



## Gender Differences in the Morphological Severity of Mitral Stenosis in Patients Presenting in a Tertiary Care Hospital

<sup>1</sup>Imran Hanif, <sup>2</sup>Masooma Ahmad, <sup>3</sup>Wardah Anwar, <sup>2</sup>Maria Ilyas, <sup>3</sup>Ambreen Anjum, <sup>4</sup>Umair Hanif, <sup>1</sup>Majid Kaleem

<sup>1</sup>Department of Cardiology, Al-Aleem Medical College, Lahore

<sup>2</sup>Department of Anatomy, Al-Aleem Medical College, Lahore

<sup>3</sup>Department of Physiology, Al-Aleem Medical College, Lahore

<sup>4</sup>Advance Centre of Research, Al-Aleem Medical College, Lahore

### ABSTRACT

**Introduction:** Mitral stenosis is most common among rheumatic valvular heart disease. The morphological severity of the mitral valve is assessed by Wilkins scoring on echocardiography. Substantial gender-related differences regarding mitral valve and other cardiovascular diseases are reported. Data showed men and women had a different risk for valvular heart diseases. This study aims to ascertain if there is any gender-specific difference in the morphological severity of mitral stenosis based on Wilkin's scoring in a tertiary care Cardiology Center. **Aims & Objectives:** To report differences in morphological severity of mitral stenosis in male and female gender based on Wilkin's scoring. **Place and duration of study:** Cardiology Department of Gulab Devi Teaching Hospital. This Study was completed in one year. **Material & Methods:** A descriptive cross-sectional study on 152 patients presenting in the Cardiology Department of Gulab Devi Teaching Hospital. The study was conducted after obtaining ethical approval from the Institutional Ethical Review Board. **Results:** A total of 152 subjects participated among which 80 male patients and 72 females. The severity of the disease was divided into mild, moderate and severe. No gender related difference was observed in echocardiographic parameters. Regarding morphological assessment based on Wilkin's score, significant difference was observed only in the values of Valve leaflet thickness. **Conclusion:** The results of this study didn't show a clear and significant difference in morphological severity of mitral stenosis when compared between male and female gender. So, each patient regardless of gender should be carefully screened and assessed while deciding treatment strategy.

**Key words:** Mitral Valve Stenosis, Echocardiography, Wilkin's score, Heart Valve Diseases, Gender

### INTRODUCTION

Mitral valve is a double leaflet valve that guards the left Atrio-ventricular orifice. Mitral valve components are mitral valve leaflets, fibrous mitral annulus, papillary muscles and the cordaetendinae. The morphology and function of all these structures can be examined on 2 and 3-dimensional echocardiography. Changes in normal structure and relation of these components can lead to valvular dysfunction.<sup>1</sup> The valve should completely close by apposition of both the leaflets for proper functioning during cardiac systole and diastole. Different etiologies can lead to disruption of valvular mechanism and cause regurgitation either by prolapse or stenosis.<sup>2</sup> Rheumatic fever is a common cause of valvular heart disease in developing countries like Pakistan

and Mitral stenosis is most common among rheumatic valvular disease.<sup>3,4</sup> A study done on a cohort of south Asian population with valvular heart disease stated that the mitral valve was the most commonly involved and female patients with mitral stenosis predominate.<sup>5</sup>

Morphology of the mitral valve is assessed by Wilkins Scoring. This semi-quantitative score is based on assessing mitral valve leaflet mobility, thickening, calcification and sub-valvular thickening on a scale of 0-4(0=less abnormal – 4=more abnormal) for each parameter and then calculating the total score by adding the score of all four parameters.<sup>6</sup> Quantitative measurement of commissural morphology and leaflet displacement in addition to Wilkins Scoring can be of more predictive value.<sup>7</sup> Wilkin's score is not only an indicator of morphology but also a predictor of post-

procedural outcome of Percutaneous Mitral commissurotomy.<sup>8</sup>

Females predominate among patients but more males undergo surgery for Mitral valve disease. This study aims to ascertain if gender differences are due to anatomical severity of Mitral stenosis or it can just be a sex bias in our social set up with less female getting appropriate medical care and access to treatment.

