Original Article
DOI: https://doi.org/10.70749/ijbr.v3i6.1909

INDUS JOURNAL OF BIOSCIENCE RESEARCH
https://ijbr.com.pk/
ISSN: 2960-2793/ 2960-2807

Frequency of Left Atrial Thrombus Among Patients with Mitral Stenosis Undergoing Percutaneous Trans-Septal Mitral Commissurotomy

Asfandiyar Khan[1], Muhammad Asif Iqbal[1], Usama Fahad[1], Roohulamin[1], Muhammad Sohail[2], Hassan Ali[3]

[1]Department of Cardiology, Lady Reading Hospital, Peshawar, Pakistan
[2]Department of Medicine, Lady Reading Hospital, Peshawar, Pakistan
[3]Department of Cardiology, Bacha Khan Medical Complex, Swabi, Pakistan

ARTICLE INFO

Keywords: Mitral stenosis, Left atrial thrombus, Percutaneous trans-septal mitral commissurotomy, Hypertension.

Correspondence to: Muhammad Asif Iqbal,

Department of Cardiology, Lady Reading Hospital, Peshawar, Pakistan
Email: drasifiqbal_175@yahoo.com

Declaration
Authors' Contribution: Asfandiyar Khan: Methodology, Data Collection & Analysis, Drafting, Review. Muhammad Asif Iqbal: Study Conception, Critical Input, Final Approval. Usama Fahad, Roohulamin, Muhammad Sohail: Literature Review.

Conflict of Interest: No conflict of interest.

Funding: No funding received by the authors.

Article History
Received: 05-05-2025 Revised: 03-06-2025
Accepted: 21-06-2025 Published: 08-07-2025

ABSTRACT

Mitral stenosis (MS), most commonly resulting from rheumatic heart disease, predisposes to left atrial thrombus (LAT) formation due to atrial enlargement, stasis of blood flow, and structural remodeling. LAT poses a major risk of systemic embolization and directly influences procedural planning for percutaneous trans-septal mitral commissurotomy (PTMC). This cross-sectional study was carried out in Department of Cardiology, Lady Reading Hospital, Peshawar, between 24 October 2024 and 24 April 2025 to find out the frequency of LAT and related factors in patients under grass root surgery PTMC. Consecutive non-probability sampling was conducted among 133 patients with age 1870 years with symptomatic MS. Baseline demographic and clinical information such as comorbidities, anthropometric measurements, were noted. All the subjects were subjected to pre-procedural transesophageal echocardiography to identify LAT. Data analysis was performed with SPSS version 21 with Stratified analysis used to evaluate relationships between LAT and possible effect modifiers. The average age of the cohort was 45.6 11.8 years in total, with the largest proportion of females (62.4%). The occurrence of LAT was found in 13 individuals (9.8%). Prevalence of LAT was significantly correlated to hypertension (p = 0.03) and BMI >25kg/m 2 (p = 0.04) with no significant correlation with either gender, residence, diabetes or smoking history. These findings stress the importance of extensive pre-procedural screening and mention among modifiable risk factors that can lead to thrombus in patients with MS. Clinicians can streamline procedural safety by means of identifying high risk subsets to minimize embolic complications during PTMC. More research is necessary to determine whether the long-term effects of modifying risk factors influence the prevalence and clinical outcome of LAT in the population.

INTRODUCTION

The major long-term outcome of rheumatic fever (RF) in adults is mitral stenosis, which may also be present as a primary or secondary effect of rheumatic fever in newborns 1. Patients diagnosed with mitral stenosis especially those who experience atrial fibrillation are at a higher risk of getting a blood clot at the left atrium 2, 3. The reason of elevated risk of blood clot development in such people is the changed structure and the enlargement of the left atrium, abnormal blood flow to the atrium, abnormal atrium contraction, its smaller size of the mitral valve area (MVA) and poor work of the endothelium 4.

