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Original Research Article

Heart Involvement in Connective Tissue Diseases: Clinical Perspectives at Tertiary Care Hospital, Telangana State

S. Srilaxmi[1], Cheekoti Santhosh Kumar[2], Nerella Vamshidhar Goud[3]

[1]Associate Professor, Department of General Medicine, Government General Hospital Rajanna, Siricilla
[2]Associate Professor, Department of General Medicine, Government General Hospital Rajanna, Siricilla
[3]Assistant Professor, Department of General Medicine, Government General Hospital Rajanna, Siricilla

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Corresponding author: Dr. Nerella Vamshidhar Goud
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Abstract

Background: Connective tissue diseases (CTDs), particularly rheumatoid arthritis (RA) and systemic lupus erythematosus (SLE), are systemic autoimmune disorders associated with significant cardiovascular morbidity and mortality. Cardiac involvement in CTDs may remain asymptomatic during the early stages, leading to delayed diagnosis and increased risk of adverse cardiovascular outcomes. Early detection through appropriate screening modalities is therefore essential for improving patient prognosis.

Aim: To assess the prevalence and pattern of cardiac involvement in patients with established connective tissue diseases, specifically rheumatoid arthritis (RA) and systemic lupus erythematosus (SLE), attending the outpatient Department of General Medicine at Tertiary Care Hospital, Telangana.

Objectives: To determine the prevalence of cardiac involvement among patients with RA and SLE; to evaluate the spectrum of cardiovascular manifestations in established CTDs; to document cardiac abnormalities using chest radiography, electrocardiography (ECG), and echocardiography; and to highlight the importance of early cardiovascular screening in CTD patients.

Methods: This observational study included patients with established diagnoses of rheumatoid arthritis and systemic lupus erythematosus attending the outpatient department. All patients underwent detailed clinical evaluation and cardiovascular assessment using chest radiography, ECG, and echocardiography to identify cardiac involvement.

Results: Cardiac manifestations identified among CTD patients included pericardial involvement, valvular abnormalities, conduction disturbances, myocardial dysfunction, and pulmonary hypertension. Echocardiography proved to be a valuable non-invasive tool for detecting both symptomatic and subclinical cardiac abnormalities. Cardiovascular involvement was observed more frequently in patients with longer disease duration and increased disease activity.

Conclusion: Cardiac involvement is a common yet often underrecognized complication in patients with connective tissue diseases. Routine cardiovascular evaluation using ECG and echocardiography can facilitate early detection and timely management of cardiac complications, thereby reducing morbidity and improving overall clinical outcomes in CTD patients.

Keywords: Connective tissue diseases; Cardiovascular Manifestations; Left Ventricular Diastolic Dysfunction.
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Introduction

Connective tissue diseases (CTDs) comprise a diverse group of systemic autoimmune disorders characterized by immune dysregulation, production of circulating autoantibodies, and progressive inflammatory damage to multiple organ systems.

Despite advances in diagnostic modalities and the emergence of newer therapeutic agents, CTDs continue to be associated with significant morbidity and mortality owing to chronic systemic involvement and disease-related complications [1].

Cardiovascular involvement is recognized as one of the leading causes of morbidity and mortality among patients with CTDs. Cardiac manifestations may involve the pericardium, myocardium, endocardium, coronary vessels, conduction system, and pulmonary vasculature.

Importantly, cardiovascular disease (CVD) in CTD patients often remains clinically silent during the early stages, presenting only with subtle risk factors before progressing to severe or potentially fatal

complications. Furthermore, cardiovascular abnormalities tend to occur at a younger age in CTD patients when compared to the general population. Consequently, regular cardiovascular risk assessment has been recommended, particularly in patients with systemic lupus erythematosus (SLE) and rheumatoid arthritis (RA) [2-4].

Accelerated atherosclerosis is considered a major contributor to cardiovascular morbidity in CTDs. In addition to traditional cardiovascular risk factors such as hypertension, diabetes mellitus, and dyslipidemia, CTD patients possess several disease-specific factors that significantly increase cardiovascular risk.

These include chronic systemic inflammation, endothelial dysfunction, oxidative stress, altered lipid metabolism, hypercoagulability, platelet activation, and prolonged disease activity [5].

Persistent inflammatory activity contributes to vascular injury and premature atherosclerotic changes, thereby increasing the incidence of ischemic heart disease, heart failure, arrhythmias, and pulmonary hypertension in these patients.

Moreover, pharmacological therapy used in the management of CTDs may further contribute to cardiovascular complications.

