 2.9 to below 1/1000 between 1970 and 2010. The prevalence rate in Punjab, Gujarat, Rajasthan, Uttar Pradesh and Tamil Nadu have been found to be in the range of 0.67 - 4.54 per 1000 children.<sup>4,5,6</sup> The adult RHD average prevalence ranges between 123 and 200 per 100,000 population,<sup>7</sup> while in industrialised nations the incidence of RF is 0.5 per 100,000 population and the prevalence is less than 0.05 per 1000.<sup>8</sup>

#### MATERIALS AND METHODS

The current study was undertaken to establish the incidence, pattern of valvular heart disease as studied by echo in a tertiary care institute located in Southern India.

Our study is a retrospective, descriptive study in which 17,625 consecutive first time echocardiogram reports were

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*Corresponding Author:*

*Dr. Perumal Jaisankar,*

*F-16, Royal Denizen Apartment,*

*Pattabiraman Pillai St, Thennur, Trichy, Tamilnadu-620017.*

*E-mail: jaicardio@gmail.com*

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analysed. Our study period was January 2016 to December 2016. Echocardiography was performed by consultant cardiologist using a two-dimensional colour Doppler and M-mode Philips HD11XE and Aloka SSD4000 ultrasound system. The echocardiography was performed in accordance with American College of Cardiology/American Heart Association Guidelines.

**Inclusion Criteria**

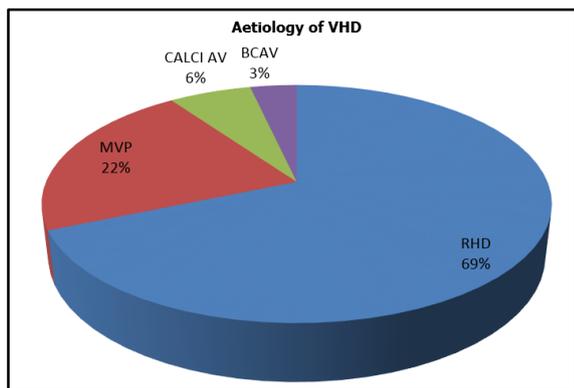
All the lesions classified as isolated lesion and combined valvular lesions were included in our study. Also, all the Rheumatic heart disease diagnosed according to World Heart Federation Echocardiography Criteria were included in our study.

**Exclusion Criteria**

A trivial, functional/unspecified mechanisms of MR, trivial-to-mild AR due to sclerotic valve or unspecified causes and trivial or functional TR were excluded from our study. Complex congenital heart diseases with valvular involvement were also excluded. Congenital lesions, degenerative disease and other acquired causes were the exclusion criteria for Rheumatic heart disease.

**RESULTS**

Out of 17,625 consecutive cases undergoing echocardiography, 632 valvular heart diseases were reported. Rheumatic heart diseases were the predominant type constituting 428 cases (67.7%), while non-rheumatic heart diseases constituted 204 cases (32.2%) (Figure 1).

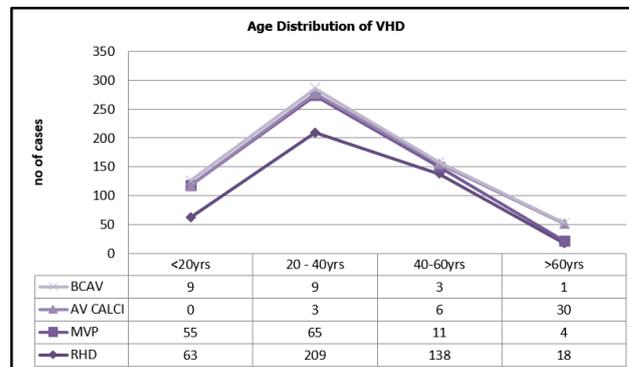


**Figure 1. Shows Different Aetiology of Valvular Heart Disease in Our Study**

Among non-rheumatic heart disease, mitral valve prolapse syndrome constitute 135 cases (21.3%) followed by degenerative calcified aortic valve disease 39 cases (6.17%) and bicuspid aortic valve disease 22 cases (3.4%). Only a very few cases of aortic aneurysm with AR, congenital pulmonary valvular stenosis and ischaemic mitral regurgitation were also reported in our study.

