

## Assessment of Pre And Post Procedural Quality of Life In Successful Percutaneous Transvenous Mitral Commissurotomy Patients

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### ABSTRACT

**Objective:** To evaluate the effect of successful Percutaneous Transvenous Mitral Commissurotomy (PTMC) on clinical status and Quality of Life (QOL) in patients with severe rheumatic mitral stenosis applying the WHOQOL-BREF questionnaire.

**Study Design:** Analytical cross-sectional research.

**Place and Duration of Study:** Cardiology Department, Armed Forces Institute of Cardiology/National Institute of Heart Diseases (AFIC/NIHD), Rawalpindi, Oct-Dec 2025

**Methodology:** Thirty-five patients aged 15–65 years with symptomatic severe rheumatic mitral stenosis undergoing successful PTMC were enrolled using non-probability consecutive sampling. Patients with left atrial thrombus, Wilkins score >8, moderate-severe MR, significant AVD, or unsuccessful PTMC were excluded. The quality of life was checked one day before and again one month after PTMC using WHOQOL-BREF. The patient's clinical status was evaluated by the NYHA classification; p-value below 0.05 was considered significant.

**Results:** A total of 35 patients were included in the study. In patients under 40 years, the WHOQOL-BREF scores were  $25.71 \pm 1.93$  for the physical domain,  $22.0 (20.0-23.0)$  for the psychological domain,  $12.0 (11.0-13.0)$  for the social domain, and  $29.0 (28.0-35.0)$  for the environmental domain, with a total score of  $88.0 (82.0-97.0)$ . Quality of life improved significantly in all domains ( $p < 0.001$ ), with total scores increased from  $52.0 (48.0-57.0)$  to  $86.0 (81.0-95.0)$  after the procedure

**Conclusion:** PTMC is a reliable and effective treatment option for patients with severe rheumatic mitral stenosis. The study shows that PTMC leads to clear improvement in mitral valve performance, functional capacity, and patients' perceived quality of life.

**Keywords:** Mitral stenosis; Percutaneous Transvenous Mitral Commissurotomy; Quality of life; Rheumatic heart disease; WHOQOL-BREF

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### INTRODUCTION

Rheumatic Heart Disease (RHD) continues to pose a major global health burden, particularly in low- and middle-income countries, where socioeconomic barriers, limited access to healthcare, and lack of primary prevention contribute to raising morbidity and mortality.<sup>1</sup> Worldwide, annually RHD accounts for over 10 million disability-adjusted life years (DALYs) affecting mainly school-going children and young adults, resulting in a long-term consequence on education, productivity, and overall quality of life (QOL).<sup>2</sup>

In Pakistan, the prevalence of RHD remains high despite gradual improvements in preventive strategies. Mitral Stenosis (MS) is the most common valvular complication of RHD that is associated with progressive dyspnea, impaired functional capacity,

repeated hospitalizations, and substantial psychosocial and environmental impact.<sup>3</sup> MS is diagnosed at an advanced stage because patients commonly present late with symptoms of NYHA class III or IV, owing to limited health awareness and difficulty in accessing specialized cardiac centers.<sup>4</sup>

Percutaneous Transvenous Mitral Commissurotomy (PTMC) is a treatment of choice for patients with severe rheumatic MS with favorable valve morphology, resulting in a significant increase in mitral valve area, improvement in transvalvular gradients, and relief of pulmonary hypertension. Both national and international literature have demonstrated high rates of procedural success.<sup>5</sup> Although the echocardiographic and hemodynamic benefits of PTMC are well documented, there are limited literature reviews on the impact of PTMC on patient Quality of Life (QOL), which includes physical, psychological, social, and environmental well-being.

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Quality of life represents a multidimensional concept that includes physical, psychological, social, and environmental aspects of health. The WHOQOL-BREF has demonstrated good internal consistency (Cronbach's  $\alpha = 0.89$ ), as reported by Cheung *et al.*,<sup>6</sup> and has been widely used in various clinical populations, including patients suffering from RHD.<sup>7,8</sup>

Assessment of QOL offers valuable information regarding the overall impact of PTMC that cannot be fully captured by echocardiographic parameters alone. Despite the high burden of RHD and frequent performance of PTMC in Pakistan, local data evaluating the impact of PTMC on quality of life remain inadequate. The objective of this study was to evaluate changes in functional status and quality of life before and after PTMC using the WHOQOL-BREF questionnaire.