Long-term use of glucocorticoids and non-steroidal anti-inflammatory drugs (NSAIDs) has been associated with hypertension, metabolic disturbances, and accelerated cardiovascular risk [6].

Therefore, early identification of cardiovascular involvement and prompt management of associated risk factors are essential to improve long-term outcomes and survival in CTD patients.

The present study was undertaken to assess cardiac involvement in patients diagnosed with rheumatoid arthritis (RA) and systemic lupus erythematosus (SLE) attending the outpatient Department of General Medicine at Tertiary Care Hospital, Telangana.

The study aims to evaluate the prevalence and pattern of cardiovascular manifestations in these patients and to emphasize the importance of early cardiovascular screening in connective tissue diseases.

Aims and Objectives

Aim: To assess the prevalence and pattern of cardiac involvement in patients with established connective tissue diseases (CTDs), specifically rheumatoid arthritis (RA) and systemic lupus erythematosus (SLE), attending the outpatient Department of General Medicine at Tertiary Care Hospital, Telangana.

Objectives

1. To determine the prevalence of cardiac involvement among patients diagnosed with rheumatoid arthritis (RA) and systemic lupus erythematosus (SLE).
2. To evaluate the spectrum of cardiovascular manifestations in patients with established CTDs.
3. To document cardiac involvement using diagnostic modalities including chest radiography, electrocardiography (ECG), and echocardiography.
4. To emphasize the importance of early cardiovascular screening in patients with connective tissue diseases for timely diagnosis and management of cardiac complications.

Material and Methods

This was a hospital-based cross-sectional study conducted to assess cardiovascular involvement in patients with connective tissue diseases (CTDs). The study was conducted in the Department of General Medicine at Tertiary Care Hospital, Telangana State.

A total of 50 patients with established connective tissue diseases were included in the study. Among them, 40 patients were diagnosed with rheumatoid arthritis (RA) and 10 patients were diagnosed with systemic lupus erythematosus (SLE). These patients were compared with 25 healthy controls, comprising 20 controls for RA and 5 controls for SLE from December 2023 to August 2025.

Inclusion Criteria: Patients with established connective tissue diseases diagnosed based on standard clinical and laboratory criteria were included in the study. The following disorders were considered:

1. Systemic lupus erythematosus (SLE) diagnosed according to the SLICC criteria.
2. Rheumatoid arthritis (RA) diagnosed according to the ACR-EULAR 2010 classification criteria.

Only patients fulfilling the above criteria after detailed clinical evaluation and laboratory investigations were enrolled.

Exclusion Criteria

Patients with the following conditions were excluded from the study:

- Congenital heart disease
- Ischemic heart disease
- Valvular heart disease
- Diabetes mellitus

Laboratory Investigations

- Complete blood picture
- Blood urea
- Serum creatinine
- Erythrocyte sedimentation rate (ESR) by Westergren method
- Rheumatoid factor (RF) by quantitative latex fixation assay
- C-reactive protein (CRP) by quantitative latex agglutination method

Statistical Analysis: Descriptive statistics were expressed as mean ± standard deviation for continuous variables and as frequencies and percentages for categorical variables.

Comparison between categorical variables was performed using the Chi-square test.

A p-value of <0.05 was considered statistically significant.

Results

Table 1: Age Distribution in Rheumatoid Arthritis Patients

Age group (Years)	Nos	Total
20-30	9	22.5
31-40	14	35.0
41-50	12	30
51-60	4	10
61-70	1	2.5

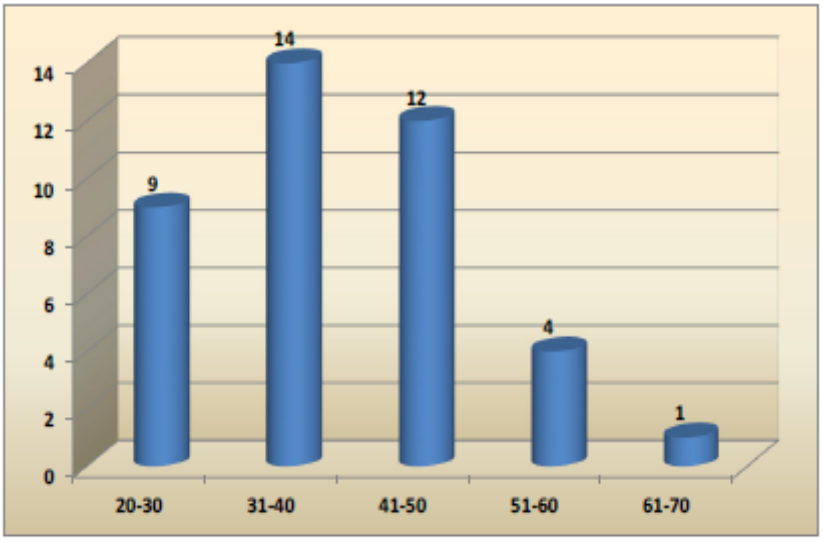

Figure 1: Age Distribution in Rheumatoid Arthritis Patients.

