VOLUME - 15, ISSUE - 08, AUGUST - 2026 • PRINT ISSN No. 2277 - 8160 • DOI : 10.36106/gjra

Original Research Paper

General Medicine

ASSOCIATION BETWEEN SERUM FERRITIN LEVELS AND SEVERITY OF RHEUMATIC MITRAL VALVE DISEASE: A CROSS-SECTIONAL OBSERVATIONAL STUDY

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ABSTRACT

Background: Rheumatic heart disease (RHD) continues to be a significant and avoidable contributor to acquired valvular heart disease within low- and middle-income nations, including India. Chronic inflammation plays a central role in disease progression and persistent inflammatory signalling may contribute to the progressive development of valve fibrosis, calcification, and remodelling. Serum ferritin, an acute-phase reactant, may reflect underlying inflammatory activity and disease severity and serves as a significant biomarker **Objectives:** To evaluate the association between serum ferritin levels and echocardiographic severity of rheumatic mitral valve disease. **Methods:** This cross-sectional observational study was conducted in the Department of Cardiology, SRN Hospital, Prayagraj, Uttar Pradesh, from March 2025 to March 2026. A total of 100 adult patients (≥ 18 years) with rheumatic mitral valve disease (mitral stenosis or mixed mitral stenosis and mitral regurgitant lesion) were included.. Clinical, laboratory, and echocardiographic parameters were analyzed and correlated with serum ferritin levels. **Results:** Patients were categorized into mild mitral stenosis (MS) and moderate-to-severe MS groups. Serum ferritin levels were significantly higher in moderate-to-severe MS (416.45 ± 40.16 ng/mL) compared to mild MS (181.25 ± 28.55 ng/mL; $p < 0.001$). Ferritin showed a negative correlation with mitral valve area ($r = -0.327$, $p = 0.001$) and hemoglobin ($r = -0.209$, $p = 0.037$), and a positive correlation with mean mitral valve gradient ($r = 0.200$, $p = 0.046$) and Wilkins score ($r = 0.244$, $p = 0.015$). No significant correlation was observed with ESR or LVEF. **Conclusion:** Serum ferritin is significantly associated with the severity of rheumatic mitral stenosis and correlates with key echocardiographic parameters. It may serve as a useful adjunct biomarker for assessing disease severity.

KEYWORDS :

INTRODUCTION

Rheumatic heart disease continues to be a significant contributor to cardiovascular morbidity in low- and middle-income countries, particularly in South Asia [1]. The mitral valve is most commonly affected, leading to progressive stenosis and/or regurgitation due to chronic immune-mediated inflammation following acute rheumatic fever [2]. This inflammatory process results in fibrosis, commissural fusion, and calcification of valve leaflets over time.

Serum ferritin, beyond its physiological role as an iron storage protein, acts as an acute-phase reactant reflecting systemic inflammation and oxidative stress [3]. Elevated ferritin levels have been associated with adverse outcomes in various cardiovascular conditions, including acute coronary syndrome and heart failure [4,5]. However, its role in rheumatic mitral valve disease remains inadequately explored.

This study aims to evaluate the relationship between serum ferritin levels and echocardiographic severity of mitral valve involvement in RHD.

MATERIALS AND METHODS

Study Design and Setting

A cross-sectional observational study conducted at SRN Hospital, Prayagraj, from March 2025 to March 2026.

Study Population

- Sample size: 100 patients
- Inclusion criteria:
  - Age ≥ 18 years
  - Rheumatic mitral valve disease (MS or MS with MR)

Grouping

- Group A: Mild MS
- Group B: Moderate-to-severe MS

Data Collection

- Clinical evaluation
- Laboratory parameters: ferritin, hemoglobin, ESR, CRP
- Echocardiography:
  - Mitral valve area (MVA)
  - Mean transmitral gradient
  - Wilkins score
  - LVEF

Statistical Analysis

- Mean ± SD for continuous variables
- Pearson correlation
- $p < 0.05$ considered significant

RESULTS

Baseline Characteristics

- Moderate-to-severe MS: 54%
- Mild MS: 46%

Age Distribution

Peak incidence occurred in 41–50 years (20%), consistent with the chronic progressive nature of rheumatic valve damage [6]. Mean age was comparable between groups ($p = 0.704$).

Gender Distribution

Females constituted 51% and males 49%, with no significant association with disease severity, similar to previous studies [7,8].

Inflammation

CRP was reactive in 53% of patients, but no significant association with MS severity was observed ($p = 0.450$). This aligns with evidence suggesting persistent low-grade inflammation in chronic RHD without direct correlation to anatomical severity [9].

Serum Ferritin and Disease Severity

Ferritin levels were significantly elevated in moderate-to-severe MS (416.45 ± 40.16 ng/mL) compared to mild MS (181.25 ± 28.55 ng/mL; $p < 0.001$).

Ferritin reflects systemic inflammation, oxidative stress, and cytokine activation, which contribute to progressive valvular fibrosis and calcification [3,10].

Echocardiographic Correlation

Mitral Valve Area

Significant reduction in MVA was observed in severe disease

($p < 0.001$), with a negative correlation with ferritin ($r = -0.327$). Similar associations between MVA and hemodynamic burden have been reported previously [6].

Mean Gradient

Higher gradients were seen in severe MS, with a positive correlation with ferritin ($r = 0.200$). Transmitral gradient reflects hemodynamic consequences of stenosis and varies with flow conditions [11].

Wilkins Score

Higher Wilkins scores correlated with elevated ferritin ($r = 0.244$), suggesting a link between biochemical inflammation and structural valve damage.

Correlation Summary

Ferritin showed:

- Negative correlation with MVA and hemoglobin
- Positive correlation with gradient and Wilkins score
- No correlation with ESR or LVEF

Preserved LVEF is expected in isolated MS, explaining the lack of association [2].

DISCUSSION

This study demonstrates that serum ferritin is strongly associated with the severity of rheumatic mitral stenosis. Elevated ferritin likely reflects chronic inflammatory and oxidative processes that contribute to progressive valvular damage.

Previous studies have shown increased ferritin levels in cardiovascular diseases and their association with adverse outcomes [4,5]. Our findings extend this relationship specifically to rheumatic mitral valve disease.

The lack of correlation between CRP and severity suggests that single inflammatory markers may not capture chronic disease progression effectively. Ferritin, in contrast, appears to reflect cumulative inflammatory burden.

CONCLUSION

Serum ferritin is significantly associated with:

- Reduced mitral valve area
- Increased transmitral gradient
- Higher Wilkins score

It may serve as a useful adjunct biomarker in assessing disease severity in rheumatic mitral stenosis.

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