As per a study, the probability of embolic events is associated with left atrial thrombus 5. Some studies have determined other features that lead to the development of left atrial thrombus in patients with mitral stenosis 6. The treatment approach of patients with mitral stenosis depends on symptoms, degree of stenosis and how suitable the valve is to percutaneous balloon mitral valvuloplasty 7. The transseptal percutaneous balloon dilatation of mitral valve has already been recognized as viable alternative to mitral valve replacement or commissurotomy surgery in a specific patient population with symptomatic mitral stenosis 8.

It is common to find mitral stenosis accompanying left atrial thrombi and the systemic effects of the mitral valve. About 20 percent patients with mitral stenosis who receive diagnosis and develop systemic embolic episodes have normal sinus rhythm 9. Thought to arise mainly as a result of embolization of left atrial debris which gets dislodged during this treatment, these episodes are observed to be fairly common. When a blood clot is dislodged in the surgery, there are possibilities of the left atrial thrombi occurrence 10. The presence of thrombi in the left atrium contraindicates the application of balloon dilatation to the mitral valve 11. A report on the

prevalence of left atrial thrombus (9.5%) of the patients with mitral stenosis who underwent percutaneous trans-septal mitral commissurotomy was reported in 12 12.

Mitral stenosis is a major heart disorder that is mostly related to rheumatic heart disease and whose normal symptoms include narrowing of the opening of the mitral valve to prevent the outflow of blood to the left ventricle. This block causes the left atrium to raise pressure, thus causing it to dilate the atrium and predisposing it to atrial fibrillation. Since very limited literature on this topic is available in the local setting, thus, the aim of the study is to establish prevalence of left atrial thrombus among patients with mitral stenosis who are subjected to percutaneous trans-septal mitral commissurotomy at our health setup. The results of the implemented research will make our healthcare workers realize the considerable impact on clinical practice, which will eventually result in an improved patient selection process, a more professionally executed strategy of the procedures, and ultimately, a safer and more efficient patient treatment process due to mitral stenosis in the form of percutaneous trans-septal mitral commissurotomy.

MATERIAL AND METHODS

This is a cross sectional study which was carried out in the department of Cardiology, Lady Reading Hospital, Peshawar with a minimum period of six months after the approval of the synopsis of the study was passed by the College of Physicians and Surgeons Pakistan (CPSP), i.e. between 24 October 2024 and 24 April 2025. Inclusion of 133 patients was realized, and the sample size was calculated using the WHO sample size calculator predictions on the basis of the estimation that there will be 9.5 percent frequency of Left atrial thrombus presence among patients with mitral stenosis who underwent percutaneous trans septal mitral commissurotomy (PTMC), a 95 percent level of confidence and a 5 percent margin of error. A non probability method of consecutive sampling was used.

Eligible patients were those of both genders aged 18 to 70 years and diagnosed with mitral stenosis based on operational definitions and planned to undergo elective PTMC procedure whereas those with other serious valvular lesions or prior history of thromboembolic events were not included. The ethical approval as required by the human research ethics board of the hospital and the CPSP research department was sought prior to approaching patients that met the inclusion criteria. There was an explanation of study objectives and procedures and informed consent verbally. Registering was done on a structured proforma where baseline demographic and clinical parameters, such as,; age, body mass index (BMI), gender, residence (urban/rural), socioeconomic and employment status, education level, and comorbidities, including hypertension, diabetes mellitus, and smoking history were recorded.

Every patient that was enrolled in the study received the PTMC procedure as per the standard protocol of the department. The catheterization table was used with each patient placed in the supine position under general anesthesia when felt appropriate. Access to femoral veins was provided using Seldinger technique, and a vascular strainer was added. The left atrium was accessed through puncture of the interatrial septum with the use of Brockenbrough needle and trans septal catheter under fluoroscopic and echocardiographic guidance. A guide catheter was inserted and an Inoue balloon catheter was placed over the mitral valve. The balloon was blown up progressively to divide the fused commissures with the photographic feedback to assure the safety and effectiveness of the procedure. All of the procedures were done under the observation of a consultant cardiologist with at least five years of post fellowship experience.