The valvular heart disease was most commonly reported in females. The number of female patients were 386 constituting 61.07%, 226 male patients (35.75%) and 20 paediatric cases (3.1%) were registered. Rheumatic heart disease was commonly reported in the age group of 21 - 40 years with female preponderance. Degenerative valvular

heart disease was most commonly reported in old age (>60 years) with male preponderance (Figure 2). Most commonly affected age group in Mitral valve prolapse is 20-40 years, whereas congenital bicuspid aortic valve disease were distributed equally in both groups of <20 years and 20 to 40 years.



**Figure 2. Age Wise Distribution of Different Valvular Heart Disease**

Table I and II show the distribution of valvular heart disease and multivalvular heart disease respectively.

Valvular Heart Disease	Total	Percentage	Male	Female
Isolated MS	78	12.3%	22 (28.2%)	56 (71.79%)
Isolated MR	236	37.3%	96 (40.6%)	140 (59.3%)
Isolated AS	28	4.4%	20 (71.4%)	8 (28.6%)
Isolated AR	23	3.6%	12 (52.1%)	11 (47.9%)
BCAV	22	3.4%	18 (81.8%)	4 (18.1%)
Multivalvular Lesion	264	41.77%	93 (35.22%)	171 (64.7%)

**Table 1. Distribution of Valvular Heart Disease in our Study**

Most of the valvular lesions were reported in females. More than 2/3<sup>rd</sup> of cases of Isolated MS (71.7%) and Multivalvular lesion (64.7%) are seen in females, whereas Congenital Bicuspid Aortic Valve disease (81.8%), isolated AS (71.4%) and isolated AR (52.1%) were distributed predominantly in males.

Multivalvular Heart Diseases	Total (264)	Percentage	Male	Female
MS + MR	117	44.3%	23 (19.7%)	94 (80.3%)
MS + AR	9	3.4%	3 (33.3%)	6 (66.6%)
MS + MR + AR	65	24.62%	18 (27.6%)	47 (72.4%)
MS + AS	2	0.75%	1 (50%)	1 (50%)
MR + AR	23	8.71%	8 (34.8%)	15 (65.2%)
MS + AS + AR	4	1.5%	2 (50%)	2 (50%)
MR + AS + AR	3	1.1%	2 (66.6%)	1 (33.3%)

MS + MR + AS	3	1.1%	1 (33.3%)	2 (66.6%)
MS + MR + AS + AR	9	3.4%	3 (33.3%)	6 (66.6%)
AS + AR	29	10.9%	25 (86.2%)	4 (13.8%)

**Table 2. Distribution of Multivalvular Heart Disease in Our Study**

In general among all multivalvular lesions combinations associated with MS were predominantly seen in females, whereas combination with AS were more common in males.

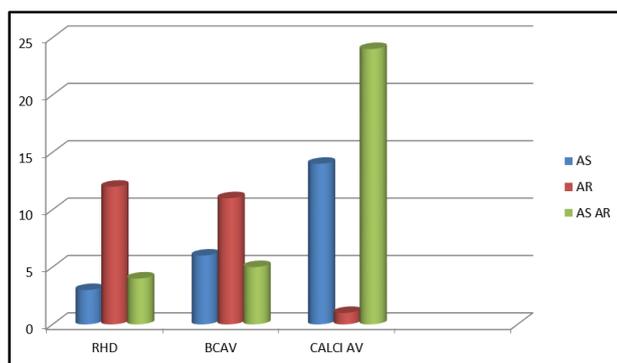
**Mitral Valve**

Mitral valve was the most commonly involved valve constituting 87% (550 cases) with predominant Rheumatic aetiology. Isolated mitral valve disease (MS and MS with MR) was reported in 195 cases (30%). Among the patients with isolated mitral valve involvement pure Mitral Regurgitation (MR) was the dominant lesion 236 cases (37.3%). A two-thirds of the above cases diagnosed as isolated MR was seen in females in the age group of 21 - 40 years. MVP (Mitral Valve Prolapse) was the most common aetiology of mitral regurgitation occurring in 131 patients (57.2%).