## METHODOLOGY

This Analytical cross-sectional study was conducted in the Cardiology Department of the Armed Forces Institute of Cardiology/National Institute of Heart Diseases (AFIC/NIHD), Rawalpindi, over a period of three months after receiving ethical approval under IERB letter number (9/2/R&D/2024/309; Dated: 28th March, 2024). A non-probability consecutive sampling technique was applied to recruit eligible participants who presented with severe rheumatic mitral stenosis going for PTMC.

A total of 35 patients were enrolled in the study. The sample size was calculated using an online sample size calculator, "WHO calculator" by using a mean of QOL improvement as  $11.11 \pm 0.75$ , 95% confidence level with a 5% margin of error. The calculated sample size was found to be  $n=18$ .<sup>8</sup> However, we collected data from 35 participants to increase the power of the study.

**Inclusion Criteria:** Patients of either gender aged 15–65 years with a diagnosis of symptomatic severe mitral stenosis and a pliable mitral valve were included.

**Exclusion Criteria:** Patient with Left atrial thrombus, Wilkins score  $> 8$ , moderate or severe MR, significant AVD, and unsuccessful PTMC.

Patients who met the specified inclusion and exclusion criteria were chosen from the Outpatient Department (OPD), wards, and emergency department following their provision of written consent. A comprehensive medical history regarding the patient's symptoms, occurrences of systemic embolization, and any prior interventions such as

valve replacement or percutaneous mitral valve commissurotomy were gathered. Patient particulars, including name, age, gender, and medical record number, were documented from the patient's profile, progress notes, or chart.

Transthoracic echocardiograms were accomplished by competent cardiologists, either by consultants or residents. The severity of stenosis was determined by computing the mitral valve area.

Quality of life was measured using the WHOQOL-BREF questionnaire. It consists of 26 short questions developed by the World Health Organization that analyze overall (2), four areas: physical health (7), psychological health (6), social relationships (3), and environmental health (8). This questionnaire was filled out one day before and again one month after the PTMC procedure. Each question was scored from 1 to 5, with higher scores indicating a better quality of life. We also analyzed the internal consistency of the questionnaire for pre and post-procedural responses using Cronbach's alpha. The pre-procedural Cronbach's alpha was 0.727, showing acceptable reliability, while the post-procedural Cronbach's alpha was 0.921, indicating excellent internal consistency. Participants were given a telephonic reminder to follow up after a period of one month.

Data were evaluated using the Statistical Package for the Social Sciences (SPSS), version 23. Normality of continuous variables was assessed using the Shapiro-Wilk test. Normally distributed continuous variables were expressed as mean  $\pm$  standard deviation, whereas non-normally distributed variables were presented as median with interquartile range (IQR). Categorical variables, including gender, clinical status, procedural success, and procedural complications, were summarized as frequencies and percentages. Comparisons of normally distributed continuous variables (post-intervention physical domain score) were performed using the independent samples t-test. The Mann-Whitney U test was used to compare WHOQOL-BREF post-intervention scores across age, gender, and marital status groups, while the Kruskal-Wallis test was applied for comparisons according to education level. Differences between continuous variables (MVR) measured at two time points were analyzed using the paired t-test. Pre- and post-intervention quality of life scores were compared using the Wilcoxon signed-rank test,  $p$ -value  $< 0.05$  was considered statistically significant.

**RESULTS**

Among the 35 participants, post-intervention quality-of-life scores were compared across demographic groups (Table-I). Participants aged <40

effectiveness of PTMC in relieving hemodynamic obstruction and improving functional capacity.

The mean LVEF remained stable (Table-II). Before PTMC, the majority of patients demonstrated

