

## Original Article

# Incidence & Pattern of Valvular Heart Disease in Patients attended in Echo Lab at a tertiary care Hospital: A single Centre Study

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## Abstract:

### Key words:

Valvular Heart Disease,  
Rheumatic heart disease,  
Echocardiography,  
Mitral stenosis,

**Background:** This echocardiographic study was undertaken to establish incidence, pattern & complications in patients of valvular heart disease.

**Methods:** A total of 97 patients were enrolled among the patients attended in echo lab at Ibrahim cardiac hospital & Research Institute over a period of 1 year.

**Results:** Mean age was  $53.8 \pm 1.5$  years. Male were predominant (58.76% vs 41.23%). Most common symptom was shortness of breath (60.8%) followed by palpitation (43.3%). 39.2% of patients had normal ECG & 12.4% revealed AF. The most common complication was pulmonary hypertension (54.6%) followed by pulmonary edema (26.8%), Stroke (10.3%), Left atrial thrombus (7.3%), & infective endocarditis (6.2%). MV was most commonly involved (72.2%) followed by aortic valve (AV) (66.0%), tricuspid valve (TV) (54.6%) & pulmonary valve (PV) was (20.6%). Rheumatic involvement (52.6%) constituted the dominant cause than degenerative & congenital (24.7% in each). Mitral stenosis (MS) was predominant (52.6%) & was rheumatic in origin; then aortic stenosis (AS) (48.5%) which was mostly degenerative followed by bicuspid aortic valve (8.2%). Mitral regurgitation (MR) was the most common valvular lesion (64.9%); then aortic regurgitation (AR) (51.5%) which was also rheumatic in etiology. Multiple valve involvement was also present. The most common variety was MS+MR (43.3%). Tricuspid stenosis (TS) was in association with MR+AR (1.03%). Tricuspid regurgitation (TR) was 58.8%, mostly secondary to rheumatic involvement of other valves. Severe TR (5.2%) was due to Ebstein anomaly and prolapse (4.1% & 3.1%). ventricular systolic & diastolic functions were normal mostly.

**Conclusion:** Among the rheumatic heart disease patients' mitral valve was the most commonly affected valve. Mitral regurgitation was the most common valvular lesion. Rheumatic involvement remains the dominant cause of valvular heart disease in Bangladesh.

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## Introduction:

The disease of the heart valves creates a major cause of cardiovascular morbidity & mortality all around the world. It has an immense burden on health care resources. Rheumatic fever complexes by Rheumatic heart disease (RHD) remains a major contributor to morbidity and premature death among the socio-economically under privileged working age population of developing countries. Prevalence of RHD has greatly decreased in developing nation; however,

increasing life expectancy & atherosclerotic risk factors, have increased the risk of acquiring age related degenerative valvular heart disease (VHD).<sup>1,2</sup>

It was estimated that worldwide 15.6 million people have rheumatic heart disease & 470,000 new cases of rheumatic fever & 233,000 deaths attributable to rheumatic fever or rheumatic heart disease each year.<sup>3</sup> Though the incidence of RHD declined, large differences were observed across regions. The

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worst affected areas are Sub-Saharan Africa, South central Asia and the Pacific.<sup>4,5</sup> Up to 1% of all school children in Africa, Asia, the Eastern Mediterranean region & Latin America show signs of disease.<sup>6</sup> The prevalence was reported for Bangladeshi children 1.3/1000.<sup>7</sup>

In the WHO's Southeast Asia region the mortality rate per 100,000 population varied from 1.8 to 7.6 Americas. Prevalence rates of RHD from screening studies in Southeast Asian countries differ from 20-50 per 1000 children using Echocardiography.<sup>8-11</sup>

As in other developing countries, RHD remains a major public health problem in Bangladesh. Prevalence of RHD and incidence of acute RF is more in developing countries where there is overcrowding, poor nutrition, poverty, and poor hygienic practice. Data regarding the incidence and prevalence of these condition vary widely.<sup>12-18</sup> Only a limited number of small-scale hospital, school and community surveys are available. Epidemiological study shows prevalence of Rheumatic fever or RHD in Bangladesh is <1/1000 in children & young adults.<sup>19</sup>