Pure mitral stenosis constituted 78 cases (12.3%) with female preponderance 56 cases (71.79%) compared to males 28 cases (28.2%); 288 cases (45.5%) of MS (isolated and combined) were reported in our study. Most of them had severe MS (48.2%) with orifice size < 1 cm<sup>2</sup> followed by moderate MS (32.2%) and mild MS (19.6%). Severe MS was predominantly seen in females in our study. The incidence of pulmonary hypertension in our study was 11.21%. The most common lesion associated with pulmonary hypertension was mitral stenosis (40 cases, 83.33%). Also, there was an increased incidence of pulmonary hypertension with increasing severity of mitral stenosis.

**Aortic Valve**

227 (35.9%) cases of isolated and combined aortic valve disease were found in our study, out of which 22 cases were associated with bicuspid aortic valve (congenital), 28 cases were associated with isolated AS, (predominantly degenerative) and was most commonly reported in elderly males (> 60 years). Rheumatic heart disease contributed a minority of cases to this stenotic valvular lesion (3 cases) (Figure 3).



**Figure 3. Shows Causes and Incidence of Aortic Valve Disease**

Isolated AR was seen in 23 cases (3.6%). Rheumatic Heart Disease was the commonest cause of isolated AR followed by bicuspid aortic valve and aneurysmal dilatation of Aorta.

**Tricuspid Valve**

Tricuspid stenosis was the least common lesion (1 case among all valvular lesions) and was associated with mitral stenosis; 48 cases of functional tricuspid regurgitation due to pulmonary hypertension were reported in our study. Organic tricuspid regurgitation of rheumatic aetiology was reported in 4 cases (0.63%).

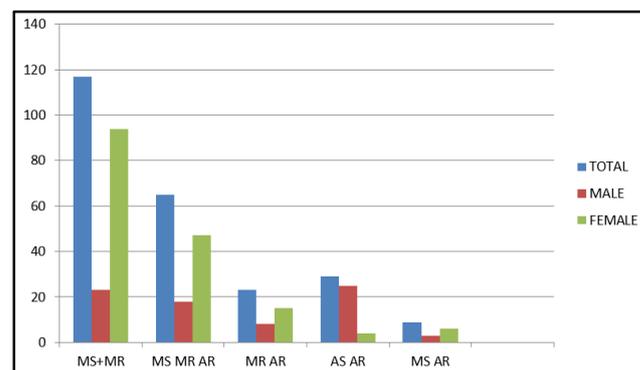
**Pulmonary Valve**

Pulmonary valve was the least commonly affected valve in our study. Two cases of isolated congenital pulmonary valvular stenosis were reported in our study.

**Multivalvular Disease**

Multivalvular diseases constituted 41.77% (264 cases) in our study. This is the most common lesion in our study.

Table 2 and Figure 4 shows distribution of multivalvular heart disease in our study.



**Figure 4. Incidence of Combined Valvular Lesion in VHD**

The three most common patterns of multivalvular lesion in the present study were MS with AR (117 cases, 44.31%) followed by MS with MR with AR 65 cases (22.64%) and AS with AR 27 cases (10.9 cases). MS with MR was most commonly seen in females (80%) and was seen in the age groups of 21-40 years. AS and AR is the only lesion which predominantly affect males, particularly elderly population.

**DISCUSSION**

Echocardiography is the main tool in diagnosing and the periodic assessment of patients with valvular heart diseases. The superiority of Echo over clinical examination in identifying subclinical Rheumatic heart disease has been conclusively shown in various school surveys across India.<sup>9,10</sup> Hence, more number of children will receive secondary prophylaxis for Rheumatic Fever, thus reducing the burden of Rheumatic Heart Disease.

Rheumatic heart disease was the most common heart disease in young adults (20-40 years). In the present study

Rheumatic Heart Disease constituted 67.79% of total valvular heart disease, which is similar to the study of Manjunathan CN et al (64.3%)<sup>11</sup> and Radhakrishnan D (68%).<sup>12</sup>

In the present study, Mitral Stenosis with Mitral Regurgitation (44.32%) were the commonest valvular Heart Disease similar to other studies; 40% by Dare et al<sup>13</sup> and Waller B et al.<sup>14</sup> In our study, isolated mitral valve in Rheumatic Heart Disease were 68.1% and 35.9% were associated with aortic valve. This was in concordance with Manjunath CN et al and Radhakrishnan D.<sup>11,12</sup> In our study, 37% of cases were isolated MR reported in young age group (10 - 30 years), of which 42% were of Rheumatic aetiology, predominant (48%) being myxomatous mitral valve prolapse. This is in concordance with studies by Olson<sup>15</sup> and Duren.<sup>16</sup>