Entry and analysis of data was conducted with the SPSS version 21. The normality of continuous variables age, height, weight, and/or a BMI was tested with the ShapiroWilk test and presented as m + SD or as med with interquartile range. Categorical data including gender, presence or absence of left atrial thrombus, smoking, diabetes, hypertension, residence, socioeconomic and employment status and education level were depicted in frequency and percentage. Potential effect modifiers such as age, BMI, gender, comorbidities and sociodemographic factors were employed in stratification. The Chi square test or Fisher exact test was used after Post stratification and p value of <0.05 was deemed to be statistically significant.

RESULTS

A total of 133 patients with mitral stenosis undergoing percutaneous trans-septal mitral commissurotomy (PTMC) were enrolled. The mean age of the study population was 45.6 ± 11.8 years (range: 18–70 years). Of the participants, 83 (62.4%) were female and 50 (37.6%) were male, yielding a female-to-male ratio of 1.7:1. Baseline demographic and clinical characteristics are summarized in Table 1.

The majority of patients (n = 87; 65.4%) were from rural areas, and 46 (34.6%) resided in urban settings. Hypertension was present in 39 (29.3%) of patients, diabetes mellitus in 21 (15.8%), and a history of smoking in 19 (14.3%). The mean BMI was 24.1 ± 3.8 kg/m^2. Employment status, education level, and socioeconomic indicators are also presented in Table 1.

Table 1

Baseline Demographic and Clinical Characteristics of the Study Population (n = 133)

Variable		n (%) or Mean ± SD
Age (years)		45.6 ± 11.8
Gender	– Male	50 (37.6%)
	– Female	83 (62.4%)
Residence	– Urban	46 (34.6%)
	– Rural	87 (65.4%)
Hypertension		39 (29.3%)
Diabetes Mellitus		21 (15.8%)
Smoking history		19 (14.3%)
BMI (kg/m^2)		24.1 ± 3.8
Employment status	– Employed	42 (31.6%)
	– Unemployed	91 (68.4%)
Education level	– Primary or less	58 (43.6%)
	– Secondary	47 (35.3%)
	– Higher education	28 (21.1%)

Following PTMC, left atrial thrombus (LAT) was detected in 13 patients (9.8%) as confirmed by transesophageal

echocardiography. The frequency of LAT showed no significant association with gender (p = 0.71) or residence (p = 0.48). However, LAT was significantly more common in patients with hypertension (p = 0.03) and in those with BMI > 25 kg/m^2 (p = 0.04). Stratified analysis of LAT occurrence with respect to demographic and clinical factors is provided in Table 2.

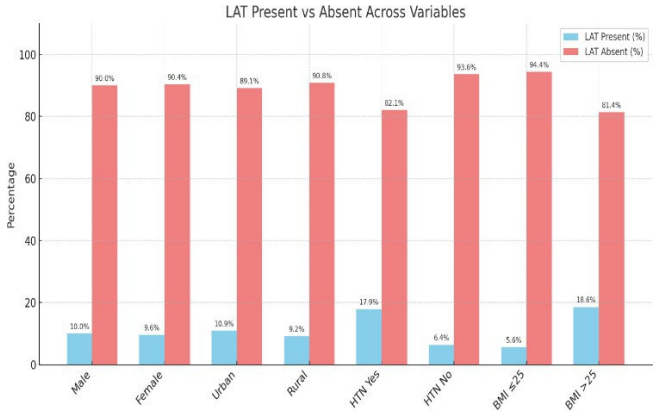
Table 2

Association of Left Atrial Thrombus with Demographic and Clinical Variables

Variable		LAT Present n (%)	LAT Absent n (%)	p-value
Gender	Male (n = 50)	5 (10.0%)	45 (90.0%)	0.71
	Female (n = 83)	8 (9.6%)	75 (90.4%)	
Residence	Urban (n = 46)	5 (10.9%)	41 (89.1%)	0.48
	Rural (n = 87)	8 (9.2%)	79 (90.8%)	
Hypertension	Yes (n = 39)	7 (17.9%)	32 (82.1%)	0.03*
	No (n = 94)	6 (6.4%)	88 (93.6%)	
BMI	≤25 kg/m^2 (n = 90)	5 (5.6%)	85 (94.4%)	0.04*
	>25 kg/m^2 (n = 43)	8 (18.6%)	35 (81.4%)	