Over the past 3 decades, there is a declining inclination of acute Rheumatic fever in the country and increasing life expectancy. However, chronic RHD precedes to be an important public health problem here.<sup>19</sup> Recently, conventional and portable echocardiography is being used increasing in studies concerning RF & RHD, as a result, more and more subclinical cause of RHD is being diagnosed. So, the prevalence of RF & RHD estimated so far may not be accurate and the true prevalence of RHD may be much higher in Bangladesh as well.<sup>19</sup> A more recent meta-analysis, using echocardiographic diagnosed RHD, estimated that the prevalence of RHD in southeast Asia was 28 per 1,000.<sup>20</sup>

The current study was undertaken to establish the incidence, pattern & complication in patients of heart valve disease as studied by echocardiography. Echo is now the single most relevant modality of investigation for evaluation of valvular lesion. Following adequate clinical evaluation, echocardiography is the key technique used to confirm the diagnosis of VHD (both rheumatic and degenerative valvular heart disease) as well as to assess its severity & prognosis.<sup>21</sup>

Among the valvular heart disease rheumatic mitral valvular disease is the most commonly encountered one. Aortic valve disease ranks, second in incidence. Tricuspid valve disease occurs infrequently & pulmonary valve disease rarely.<sup>22</sup> The Involvement of Mitral valve either alone or in combination, with other valves, was found to 90% cause of rheumatic valvular disease.<sup>23</sup> The prevalence of rheumatic mitral valve disease is 1.3 per 1000 in rural Bangladesh.<sup>7</sup>

The lesion of the aortic valve like aortic stenosis & aortic regurgitation are seen in multiple condition including rheumatic, degenerative & connective tissue disease. The supreme cause of aortic stenosis in western countries is degenerative calcific disease in middle aged & elderly patients, though in tropical countries rheumatic aortic stenosis is still common. In the young age group, clinically significant AS is predominantly due to bicuspid aortic valve disease. Aortic regurgitation also arises frequently from a degenerative process apart from rheumatic and congenital lesion.<sup>24</sup> Sclerosis arises from thickening & fibrosis of the aortic valve leaflets. It progresses slowly over several decades leading to aortic stenosis.<sup>25,26</sup> The prevalence of aortic sclerosis/ stenosis in elderly population is 20.9%.<sup>27</sup> The disease of the aortic and mitral valve as well as TR increased continuously with increasing age, starting from the fourth or fifth decade of life with peak incidence in the seventh to eight decades.

Early detection and treatment are advocated to improve long term outcome.<sup>28,29</sup> However, a significant proportion of patients with valve disease is present late when long term benefits of intervention are less certain. A substantial number of our patients presented with the advanced stage of the disease process. This is more feasible for female patient of low socioeconomic status. A scar of surgery or condition of heart valves known to others act as a social stigma to them which imparts problem with their marital issue.

Bangladesh is facing a huge burden of RHD where a lot of children, young and adult people are losing their productive age of life in hospital beds and losing their life prematurely. This type of study will assist the concerned people to initiate and implement the program for reduction of burden of RHD in Bangladesh. It will ultimately help to save the lives of many young patients.

### Study Methods:

The current study was undertaken at Ibrahim Cardiac Hospital & Research Institute, a tertiary care cardiac hospital located at Dhaka, Bangladesh. All the echocardiogram done over a period of 1 year from 1<sup>st</sup> October 2018 to 30<sup>th</sup> September 2019, were analyzed for the present study. A total of 5532 echocardiogram was performed during the period. From the total database, 97 cases of valvular heart disease were enrolled in the study. The study was designed to determine the pattern of valvular heart disease. Patients of all age group who brought to Echo lab in ICH&RI, history, clinical examination & echo criteria were used for diagnosis of VHD, were included in the study. Patient with Trivial or unspecified mechanism of mitral regurgitation, trivial aortic regurgitation (AR) due to sclerotic aortic valve or unspecified causes, and trivial tricuspid regurgitation (TR) were excluded from the analysis to avoid erroneous estimates that can be produced by these large numbers of insignificant lesions. Trivial regurgitation is a qualitative description that implies 'not as severe as mild'. Usually this can be physiologic, particularly in right heart valves and mitral valve, and may not produce an audible murmur. Mild regurgitation when jet is small (jet area <4 cm<sup>2</sup> or <20% left atrial area and central). No flow convergence zone is displayed.