The peak incidence of Rheumatic MR was two decades earlier than that of mitral stenosis. This is due to the fact that a long latent period following the acute attack of Rheumatic fever generally exists before the stenotic mitral lesion manifests clinically.<sup>17</sup>

35.9% aortic valve diseases have been reported in our study. Aortic associated with mitral was around 23% similar to the studies of CN Manjunath<sup>11</sup> and Siddharth et al.<sup>18</sup> Rheumatic heart disease was the predominant aetiology for isolated AR, whereas degenerative calcification was the main etiological factor in isolated AS.<sup>19,20,21</sup> In our study, among 28 (4.4%) isolated AS cases, 50% (14 cases) were due to degenerative calcification of aortic valve similar to Subramaniyan et al<sup>19</sup> and Peterson MD et al<sup>20</sup>; 12 (53%) out of 23 isolated AR cases were due to Rheumatic heart diseases, which is in concordance with Olson et al.<sup>22</sup>

Multivalvular involvement in our study were (264 cases, 41.7%), which is in concordance with Vaishali Bhalani et al<sup>3</sup> and was lower by 18% and 36.8% in other studies by Radhakrishnan D<sup>12</sup> and Manjunath et al,<sup>11</sup> respectively. In our study, most common combination was MS with MR (44%) and MS with MR with AR (24 %) similar to Manjunath et al.<sup>11</sup>

In our study the least common combination was MS with AS (0.75%, 2 cases), which is not in concordance with other studies. In our study peak age of valvular heart disease were 25 - 40 years (32%), similar to studies by Radhakrishnan D<sup>12</sup>; (29.8%). Among the total valvular heart disease female (61%) preponderance over male (35%) was observed. This is in concordance with studies by Radhakrishnan D et al, Bonow et al and Kutumbiah et al.<sup>12,23,24</sup>

### Limitations of the Study

1. Our analytical study reflects a single tertiary care institute retrospective observation. Hence, it is not a population-based study. This may result in several biases.
2. This study reflects the prevalence of valvular lesion in selected population. Being a tertiary care centre, more severe lesions are likely to be over-represented.
3. There may be overlapping of lesions, because it is a retrospective study (repeat Echo).

4. Even though Echo remains an important diagnostic tool, it has inherent limitations in comparison to surgical or autopsy-based studies in detecting early morphological lesions, as the lesion takes time to develop to be seen by Echocardiography.

### CONCLUSION

Rheumatic heart disease (67.7%) is the most common contributing aetiology to valvular heart diseases. The other important causes being myxomatous mitral valve prolapse, degenerative and bicuspid aortic valve. Multivalvular lesions constitute more than one-third of all the cases. Rheumatic involvement of mitral (87%) followed by aortic (35.9%) was the most common presentation. MS with MR was the commonest lesion affecting females in the age group 21 - 40 years. With the advent of newer techniques and advancement in assessment of anatomical and haemodynamic effects, Echocardiography has now become an important modality in evaluation and management of valvular heart disease patients.