*Chi-square or Fisher's exact test as appropriate;
*p < 0.05 considered significant.

Figure: 1



The prevalence of LAT in patients with mitral stenosis undergoing PTMC was **9.8%** in our cohort. Stratified analyses revealed significant associations between LAT and comorbid hypertension as well as higher BMI, indicating that patients with these risk factors were more likely to develop thrombus formation prior to the procedure. No significant association was observed between LAT and gender, residential area, smoking status, or diabetes.

DISCUSSION

The frequency and determinants of left atrial thrombus (LAT) in patients with mitral stenosis patients undergoing percutaneous trans septal mitral commissurotomy (PTMC) was also assessed by this cross sectional study at a tertiary care facility. The prevalence of LAT observed in our cohort was 9.8 percent, similar to the 7-15 percent reported by other studies in comparable patient groups undergoing PTMC. The results emphasize that LAT is a major issue in patients with chronic mitral stenosis which is to be expected in areas with latent access to definite measures.

In our research, it is notable that there was a prominent relationship with LAT and hypertension, not to mention high body mass index. The associations raise the possibility that systemic hemodynamic stress and pro thrombotic metabolic states can act as synergistic factors to enhance stasis and the formation of thrombi within a dilated left atrium, when rheumatic valvular pathology is also present. Another report has also indicated that hypertrophic patients with mitral stenosis evidence superior left atrial dimensions and diminished atrial functionality which are also well-known predisposing factors of LAT. This way, obesity and increased BMI have been associated with chronic inflammation, endothelial dysfunction and hypercoagulability, which have been attributed to the development of thrombus in valvular heart disease.

Interestingly, no significant relationships were obtained between LAT and gender, history of diabetes, and smoking history. These results run counter with some previous studies in which female gender and diabetes were suggested as possible risk factors though possibly, the differences might also be explaining by difference in sample size, demographics or co-morbidity of the severity of stenosis in mitral case. Moreover, lack of a meaningful LAT correlation with residential status (urban, rural) implies that geographic and socioeconomic differences in the ability to access care may play a role, but not a direct role in the formation of thrombus after the risk group is referred to PTMC.

Procedural PTMC in our research was conducted using internationally accepted protocols, all our cases were carried out under fluoroscopic and echo guidance and with cardiologists who have sufficient experience. Relative rare prevalence of LAT may also result due to diligent patient selection and pre procedural optimization. However, the observation of LAT in close to ten percent of patients highlights the need to perform pre procedural transesophageal echocardiography (routine) in order to pick out a high risk individual to prevent catastrophic embolic events that can occur during PTMC.

In sum, these results provide a significant reminder of the importance of rigorous risk stratification in mitral stenosis who are candidates of PTMC, especially those with co-morbidity of hypertension and high BMIs. The existence of these associations warrants future multicenter studies involving larger samples and longitudinal follow up to improve the characterization of such associations and to ascertain the effects of early intervention and aggressive risk factor change on incidence of LAT and events and outcome thereof.