Table 2: Duration of disease in Rheumatoid Arthritis Patients

Duration of Disease	No. of patients	Echocardiac abnormalities	Specifics
<1-2	2	1	Pericardial effusion
> 2-3	10	1	Pericardial thickening with Aortic root dilation
>3-4	14	3	Pericardial Effusion -1 Pulmonary hypertension with TR-1 Pecricardial effusion-1
> 4-5	7	2	LV Diastolic Dysfunction
>5-10	6	3	LV Diastolic Dysfunction
> 10-	1	1	LV Diastolic Dysfunction

Table 3: Baseline characteristics of RA patients and control subjects

Parameters	Study group	Control Group
Sex Ratio	01:02.3	01:02.3
Age (mean)	38.6+-9.89	38.35+-10.35
Duration of disease	4.3+-2.13	--
ESR	34.5+-15.6	24.6+-9.7
TJC	15.75+-5.99	-
SJC	9.1+-6.13	-
RF	31/40 (77.5%)	-
Stein brockers classification		-
I	2	-
II	26	-
III	11	-
IV	4	-

Table-4: Echo-Cardiographic and Doppler Variables in RA Patients and Controls

Echocardiography	Study Group	control group	P value
Left Atrial Diameter	3.10+-0.37	3.15+-0.32	0.4
Aortic Root Diameter	3.10+-0.50	2.97+-0.15	0.28
E-F Slope (cms/sec)			
LV Diastolic Internal Diameter	4.23+-0.47	4.35+-0.35	0.19
LV Systolic Internal Diameter	3.26+-0.53	3.16+-0.60	0.55
Thickness of Septum	0.84+-0.13	0.78+-0.14	0.01
Thickness of Posterior Vall	0.83+-0.17	0.74+-0.15	0.03
LV Mass			
EF%	65.48+-9.07	67.25+-8.14	0.49
E	65.23+-8.01	63.70+-5.16	0.56
A	69.98+-18.33	50.85+-8.01	<0.001**
E/A	0.99+-0.27	1.26+-0.19	<0.001**
S	48.32+-4.01	38.85+-3.07	<0.001**
D	44.08+-7.07	47.95+-1.54	0.006*
S/D	1.12+-0.16	0.81+-0.07	<0.001**
Other cardiac abnormalities			
pericadial effusion	3		
pericadial thickening	1		
valvular abnormalities			
Mitral		MVP 1	
Tricuspid	Tricuspid regurgitation1		
Pulmonary			
Aortic	aortic root dilation		