### REFERENCES

- [1] Eisenberg MJ. Rheumatic heart diseases in developing world: prevalence, prevention and control. *Eur Heart J* 1993;14(1):122-128.
- [2] Lung B, Baron G, Tornos P, et al. Valvular heart disease in the community: a European experience. *Curr Probl Cardiol* 2007;32(11):609-661.
- [3] Bhalavi V, Yadav BS. Distribution and pattern of valvular heart diseases by echocardiography: a tertiary care center study. *J Evolution Med Dent Sci* 2016;5(27):1394-1399.
- [4] Patel DC, Patel NI, Patel JD, et al. Rheumatic fever and rheumatic heart disease in school children of Anand. *J Assoc Physicians India* 1986;34(12):837-839.
- [5] Thakur JS, Negi PC, Ahluwalia SK, et al. Epidemiological survey of rheumatic heart diseases among school children in the Shimla Hills of northern India: prevalence and risk factors. *J Epidemiol Community Health* 1996;50(1):62-67.
- [6] Lalchandani A, Kumar HR, Alam SM, et al. Prevalence of rheumatic fever and rheumatic heart disease in rural and urban school children of district Kanpur (UP). *Indian Heart J* 2000;52:672.
- [7] Mathur KS, Wahal PK. Epidemiology of rheumatic heart disease-a study of 29,922 school children. *Indian Heart J* 1982;34(6):367-371.
- [8] Padmavati S. Rheumatic fever and rheumatic heart disease in developing countries. *Bull WHO* 1978;56(4):543-550.
- [9] Bhaya M, Panwar S, Beniwal R, et al. High prevalence of rheumatic heart disease detected by echocardiography in school children. *Echocardiography* 2010;27(4):448-453.
- [10] Saxena A, Ramakrishnan S, Roy A, et al. Prevalence and outcome of subclinical rheumatic heart disease in India: the RHEUMATIC (Rheumatic Heart Echo

- Utilisation and Monitoring Actuarial Trends in Indian Children) study. *Heart* 2011;97(24):2018-2022.
- [11] Manjunath CN, Srinivas P, Ravindranath KS, et al. Incidence and patterns of valvular heart disease in a tertiary care high-volume cardiac center: a single center experience. *Indian Heart J* 2014;66(3):320-326.
- [12] Krishnan RD, Srinivas V. The study of prevalence and clinical profile of valvular heart diseases in a teaching hospital. *Jebmh* 2015;2(18):2707-2718.
- [13] Dare AJ, Harrity PJ, Tazelaar HD, et al. Evaluation of surgically excised mitral valves: revised recommendations based on changing operative procedures in the 1990s. *Hum Pathol* 1993;24(12):1286-1293.
- [14] Waller BF, Howard J, Fess S. Pathology of mitral valve stenosis and pure mitral regurgitation--part I. *Clin Cardiol* 1994;17(6):330-336.
- [15] Olson LJ, Subramanian R, Ackermann DM, et al. Surgical pathology of the mitral valve: a study of 712 cases spanning 21 years. *Mayo Clin Proc* 1987;62(1):22-34.
- [16] Duren DR, Becker AE, Dunning AJ. Long term follow-up of idiopathic mitral valve prolapsed in 300 patients: a prospective study. *J Am Coll Cardiol* 1988;11(1):42-47.
- [17] Hammer WJ, Roberts WC, deLeon AC. Mitral stenosis secondary to combined massive mitral anular calcific deposits and small, hypertrophied left ventricles. Hemodynamic documentation in four patients. *Am J Med* 1978;64(3):371-376.
- [18] Lakhani SV, Joglekar VK. Clinical study of valvular heart disease. *Journal of Medical Thesis* 2013;1(1):8-11.
- [19] Subramanian R, Olson LJ, Edwards WD. Surgical pathology of pure aortic stenosis: a study of 374 cases. *Mayo Clin Proc* 1984;59(10):683-690.
- [20] Peterson MD, Roach RM, Edwards JE. Types of aortic stenosis in surgically removed valves. *Arch Pathol Lab Med* 1985;109(9):829-832.
- [21] Dare AJ, Veinot JP, Edwards WD, et al. New observations on the etiology of aortic valve disease: a surgical pathologic study of 236 cases from 1990. *Hum Pathol* 1993;24(12):1330-1338.
- [22] Olson LJ, Subramanian R, Edwards WD. Surgical pathology of pure aortic insufficiency: a study of 225 cases. *Mayo Clin Proc* 1984;59(12):835-841.
- [23] Bonow RO, Carabello BA, Chatterjee K, et al. ACC/AHA 2006 guidelines for the management of patients with valvular heart disease: a report of the American college of cardiology/ American heart association task force on practice guidelines (writing committee to revise the 1998 guidelines for the management of patients with valvular heart disease) developed in collaboration with the society of cardiovascular anesthesiologists: endorsed by the society for cardiovascular angiography and interventions and the society of thoracic surgeons. *J Am Coll Cardiol* 2006;48(3):e1-148.
- [24] Kutumbiah P. Rheumatism in childhood and adolescence part 1. *Indian J Pediatr* 1941;8:65-86.