### Echocardiography:

Echocardiographic findings of affected valve, types of lesion (Stenosis or Regurgitation) were collected by the adult Cardiologist of ICH&RI. Diagnosis of RHD was made with history, clinical examination, and according to American society of echocardiographic criteria for diagnosis of RHD guideline.<sup>30, 31</sup> The echo machine used was GE, Vivid E95, and X Matrix. The assessment of valve regurgitation was performed based on the quantitative parameters including regurgitant volume & effective regurgitant orifice area & supported by semi- quantitative methods like vena contracta width & pressure half time. The Severity of valve stenosis was assessed based on the peak gradient, velocity, mean gradient & valve area. The severity of valve pathology was graded as mild, moderate, or severe. The consensus of the Task Force is to classify grading of severity of regurgitation into mild, moderate, and severe. In case of overlap or intermediate severity, the terms 'mild-to-moderate' or 'moderate-to-severe' can be used.<sup>31</sup> Quantitative parameters can help subclassify

the moderate regurgitation group into mild to moderate and moderate to severe regurgitation as shown. Regurgitant volume ml/beat <30 is mild, 30-44 is mild to moderate, 45-59% is moderate, >60% is severe. Care was always taken during the echocardiography studies to exclude secondary mitral regurgitation due to dilated cardiomyopathy & Ischemic heart disease before making a diagnosis of primary mitral regurgitation.<sup>32,33</sup> All studies performed & reported by experienced cardiologists. These tools contained questionnaire includes the following component: age of patient, sex, valve involved and cause, type of valve lesions, clinical features, complications, clinical history, ECG findings, and echocardiography.

The statistical analysis was carried out by using SPSS 16.0 (statistical package for the social sciences by SPSS Inc. Chicago, ii, USA, 2007). Descriptive statistics was used to describe & summarized the data. Continuous variables were expressed as mean values  $\pm$  standard deviation. Categorical variables were presented as frequencies with corresponding percentage.

### Results:

The result was analyzed with appropriate parameters and various combinations. The data is presented in tables and figures. Data are expressed in numbers, percentage, and ratios. In this study, total 97 patients included out of 5,532 patients attended in the echo lab of Ibrahim cardiac hospital & research institute.

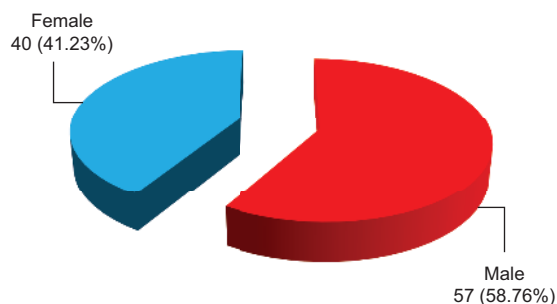
The most commonly affected age group was >60 years 38 (39.2%) then 41-50 years of age group 22 (22.7%), the least affected group was <30 years with an incidence of 7.2%. The mean age was 53.8 $\pm$ 1.5: range (21-82).

**Table-I**  
*Age distribution of study population (N=97).*

| Age (Years) | Frequency | Percentage |
|-------------|-----------|------------|
| <=30        | 7         | 7.2        |
| >60         | 38        | 39.2       |
| 30-40       | 14        | 14.4       |
| 41-50       | 22        | 22.7       |
| 51-60       | 16        | 16.5       |

Mean age and SD 53.8  $\pm$  1.5; range (21-82)

Out of 97 patients, 57 (58.76%) were male and 40 (41.23%) were female.