CONCLUSION

This research shows that incidence of left atrial thrombus in patients with mitral stenosis who receive percutaneous trans septal mitral commissurotomy in our tertiary care facility is about one in every ten patients. The strong correlation between LAT and modifiable variables, including hypertension and high BMI, indicates the significance of conducting risk assessment and pre preparative optimization in much greater detail. Transesophageal echocardiography is essential in daily routine of detecting LAT to avoid potentially dangerous actions in high risk patients. These results indicate that intense blood pressure control and weight loss, and timely intervention referral might reduce the occurrence of

thrombus and enhance the overall safety of the procedures. Although there was no substantial correlation with gender, diabetes, or residency, multicenter studies with more extensive numbers and longitudinal monitoring are required to provide some hazard patterns and instruction targeted plans to decrease the LAT incidence and the best possible outcome management in mitral stenosis.

REFERENCES

1. Harky A, Botezatu B, Kakar S, Ren M, Shirke MM, Pullan M. Mitral valve diseases: pathophysiology and interventions. Prog Cardiovasc Dis. 2021;67(15):98-104. https://doi.org/10.1016/j.pcad.2021.03.008
2. Sahin O, Savas G. Relationship between presence of spontaneous echo contrast and platelet-to-lymphocyte ratio in patients with mitral stenosis. Echocardiography. 2019;36(5):924-9. https://doi.org/10.1111/echo.14338
3. Tek M, Efe FK. The association between platelet to lymphocyte ratio and left atrial appendage thrombogenic milieu in patients with non-valvular atrial fibrillation. Ankara Med J. 2022;22(2):260-9. https://doi.org/10.5505/amj.2022.89896
4. Watson T, Shantsila E, Lip GY. Mechanisms of thrombogenesis in atrial fibrillation: Virchow's triad revisited. Lancet. 2009;373(9658):155-66. https://doi.org/10.1016/s0140-6736(09)60040-4
5. Velangi PS, Choo C, Chen KH, Kazmirczak F, Nijjar PS, Farzaneh-Far A, et al. Longterm embolic outcomes after detection of left ventricular thrombus by late gadolinium enhancement cardiovascular magnetic resonance imaging: a matched cohort study. Circulation. Cardiovasc Imaging. 2019;12(11):e009723. https://doi.org/10.1161/circimaging.119.009723
6. Gholoobi A, Poorzand H. Multiple coronary fistula formation associated with a huge left atrial thrombus in rheumatic mitral valve stenosis. J Cardiol Cases. 2014;9(3):124-6. https://doi.org/10.1016/j.jccase.2013.11.008
7. Rmilah AA, Tahboub MA, Alkurashi AK, Jaber SA, Yagmour AH, Al-Souri D, et al. Efficacy and safety of percutaneous mitral balloon valvotomy in patients with mitral stenosis: A systematic review and meta-analysis. Heart Vascul. 2021;33(23):1007-15. https://doi.org/10.1016/j.ijcha.2021.100765
8. Turi ZG. The 40th anniversary of percutaneous balloon valvuloplasty for mitral stenosis: current status. Heart. 2022;6(5):45-9. https://doi.org/10.1016/j.shj.2022.100087
9. Bonow RO, Mann DL, Zipes DP, Libby P. Braunwald's heart disease e-book: A textbook of cardiovascular medicine. Health Sci. 2011;7(5):35-42. https://doi.org/10.1016/b978-1-4377-0398-6.00124-4
10. Galusko V, Ionescu A, Edwards A, Sekar B, Wong K, Patel K, et al. Management of mitral stenosis: a systematic review of clinical practice guidelines and recommendations. Eur Heart J. 2022;8(6):602-18. https://doi.org/10.1093/ehjqcco/qcab083
11. Eng MH, Kargoli F, Wang DD, Frisoli TM, Lee JC, Villablanca PS, et al. Short-and midterm outcomes in percutaneous mitral valve replacement using balloon expandable valves. atheter Cardiovasc Interv. 2021;98(6):1193-203. https://doi.org/10.1002/ccd.29783
12. Gill BU, Abbas T, Haq RU, Qureshi BA, Hashmi KA, Ahmed I, et al. Frequency of left atrial thrombus in patients of mitral stenosis suitable for percutaneous trans-septal mitral commissurotomy. Pak Heart J. 2015;48(1):48-51.