**MATERIAL AND METHODS**

**Study Design and Setting:** Descriptive Cross-Sectional Study on 152 patients who presented in the Cardiology Department of Gulab Devi Teaching Hospital. This Study was completed in one year. Ethical approval was taken from the Institutional Ethical Review Board.

The sample size was calculated using Cochran’s formula using 0.05 acceptable margin of error and 0.05  $\alpha$  level. Subjects were enrolled after obtaining informed consent.

**Sampling Technique:** Non-probability purposive sampling was used.

**Inclusion criteria:** Male and female patients of age 10-60 years diagnosed with Mitral stenosis presenting in Out / In patient Department of Gulab Devi Teaching Hospital, Lahore.

**Exclusion Criteria:**

1. Patients who refused to give informed consent.
2. Patients presenting with severe Mitral regurgitation
3. Patients with a history of previous percutaneous or surgical intervention.

**Data Collection Method:** After taking verbal consent data was collected by interviewing the patients and looking at their echo reports. Medical record; presentation, age, presence of comorbidity and echocardiogram finding; scoring & assessment of quantitative parameters were noted down in a Performa. Wilkin’s score was determined.<sup>6</sup>

**Statistical analysis:**

The data was entered and analyzed using IBM Statistical Package for Social Sciences (SPSS) software, version 22. Normality of data was checked using Shapiro-Wilk test, *p*-value indicating that data was not normally distributed. So, Mann Whitney U (non-parametric) test was applied to compare means of quantitative parameters between the two groups. Mean $\pm$ SD and median $\pm$ interquartile range was calculated for quantitative variables.

**RESULTS**

A total of 152 patients participated among which 80 were male and 72 were females. The severity of the disease was divided into mild, moderate and severe. Table-1 shows the severity of disease in the enrolled subjects. 10% of male patients were diagnosed with mild disease, 11% had moderate and 78.8% had severe mitral stenosis. Female patients had almost similar percentages of 7%, 13% and 79% for mild, moderate and severe respectively.

Disease Severity	In males		In females	
	Frequency	Percentage	Frequency	Percentage
Mild M.S.*	8	10%	5	7%
Moderate M.S.	9	11%	10	13%
Severe M.S.	63	78.8%	57	79%

\*M.S. denotes Mitral Stenosis

**Table-1:** Disease Severity Scale

18 male participants and 12 female patients had thickened aortic valve due to Rheumatic heart disease. 1 (0.9%) male patient whereas, none of the female patient participated had tricuspid regurgitation along with Mitral stenosis (Table-2.)

Associated Valve	In males		In females	
	Frequency	Percentage	Frequency	Percentage
Thickened Aortic Valve	18	16.7%	12	11%

**Table-2:** Associated Heart Valves

The echocardiographic finding of these patients reported in Table-3. All parameters showed statistically nonsignificant difference when compared between both genders.

ECHO finding	Group I(Males) (Mean $\pm$ SEM)	Group II (Females) (Mean $\pm$ SEM)	p-value
MV MPG mmHg	13.6 $\pm$ 1.1	12.7 $\pm$ 0.5	0.57
MV PPG mmHg	21.9 $\pm$ 0.9	22.5 $\pm$ 0.7	0.28
PASP mmHg	66.1 $\pm$ 2.8	64.5 $\pm$ 3.1	0.28

\**p*-value $\leq$  0.05 is considered to be statistically significant  
Note: data was not normally distributed

**Table 3:** Diagnostic Findings on Echocardiography

Significant difference was observed in the value of valve leaflet thickness, when compared between male and female groups (*p*-value = 0.04\*).

However, the comparison of values of valve leaflet calcification, pliability, sub-valvular lesion and total Wilkin’s score between both groups was not statistically significant (Table-4).