**Fig-1:** Gender distribution of cases

The most common symptom was shortness of breath 60.8%, followed by palpitation in 43.3% of cases. Chest pain was the least common symptom (27.8%).

**Table-IIa:**

*Distribution of symptoms among the patients (N=97).*

| Clinical feature    | Frequency | Percentage |
|---------------------|-----------|------------|
| Shortness of breath | 59        | 60.8       |
| Chest pain          | 27        | 27.8       |
| Palpitation         | 42        | 43.3       |

There were no significant ECG changes among 39.2 % of patients. 12.4 % of patients' ECG revealed AF.

**Table-IIb**

*Distribution of ECG findings among the patients (N=97).*

| ECG finding         | Frequency | Percentage |
|---------------------|-----------|------------|
| Atrial Fibrillation | 12        | 12.4       |
| Ventricular Ectopic | 19        | 19.6       |
| ST changes          | 28        | 28.9       |
| Normal              | 38        | 39.2       |

The frequently encountered complications were pulmonary hypertension (54.6%) followed by pulmonary edema (26.8%). Cerebrovascular accident, LAA thrombus and Infective endocarditis were reported as 10.3, 7.2%, and 6.2%

**Table-IIc**

*Distribution of complications among the patients (N=97).*

| Complications            | Frequency | Percentage |
|--------------------------|-----------|------------|
| Pulmonary HTN            | 53        | 54.6       |
| Pulmonary edema          | 26        | 26.8       |
| Cerebrovascular accident | 10        | 10.3       |
| LAA Thrombus             | 7         | 7.2        |
| Infective endocarditis   | 6         | 6.2        |

The most common etiology was Rheumatic in origin 52.6% and the least common was sclero-degenerative and congenital (24.7% in each).

**Table-IId**

*Distribution of Etiology of lesions among the patients (N=97).*

| Etiology                  | Frequency | Percentage |
|---------------------------|-----------|------------|
| Rheumatic                 | 51        | 52.6       |
| Sclero-degenerative       | 24        | 24.7       |
| Congenital                | 24        | 24.7       |
| Post valvular replacement | 10        | 10.3       |

The mitral valve was most commonly involved with a valve 72.2% followed by aortic valve 66.0% .

Table IIe: Distribution of type of isolated valve lesion among the patients (N=97).?

| Type of valve involvement | Frequency | Percentage |
|---------------------------|-----------|------------|
| Mitral Valve              | 70        | 72.2       |
| Aortic Valve              | 64        | 66.0       |

The predominant form was mitral regurgitation 64.9% then, mitral stenosis 52.6% which was more of mild form (33.0%) followed by moderate (15.5%) and severe form (8.2%). 4.1% of patient had MVP as a course of MR. Moderate mitral stenosis was 20.6% followed by mild form 18.6% and severe 13.4%.

**Table-III**

*Distribution of cases across the severity of mitral valvular disease (N=97).*

| Mitral Valve            | Frequency | Percentage |
|-------------------------|-----------|------------|
| Stenosis                | 51        | 52.6       |
| If Stenosis (n=51)      |           |            |
| Mild                    | 18        | 18.6       |
| Moderate                | 20        | 20.6       |
| Severe                  | 13        | 13.4       |
| Regurgitation           | 63        | 64.9       |
| If regurgitation (n=63) |           |            |
| Mild                    | 32        | 33.0       |
| Mild to moderate        | 6         | 6.2        |
| Moderate                | 15        | 15.5       |
| Moderate to severe      | 2         | 2.1        |
| Severe                  | 8         | 8.2        |
| Prolapse                | 4         | 4.1        |

Aortic regurgitation was predominant 49.5% than aortic stenosis 48.5% which was either rheumatic or degenerative. According to severity, a mild form of aortic regurgitation was more common than moderate and severe form (23.7%, 12.4%, and 4.1%). Mild aortic stenosis was more than severe (21.6%, 19.6%), moderate aortic stenosis was the least of cases (8.3%). 8.2% reported to have bicuspid aortic valve disease and 14.4% had aortic root dilatation.