**Table I: Comparison of Post-Intervention Quality of Life Domains between Demographic Groups (n=35)**

Variables	Physical Domain	Psychological Domain	Social Domain	Environmental Domain	Total Score
	(Mean ± SD)	Median (IQR)			
<b>Age (years)</b>					
<40	25.71±1.93	22.0(20.0–23.0)	12.0(11.0–13.0)	29.0(28.0–35.0)	88.0(82.0–97.0)
>40	25.00±2.15	20.0(18.0–22.0)	11.0(11.0–12.0)	28.5(28.0–33.0)	82.5(81.0–95.0)
<i>p</i> -value	0.312	0.096	0.663	0.422	0.229
<b>Gender</b>					
Male	25.33±1.99	22.0(20.0–23.0)	11.0(10.0–13.0)	29.0(27.0–35.0)	88.0(81.0–96.0)
Female	25.50±2.09	20.0(18.5–22.0)	11.0(11.0–12.5)	29.0(28.0–34.5)	83.0(81.5–95.0)
<i>p</i> -value	0.813	0.139	0.959	0.588	0.920
<b>Marital Status</b>					
Single	25.38 ± 2.13	22.0(20.0–24.0)	12.0(11.0–13.0)	32.0(28.5–36.5)	93.0(82.5–99.0)
Married	25.44 ± 2.03	21.0(19.0–22.0)	11.0(10.0–13.0)	28.0(28.0–33.0)	83.0(81.0–95.0)
<i>p</i> -value	0.933	0.378	0.179	0.083	0.179
<b>Education</b>					
Illiterate	24.50±0.58	20.0(19.5–21.0)	11.0(10.0–11.5)	28.0(28.0–32.0)	83.0(82.0–89.0)
Primary	25.33±1.53	23.0(18.0–23.0)	11.0(10.0–12.0)	31.0(28.0–35.0)	88.0(82.0–97.0)
Middle	25.57±1.72	21.0(21.0–22.0)	11.0(9.0–13.0)	29.0(26.0–33.0)	82.0(80.0–95.0)
Matric	25.30±2.41	22.0(20.0–22.0)	12.0(11.0–13.0)	31.5(29.0–36.0)	93.0(82.0–97.0)
Intermediate	25.82±2.40	20.0(19.0–22.0)	11.0(11.0–13.0)	28.0(27.0–33.0)	86.0(81.0–95.0)
<i>p</i> -value	0.871	0.838	0.583	0.336	0.818

years had a slight difference in mean physical domain score (25.71±1.93) than those aged >40 years (25.00±2.15; *p*=0.312). Median psychological, social, environmental, and total quality-of-life scores were also higher in the younger age group[22.0 (20.0–23.0), 12.0 (11.0–13.0), 29.0 (28.0–35.0), and 88.0 (82.0–97.0), respectively] compared with participants aged >40 years [20.0 (18.0–22.0), 11.0 (11.0–12.0), 28.5 (28.0–33.0), and 82.5 (81.0–95.0)]; however, these differences were not statistically significant (all *p* > 0.05). Similarly, no significant differences were observed in post-intervention quality-of-life domains according to gender, marital status, or education level.

Prior to PTMC, the majority of patients exhibited severe functional limitation, with 13(37.1%) in NYHA Class III and 22(62.9%) in Class IV, reflecting marked symptoms such as dyspnea at minimal exertion or even at rest. This highlights the advanced clinical severity of mitral stenosis in the study cohort. At one-month post-PTMC, all patients demonstrated notable functional improvement. Specifically, 9.0(25.7%) shifted to NYHA Class 0, indicating complete symptom relief, 22.0(62.9%) moved to Class I, corresponding to mild limitation of physical activity, and 4.0(11.4%) were in Class II, showing slight limitation of ordinary activity. Importantly, no patients remained in Class III or IV, reflecting the

no mitral regurgitation, with 21.0(60.0%) having no regurgitation and 14.0(40.0%) exhibiting only mild regurgitation, indicating relatively preserved mitral valve competence at baseline. Importantly, no cases of moderate mitral regurgitation were observed before the procedure.

**Table-II: Pre- and Post-PTMC Functional and Echocardiographic Findings**

Variables	Categories	Pre-PTMC	After 1 month
		Frequency (%)	
NYHA Class	Class 0	-	9.0 (25.7%)
	Class I	-	22.0 (62.9%)
	Class II	-	4.0 (11.4%)
	Class III	13.0 (37.1%)	-
	Class IV	22.0 (62.9%)	-
Mitral Regurgitation	None	21.0 (60.0%)	15.0 (42.9%)
	Mild	14.0 (40.0%)	17.0 (48.6%)
	Moderate	0.0(0.0%)	3.0 (8.6%)
Aortic Valve Disease	No	35.0 (100.0%)	35.0 (100.0%)
Median (IQR)			
Left Ventricular Ejection Fraction (LVEF)		60.0(55.0-60.0)	60.0(55.0-60.0)