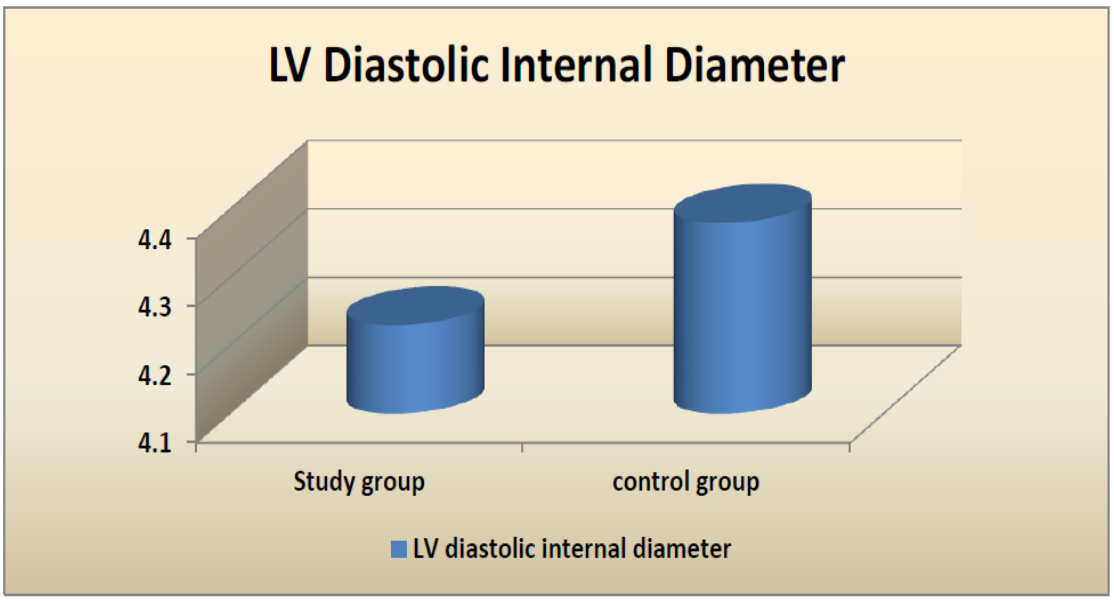

Figure 2: Comparison of Left Diastolic Internal Diameter

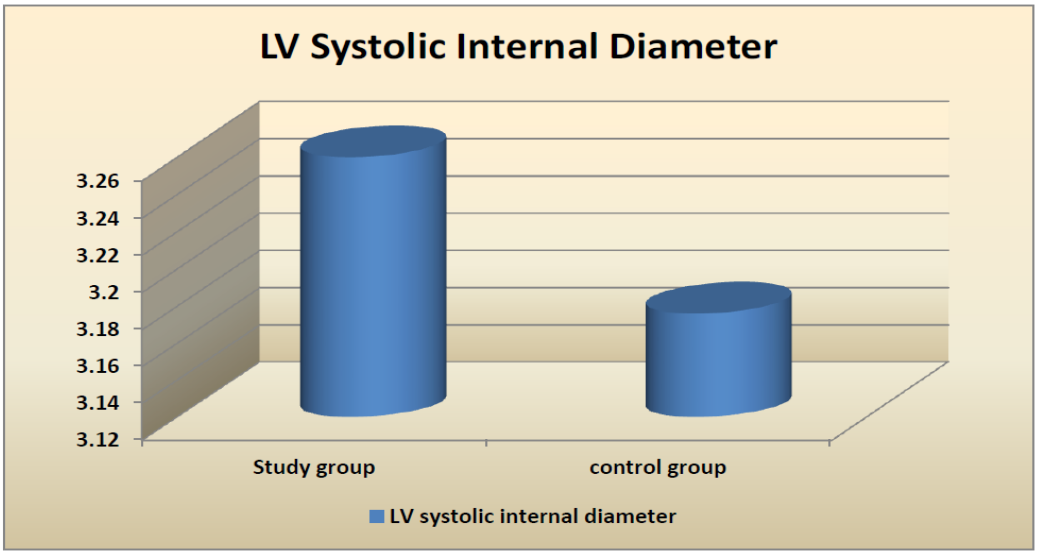

Figure 3: Comparison of Left Systolic Internal Diameter

Table 5: Comparison of RA Patients with and without Cardiac Abnormalities

Parameters	Patients Without Cardiac Abnormalities	Patients With Cardiac Abnormalities	Significance
Age	35.81+-7.99	43.17+-12.17	p=0.01
Sex	M=23% F= 77%	M=43% F= 57%	p=0.03, OR=4.4
Duration of Disease	3.83+-2.93	5.14+- 1.40	p=0.06
TJC	12.21+-5.4	19+- 7.48	p<0.05
SJC 7.	48+- 3.83	10.08+-6.54	p=0.98
ESR	30.85+-15.90	41.43+-4	p=0.04
Subcutaneous Nodules	7.00%	46.00%	p=0.0003, OR= 10
RA Factor	27.00%	86.00%	P=0.04

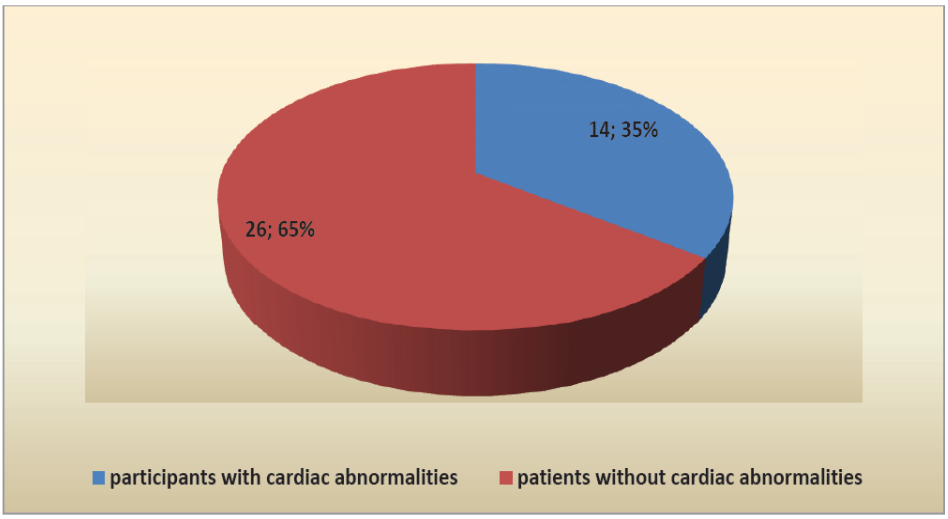

Figure 4: Distribution of Cardiac Abnormalities In Study Group With RA.