**Table-IV**  
*Distribution of cases of aortic valvular disease (N=97).*

| Aortic Valve            | Frequency | Percentage |
|-------------------------|-----------|------------|
| Stenosis                | 47        | 48.5       |
| If Stenosis (n=47)      |           |            |
| Mild                    | 21        | 21.6       |
| Moderate                | 8         | 8.3        |
| Severe                  | 19        | 19.6       |
| Regurgitation           | 48        | 49.5       |
| If regurgitation (n=48) |           |            |
| Mild                    | 23        | 23.7       |
| Mild to moderate        | 8         | 8.2        |
| Moderate                | 12        | 12.4       |
| Moderate to severe      | 1         | 1.0        |
| Severe                  | 4         | 4.1        |
| Bicuspid                | 8         | 8.2        |
| Root Dilatation         | 14        | 14.4       |

Most of patients had tricuspid regurgitation 58.8%. Mild regurgitation was more predominant 36.1% followed by moderate form 10.3% and severe 5.2%. The most common cause was secondary to rheumatic involvement of other valves. 3.1% were reported to have TV prolapse and 4.1% had Ebstein anomaly which caused TR.

**Table-V**  
*Distribution of cases of Tricuspid Valvular lesion.*

| Tricuspid Valve    | Frequency | Percentage |
|--------------------|-----------|------------|
| Stenosis           | 1         | 1.03       |
| Regurgitation      | 57        | 58.8       |
| Mild               | 35        | 36.1       |
| mild to moderate   | 4         | 4.1        |
| Moderate           | 10        | 10.3       |
| Moderate to severe | 3         | 3.1        |
| Severe             | 5         | 5.2        |
| Prolapse           | 3         | 3.1        |
| Ebstein            | 4         | 4.1        |

Among the pulmonary valve lesions, pulmonary regurgitation was predominant 33.0%, then stenosis 3.1%. More than half of the patients had mild pulmonary regurgitation 25.8%. Only 1.0% had severe form. Out of 3 patients, 2.1% had severe and 1.0% had moderate pulmonary stenosis. 1.0% of patient had pulmonary valve prolapse as a cause of PR.

**Table-VI**  
*Distribution of cases of pulmonary valvular lesion.*

| Pulmonary Valve         | Frequency | Percentage |
|-------------------------|-----------|------------|
| Stenosis                | 3         | 3.1        |
| If Stenosis (n=3)       |           |            |
| Moderate                | 1         | 1.0        |
| Severe                  | 2         | 2.1        |
| Regurgitation           | 32        | 33.0       |
| If regurgitation (n=32) |           |            |
| Mild                    | 25        | 25.8       |
| Mild to moderate        | 3         | 3.1        |
| Moderate                | 3         | 3.1        |
| Severe                  | 1         | 1.0        |
| Prolapse                | 1         | 1.0        |

MR was commonly isolated valve lesion 64.9% followed by MS 52.6%. The least common isolated lesion was PS 3.1%. Among the combined valve lesion commonest one was MS+MR 43.3% and the least common one was MR+TS+TR+AR 1.03%.

**Table-VII**  
*Type of isolated and combination of valve lesion.*

| Combination | Frequency | Percentage |
|-------------|-----------|------------|
| MS 51       | 52.6      |            |
| MR 63       | 64.9      |            |
| AR 50       | 51.5      |            |
| AS 47       | 48.5      |            |
| PS 3        | 3.1       |            |
| PR 31       | 32.0      |            |
| MS+MR       | 42        | 43.3       |
| MS+AR       | 26        | 26.8       |
| AS+AR       | 39        | 40.2       |
| MR+AR       | 35        | 36.1       |
| MS+AS       | 20        | 20.6       |
| MR+AS       | 26        | 26.8       |
| MS+MR+AS+AR | 15        | 15.5       |
| MS+MR+AR    | 22        | 22.7       |
| AS+AR+MR    | 25        | 25.8       |
| MS+AS+AR    | 19        | 19.6       |
| MR+TS+TR+AR | 1         | 1.03       |

In combination rheumatic form MS+MR 76.5%, sclero-degenerative AS+AR was 54.2%. AS was the most predominant degenerative disease.