Parameter	Group	Mean ± SEM	p-value
Valve leaflet Calcification	Male	2.54±0.10	0.28
	Female	2.40±0.08	
Valve leaflet Pliability	Male	1.85±0.16	0.46
	Female	1.56±0.11	
Valve leaflet Thickness	Male	2.23±0.07	0.04*
	Female	2.05±0.04	
Sub-valvular lesion	Male	2.29±0.12	0.89
	Female	2.24±0.11	
Total	Male	8.86±0.32	0.16
	Female	8.25±0.23	

\*p-value ≤ 0.05 is considered to be statistically significant

**Table-4:** Showing comparison of mean values of parameters of Wilkins scoring between male and female patients.

### DISCUSSION

The normal area of mitral valve opening is 4-6 cm<sup>2</sup>, mechanical obstruction in blood flow occurs when this area becomes less than 2cm<sup>2</sup> and is termed as stenosis. 90% of mitral stenosis in adults is due to rheumatic involvement, while endocarditis, systemic lupus erythematosus and others just contribute to 10% of etiology.<sup>9</sup> The severity of mitral stenosis can be graded using EAE/ASE guidelines based on valve area, mean gradient and pulmonary artery pressure, into mild, moderate and severe.<sup>10</sup> For assessment of the anatomy of Mitral valve for pre-procedural selection of patients Wilkin’s score and Cormier’s score are more widely accepted.<sup>11</sup>

Chiang et al. compared male and female patients of mitral stenosis and reported a higher prevalence of mitral stenosis along with the increased incidence of concomitant tricuspid and pulmonary regurgitation in female patients but higher echocardiographic scores in male patients. This higher score in males represents a more severe pathological change in mitral valve morphology which can be associated with increased physical activity in males. They suggested different pathophysiology of mitral stenosis in both genders.<sup>12</sup> This finding is in partial agreement to current study which reported statistically significant increase in males compared to female patients of mitral stenosis regarding valve leaflet thickening but differs as it didn’t document rest of the sex related differences.

The results of our study are in agreement to the previous work which reported no anatomical

difference in valve morphology in male and female groups of patients.<sup>13</sup>

Some studies suggested that though Rheumatic mitral valve stenosis has a greater prevalence, it also has better post-surgical outcomes in females than males.<sup>14</sup> Others suggested a more aggressive disease in women and late referral due to sex bias as compared to men.<sup>15</sup>

Women have less clear and different symptoms delaying the clinical assessment and also making it difficult. Females also have more co-morbidities so decreasing the referral rate for surgical intervention.<sup>16</sup> All these factors can explain the clinical observation that though mitral stenosis predominates in female patients more males undergo surgery.

### Limitation:

Larger sample size would have been more reliable in providing epidemiological data of disease burden. Usage of 3D echocardiography would have yielded more information and added greater to the results.

### CONCLUSION

Wilkins’s scoring is a non-invasive predictor of morphological severity of mitral stenosis. The study showed no clear gender-related differences in parameters of Wilkin’s score so; both genders should be carefully screened for symptoms and appropriately assessed while deciding the therapeutic strategy for patients with mitral stenosis.

### Acknowledgment:

The authors would like to express their sincere thanks to Dr. Abid Ali for his support. We’re thankful to Dr. Muhammad Bahadur for helping in statistical analysis. We also acknowledge the help provided by our colleagues of the catheterization laboratory team for the conduction of this study.

### REFERENCES

1. Bianco JP and Levine RA. Anatomy of the mitral valve apparatus: role of 2D and 3D echocardiography. *Cardiology clinics*. 2013; 31(2):151-64.
2. McCarthy K, Ring L, Rana B. Anatomy of the mitral valve: understanding the mitral valve complex in mitral regurgitation. *European Journal of Echocardiography*. 2010; 11(10):i3-9.
3. Rizvi SF, Khan MA, Kundi A, Marsh DR, Samad A. and Pasha O. Status of rheumatic heart disease in rural Pakistan. *Heart*. 2004; 90(4):394-9.