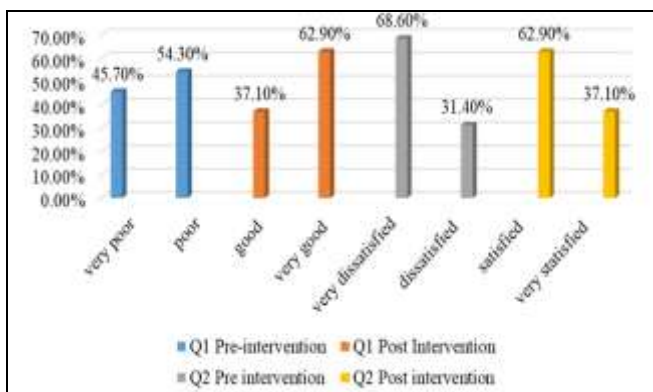
At one month following PTMC, there was a notable redistribution in the severity of mitral regurgitation. The proportion of patients without regurgitation decreased to 15.0(42.9%), while mild regurgitation increased to 17.0(48.6%) and moderate regurgitation emerged in 3.0(8.6%). This shift reflects a procedural effect on mitral valve dynamics, likely related to commissural splitting during PTMC

Table-III illustrates a marked increase in the mitral valve area following the procedure. The mean mitral valve area increased from 1.01±0.02 cm<sup>2</sup> pre-procedure to 1.83±0.15cm<sup>2</sup> post-procedure, statistically significant *p* value <0.001.

**Table-III: Improvement in Mitral Valve Area Following Intervention**

Variable	Mean±SD		<i>p</i> -value
	Pre	Post	
Procedural Mitral valve area (cm <sup>2</sup> )	1.01 ± 0.02	1.83 ± 0.15	<0.001

The results in figure 1 indicate a significant improvement in both quality of life and health satisfaction following the intervention; for Quality of Life (Q1), pre-intervention, 32.0(45.7%) reported “Very Poor” and 38.0(54.3%) reported “Poor.” Post-intervention 26.0(37.1%) reported “Good” and 44.0(62.9%) reported “Very Good,” showing a clear positive shift in perceived quality of life. Before the intervention, many patients reported poor satisfaction with their health, with 48.0(68.6%) identifying as “Very Dissatisfied” and 22.0(31.4%) as “Dissatisfied”, reflecting a high burden of perceived health limitations.



**Figure-1: Pre- and Post-Intervention Responses for Quality of Life and Health Satisfaction**

Following the intervention, there was a substantial shift in patient-reported outcomes, with 44.0(62.9%) reporting being “Satisfied” and 26.0(37.1%) reporting “Very Satisfied”, indicating a marked improvement in perceived health status.

Quality of life improved significant through all domains following the intervention (Table-IV). The median physical domain score increased from 15.0 (14.0–15.0) pre-intervention to 25.0 (24.0–27.0) post-intervention, while the psychological domain improved from 12.0 (11.0–14.0) to 21.0 (20.0–22.0). Similarly, the social domain score increased from 7.0

(5.0–8.0) to 11.0 (11.0–13.0), and the environmental domain from 18.0 (17.0–19.0) to 29.0 (28.0–35.0). The over-all quality of life score showed a noticeable increase from 52.0 (48.0–57.0) pre-intervention to 86.0 (81.0–95.0) post-intervention. All improvements were statistically significant *p*<0.001.

**Table-IV: Comparison of Quality of Life Domains pre and Post Intervention**

Domains	Pre-Intervention	Post-Intervention	<i>p</i> -value
	Median (IQR)		
Physical Domain	15.0 (14.0–15.0)	25.0 (24.0–27.0)	<0.001
Psychological Domain	12.0 (11.0–14.0)	21.0 (20.0–22.0)	<0.001
Social Domain	7.0 (5.0–8.0)	11.0 (11.0–13.0)	<0.001
Environmental Domain	18.0 (17.0–19.0)	29.0 (28.0–35.0)	<0.001
Total Quality of Life Score	52.0 (48.0–57.0)	86.0 (81.0–95.0)	<0.001

## DISCUSSION

The present study was done to assess the PTMC effect on clinical symptoms and quality of life in patients with severe rheumatic mitral stenosis. This research also focused on patient-reported outcomes using the WHOQOL-BREF questionnaire in addition to echocardiographic and symptoms. The results showed that successful PTMC led to significant improvement in physical ability and overall quality of life, showing that the procedure helps in many ways.

Rheumatic mitral stenosis is a major public health problem in low- and middle-income countries. It often affects younger people. Due to delayed diagnosis and poor access to specialized cardiac care, these patients present late with severe disease. Recent global reports show that rheumatic heart disease is still a leading cause of valvular problems around the world, impacting functional status and daily living.<sup>9,10</sup> These epidemiological facts show the importance of effective interventions that address both clinical severity and patient well-being.<sup>11</sup>

Percutaneous transvenous mitral commissurotomy is currently recognized as the treatment of choice for symptomatic severe rheumatic mitral stenosis in patients with favorable valve morphology. Recent evidence and international guidelines support PTMC as an effective treatment option instead of surgical intervention, giving similar clinical outcomes and is generally safe.<sup>12-14</sup> The improvements observed in our study matches with the established role of PTMC in the rheumatic mitral stenosis management.