**Table-VIII**

*Etiology specific analysis of various combination of lesions.*

| Combination | Rheumatic (n=51) | Sclero-degenerative (n=24) |
|-------------|------------------|----------------------------|
| MS+MR       | 39(76.5)         | 4(16.7)                    |
| MS+AS       | 19(37.3)         | 1(4.2)                     |
| MS+AR       | 25(49.0)         | 2(8.3)                     |
| MR+AS       | 15(29.4)         | 8(33.3)                    |
| MR+AR       | 22(43.1)         | 9(37.5)                    |
| AS+AR       | 20(39.2)         | 13(54.2)                   |

(MS=mitral stenosis, MR=mitral regurgitation, AS=aortic stenosis, AR=aortic regurgitation)

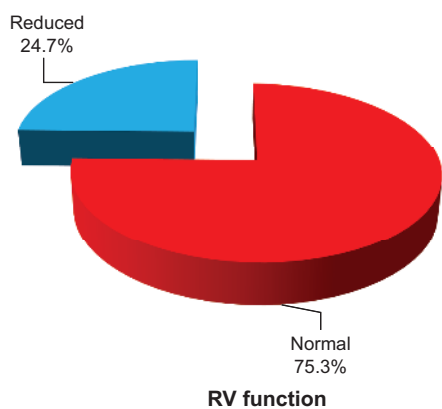
Only 5.2% of patients had intracardiac mass like myxoma. Most of them had normal diastolic function 61.9% and 38.1% of patients had diastolic dysfunction.

**Table-IX**

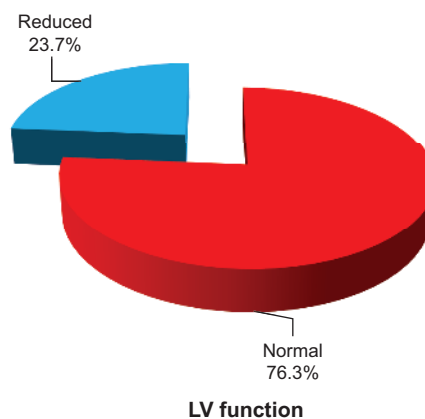
*Intracardiac Mass and diastolic dysfunction.*

| Intracardiac Mass & Diastolic function | Frequency | Percentage |
|--|-----------|------------|
| Intracardiac Mass                      | 5         | 5.2        |
| Diastolic function                     |           |            |
| Normal                                 | 60        | 61.9       |
| Reduced                                | 37        | 38.1       |

Figure 2a and b of pie chart shows most of patient had normal RV and LV systolic function (75.3%, 76.3%). Reduced LV systolic function was (23.7%) and reduced RV systolic function was (24.7%) of patients.



**Fig.-2a:** RV function of the study population.



**Fig.-2b:** LV function of the study population.

Most of the patient had normal LV systolic function 76.3%. Among the patients with reduced LV systolic function, mild LV systolic impairment 16.5%, moderate LV systolic impairment 6.2% and severe LV systolic impairment was only 1.0%.

**Table-X**

*Distribution of LV ejection fraction.*

| LVEF                 | Frequency | Percentage |
|----------------------|-----------|------------|
| Normal               | 74        | 76.3       |
| Mild Dysfunction     | 16        | 16.5       |
| Moderate dysfunction | 6         | 6.2        |
| Severe Dysfunction   | 1         | 1.0        |

**Discussion:**

The present study was undertaken in a tertiary care cardiac center in Dhaka, Bangladesh with objective of systematically analyzing on valvular heart disease by echocardiography in the echo laboratory. The echo has played the dominant role in the evaluation of the anatomic and hemodynamic effects of valve lesion. This has almost obviated the need for invasive cardiac catheterization in the management of valvular heart disease. The echocardiography & color doppler study is the most specific & non-invasive tool and is considered to be a gold standard investigation in the diagnosis, management, and follow up of patients with valvular heart disease. The M-mode describes valve morphology, leaflet thickness, mobility & calcification. The superiority of echo over clinical examination in identifying sub clinical rheumatic heart ailment has been conclusively shown in various school survey done in India.<sup>34, 35</sup> This may result in more children

receiving secondary prophylaxis for rheumatic fever, thus reducing the burden of established rheumatic heart disease.