4. Gul A. and Hafizullah M. Rheumatic heart disease in urban school children of Peshawar. *Journal of Postgraduate Medical Institute (Peshawar-Pakistan)*. 2011; 23(4).
  5. Manjunath C, Srinivas P, Ravindranath R. and Dhanalakshmi C. Incidence and patterns of valvular heart disease in a tertiary care high-volume cardiac center: A single center experience. *Indian Heart*. 2014; 66(3):320-6.
  6. Palacios IF, Block PC, Wilkins GT, Weyman AE. Follow-up of patients undergoing percutaneous mitral balloonvalvotomy. Analysis of factors determining restenosis. *Circulation*. 1989; 79(3):573-9
  7. Nunes M, Tan TC, Elmariah S, do Lago R, Margey R, Zheng H. The echo score revisited: Impact of incorporating commissural morphology and leaflet displacement to the prediction of outcome for patients undergoing percutaneous mitral valvuloplasty. *Circulation*. 2014; 129(8):886-95.
  8. Mughal S, Hanif I, Riaz A, Hanif A. Wilkin's Score; Predictive value of Wilkin's score in determining the procedural success of Percutaneous Transvenous Mitral commissurotomy. *The Professional Medical Journal*. 2018; 25(9):1432-7.
  9. Omran AS, Arifi AA, Mohamed AA. Echocardiography in mitral stenosis. *Journal of the Saudi Heart Association*. 2011 Jan 1; 23(1):51-8.
  10. Baumgartner H, Hung J, Bermejo J, et al. Echocardiographic assessment of valve stenosis: EAE/ASE recommendations for clinical practice. *J. Am. Soc. Echocardiogr.* 2009; 22, 1-23
  11. Wilkins GT, Weyman AE, Abascal VM, et al. Percutaneous balloon dilatation of the mitral valve: an analysis of echocardiographic variables related to outcome and the mechanism of dilatation. *Br. Heart J*. 1988; 60, 299-308.
  12. Chiang CW, Kuo CT, Chen WJ, Lee CB, Hsu TS. Comparisons between female and male patients with mitral stenosis. *Br Heart J*. 1994; 72(6):567-70.
  13. Benhaourech S, Kharbouche K, Hassari J, Habbal R. The gender influence on the characteristics of mitral stenosis: a retrospective study. *Archives of Cardiovascular Diseases Supplement*, 2016; 8(1):109.
  14. Nitsche C, KoschutnikM, Kammerlander A, MascherbauerJ. Gender-specific differences in valvular heart disease. *Wien Klin Wochenschr*. 2020; 132:61-8.
  15. Kislitsina ON, Zareba KM, Bonow RO, Andrei AC, Kruse J, Puthumana J, Akhter N, et al. Is mitral valve disease treated differently in men and women? *Eur J Prev Cardiol*. 2019; 26(13):1433-43.
  16. Marsan NA. Gender difference in mitral valve disease: Where is the bias? *Eur J Prev Cardiol*. 2019; 26(13):1430-2.
- The Authors:**  
Prof. Imran Hanif  
Department of Cardiology,  
Al-Aleem Medical College, Lahore.
- Dr. Masooma Ahmad  
Assistant Professor,  
Department of Anatomy,  
Al-Aleem Medical College, Lahore.
- Dr. Wardah Anwar  
Assistant Professor,  
Department of Physiology,  
Al-Aleem Medical College, Lahore.
- Dr. Maria Ilyas  
Senior Demonstrator,  
Department of Anatomy,  
Al-Aleem Medical College, Lahore.
- Dr. Ambreen Anjum  
Assistant Professor,  
Department of Physiology,  
Al-Aleem Medical College, Lahore.
- Dr. Umair Hanif  
Director,  
Advance Center of Research,  
Al-Aleem Medical College, Lahore.
- Prof. Majid Kaleem  
Department of Cardiology,  
Al-Aleem Medical College, Lahore.
- Corresponding Author:**  
Dr. Masooma Ahmad  
Assistant Professor,  
Department of Anatomy,  
Al-Aleem Medical College, Lahore.  
E-mail: masoomarlm@gmail.com