The increase in mitral valve area was seen following PTMC in our study ( $p < 0.001$ ). Other studies from different centers and populations reported similar improvements in valve area and hemodynamics across the valve.<sup>15-18</sup> These findings show the effectiveness of PTMC in relieving rheumatic mitral obstruction and improving cardiac hemodynamics.

Shabeer *et al.*, reported that most patients get symptomatic improvement after PTMC. The majority of patients showed great relief of symptoms from advanced NYHA class III-IV to NYHA class I-II during early hospital follow-up. In comparison, the improvement in our study was more pronounced, with 100% (35/35) of patients improving from NYHA class III or IV before PTMC to NYHA class 0 to II within one month. Before PTMC, the majority of patients had severe limitations in daily activities. One month after PTMC, all patients showed clear functional improvement. 22(62.9%) improved to NYHA class I, 9 (25.7%) to class 0, and 4 (11.4%) to class II. No patient remained in NYHA class III or IV ( $p < 0.001$ ). The greater improvement observed in this research may be due to careful patient selection, exclusion of unsuccessful procedures, and early follow-up that captured the immediate benefits of valve commissurotomy.<sup>19</sup>

Beyond echocardiographic and functional outcomes, the present study showed a clear improvement in patient-reported quality of life after PTMC. Bhardwaj *et al.*, also reported significant improvement in quality of life after successful PTMC, especially within physical and psychological domains. In consistent with these findings, our study showed a considerable increase in total WHOQOL-BREF score from 52.0 (48.0-57.0) before PTMC to 86.0 (81.0-95.0) post PTMC ( $p < 0.001$ ). Domain-wise analysis revealed significant improvement in physical pre-intervention 15.0 (14.0-15.0) to 25.0 (24.0-27.0) post-intervention, psychological (12.0 (11.0-14.0) to 21.0 (20.0-22.0), social 7.0 (5.0-8.0) to 11.0 (11.0-13.0), and environmental 18.0 (17.0-19.0) to 29.0 (28.0-35.0). domains, all achieving strong statistical significance ( $p < 0.001$ ). The comparatively greater gains observed in social and environmental domains may reflect improved functional independence and early reintegration into daily activities following symptom relief.<sup>8</sup>

In our study, patients showed early improvement in daily activity and quality of life after PTMC. Other

studies also supported by evidence suggest that patients reported benefits of PTMC soon after hemodynamic correction across the valve. Symptomatic relief and return to daily work often come before long-term structural changes in the heart and lung vessels. This emphasizes why early follow-up after the procedure is important.<sup>20,21</sup>

The absence of statistically significant differences in the quality-of-life scores after PTMC across age, gender, and educational status suggests that the benefits of PTMC are experienced broadly across demographic subgroups. This observation is particularly relevant in resource-limited settings and supports the equitable impact of PTMC on early recovery and perceived health status.<sup>22</sup>

#### LIMITATIONS OF STUDY

This study has some limitations that should be noted. It included a small sample size and was conducted at one center. Because of this, the findings may not apply to everyone. The follow-up period was short and covered only the early post-procedural follow-up. Therefore, the improvements in functional status and quality of life for a long time could not be evaluated. We also did not look at factors like income level or how well patients kept taking their medicines. These may have affected how patients reported their quality of life.

#### CONCLUSION

PTMC is a reliable and effective treatment option for patients with severe rheumatic mitral stenosis. Our study shows that it improves the mitral valve area, functional capacity, and patients' perceived quality of life. Patients also experienced symptomatic relief and improvement in the NYHA functional class. These findings show that the importance of PTMC extends beyond echocardiographic outcomes and includes important patient-centered outcomes. Checking the quality of life along with routine tests can give a fuller view of treatment success. It may also support doing the procedure earlier in patients whose daily life is already badly compromised

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#### Authors' Contribution

Following authors have made substantial contributions to the manuscript as under:

SM & MS: Data acquisition, data analysis, critical review, approval of the final version to be published.

HM & HA: Study design, data interpretation, drafting the manuscript, critical review, approval of the final version to be published.

AAUH & AA & ME: Conception, data acquisition, drafting the manuscript, approval of the final version to be published.

Authors agree to be accountable for all aspects of the work in ensuring that questions related to the accuracy or integrity of any part of the work are appropriately investigated and resolved.

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