RHD contributed the most to the burden of valvular heart disease (52.6% in the present study). Epidemiological study shows prevalence of Rheumatic fever or RHD in Bangladesh is <1/1000 in children & young adults.<sup>19</sup> In the present study, 97 patients were included. The male to female ratio being 1.42:1. In a study by Prakash et al., male: female ratio was 1.38:1<sup>36</sup> and Aurakzai et al., was 1.17:1.<sup>37</sup>

Among 97 patients, 52.6% of patients were younger than 50 years. In a study by Ramakrishna et al., in south India 33.50% of patient were younger than 40 years.<sup>38</sup> In a study by Aurakzai et al., in Pakistan the mean age of male was 42.3 years and mean age of female was 44.3 years.<sup>37</sup> In our study mean age of both male and female was 53.8 years.

The most common symptom was breathlessness (60.8%) and palpitation (43.3%) in our study. A Study was done by Shely et al., breathlessness was the commonest symptom in 76% of cases and palpitation in 68.6% of cases.<sup>39</sup> There were no significant ECG changes among 39.2% of patients in our study. In 12.4% of patients, ECG revealed atrial fibrillation (AF). Chamber enlargement was not included here in ECG. The incidence of AF was 5.9% in the study done by chockalingan et al., in Chennai, India.<sup>40</sup> Ramakrishna et al., in South India found 32% of patients had atrial fibrillation in their study.<sup>38</sup>

The most common complication in our study was pulmonary hypertension (54.6%) followed by pulmonary edema (26.8%), cerebrovascular accident (10.3%), LAA thrombus (7.3%) and infective endocarditis (6.2%). As common lesion was MS in our study, where pulmonary hypertension is more prevalent than pulmonary edema, particularly when the rhythm deteriorates to atrial fibrillation with tachycardia and loss of coordinated atrial contraction, that is partially prevented by alveolar and capillary thickening and pulmonary arterial vasoconstriction (reactive pulmonary hypertension). Various complications were noticed in a study done by Sundaram et al., in Chennai, India. In their study, congestive heart failure was 54%, acute pulmonary edema (31%), embolic episodes (21%), infective endocarditis

(0.3%).<sup>41</sup> Findings of Prakash et al., Maharashtra, India, were pulmonary hypertension (55%), congestive heart failure (33%), acute pulmonary edema (12%), infective endocarditis (4%), cerebrovascular accident (4%), LA thrombus (3%) and death (3%).<sup>36</sup>

The order of involvement of valve lesion in RHD in our study was mitral, aortic, tricuspid, and pulmonary. This reflects the pathological involvement of the cardiac valves in acute rheumatic fever with mitral being the most common and pulmonary, the least.<sup>34</sup> The mitral valve was the most commonly affected valve (72.2%) followed by aortic valve (66.0%), mitral and aortic was in 20.6% of patients. In a study by J.N. Berry in northern India mitral valve was involved in 84%, aortic valve was involved in 50%.<sup>42</sup> A study done by Bharani et al., in Indore mitral valve was involved in 60.8%, mitral and aortic in (17.1%), mitral, aortic, and tricuspid in 6.7%.<sup>43</sup>

Rheumatic heart disease contributed the maximum burden of valvular heart disease in the present study with the common finding of mitral stenosis (52.6%) than aortic stenosis (48.5%). A study done by Malla et al., mitral valve was most commonly involved valve (78.8%). In our study, Isolated mitral valve was affected 72.2% which was almost exclusively of rheumatic etiology followed by isolated aortic valve 66% most of degenerative. Similarly, in the study of Manjunath et al., mitral valve was most commonly affected valve followed by aortic valve.<sup>2</sup> Laudari et al, also found that isolated mitral valve was most commonly affected valve (46.80%) followed by isolated aortic valve (9.36%).<sup>44</sup>

Degenerative calcification of the mitral annulus often causes MR, but rarely can cause stenosis of the mitral valve in <3% of cases.<sup>46</sup> MR was the most common valvular lesion presented in our study (64.9%). The most common etiology of mitral regurgitation was rheumatic. Similar findings were found by Al-khalifa et al. and Shrestha et al. In their study, MR was the most common valvular lesion in all age group.<sup>47,48</sup> The peak incidence of rheumatic MR was 2 decades earlier than that of MS. This explained by the fact that a long latent period following the acute attack of rheumatic fever generally exists before the stenotic mitral lesion manifests clinically.<sup>35</sup>

Rheumatic involvement of mitral valve constituted the dominant cause followed closely by myxomatous or mitral valve prolapse (4.1%). Calcific degeneration was the predominant etiology of isolated aortic stenosis whereas rheumatic etiology dominated the isolated AR cases. A changing pattern of aortic stenosis pathology can be noted with degenerative disease now being the most common cause of AS. In aortic valvular lesion, Aortic regurgitation was present in 49.5% of patient while AS was present in 48.5%.

Bicuspid aortic valve (8.2%) was well represented in the present study. Out of 97 cases, 47(48.5%) had pure AS, 50(51.5%) had pure AR, and 39(40.2%) had combined AS+AR. Among them rheumatic were 20(39.2%) and 13(54.2%) were degenerative etiology. Incidence of degenerative valvular disease was 24.7%. All were more than 50 years of age. The most common lesion AS+MR were mostly of degenerative in the surgical series from 1965 through 1990.<sup>49-51</sup> The congenital cause was attributed to the bicuspid valve. The natural history autopsy series of 85 cases by Roberts found that 72% of bicuspid valve developed stenosis which 13% had pure AR in that study.<sup>52</sup>

According to the Essop, et al, approximately 40% have combine MS+MR, multivalve involvement is seen in 38% of patients, MS with aortic valve affected in approximately 35%.<sup>45</sup> In our study there were also multiple valve involvement. The most common combination was MS+MR (43.3%). MR+AR was the common finding in the study of Prabha, et al.<sup>53</sup> where it was 36.1% in our study. Melvin also found that MR+AR, was the most common combination of rheumatic valvular lesion.<sup>54</sup> TS was rheumatic in our study and was almost exclusively seen in association with MR+AR (1.03%). In the necropsy series of Roberts and Virmani.<sup>52</sup> 12% of cases had some pathological involvement of tricuspid valve stenosis. 3.1% of patient had PS which was congenital in our study.

In a surgical pathology series of tricuspid valve disease done by Hauck, et al, RHD was the commonest cause of pure TR followed by Ebstein anomaly (41 & 14% respectively).<sup>55</sup> In our study, we found TR in 58.8 % cases which was secondary to rheumatic involvement of other valves. TR was mild (36.1%) mostly. Only 5.2% had severe TR which was due to Ebstein anomaly and prolapse

(4.1% and 3.1%). Most of the patient had normal RV and LV systolic function and normal diastolic function in our study.

#### Limitations of study:

The limitation of our study was a single-center study with small sample size. Most of the patients was from middle income group rather than lower socioeconomic condition. So, the results might not be the true representation of the whole country.

#### Conclusion:

RHD contributed most to the burden of VHD in the present study where the mitral valve was the most commonly affected valve and mitral regurgitation was the most common valvular lesion. Mitral stenosis was statistically predominate in male, 40% of patients. Aortic stenosis as well as aortic regurgitation was significant also in male (40% and 29% of patients). Although recent research in Bangladesh continues to demonstrate a declining trend in the prevalence of RHD, Rheumatic involvement is still the dominant form of VHD in Bangladesh. A coordinated multidisciplinary approach to research education and clinical management is now needed to ensure improved outcomes of patients with VHD.

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#### Conflict of Interest - None.

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