Table 6: Age Distribution in SLE participants

	No	(%)
<20	1	10.00
21-30	4	40.00
31-40	4	40.00
41-50	1	10.00
	10	100%

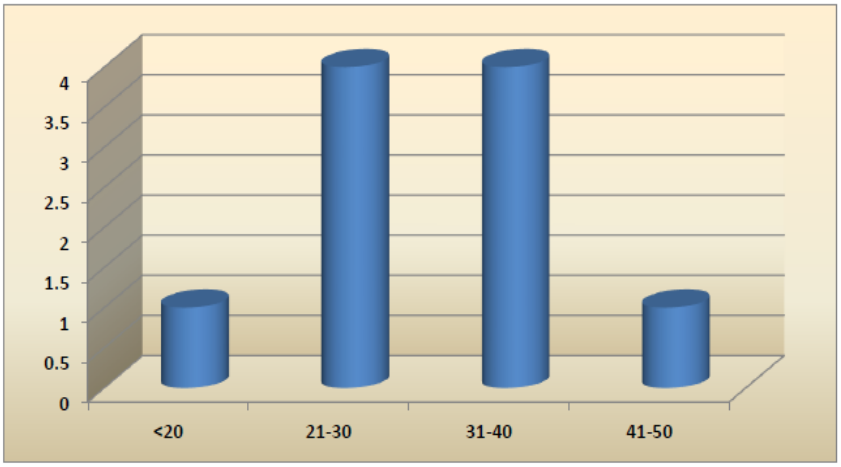

Figure 5: Age Distribution in SLE participants.

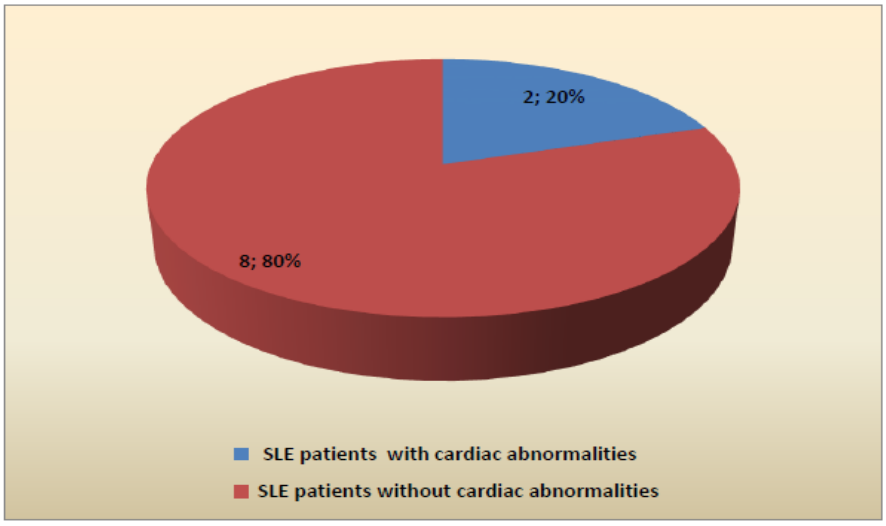

Figure 6: Cardiac Abnormalities in SLE Patients

Discussion

The present study was conducted to evaluate cardiovascular manifestations in patients with connective tissue diseases (CTDs), specifically rheumatoid arthritis (RA) and systemic lupus erythematosus (SLE). The study included 50 patients, comprising 40 patients with RA and 10 patients with SLE, along with 25 healthy controls.

Cardiovascular involvement is a well-recognized extra-articular manifestation of rheumatoid arthritis and contributes significantly to morbidity and mortality. In the present study, cardiac abnormalities were observed in 14 (35%) patients with RA. Left ventricular diastolic dysfunction was the most common abnormality, identified in 8 (20%) patients, while pericardial involvement was observed in 5 (12.5%) patients. Pericardial abnormalities included pericardial effusion in four patients and pericardial thickening with aortic root dilatation in one patient. Tricuspid regurgitation with pulmonary hypertension was observed in one patient. In the control group, only one participant demonstrated mitral valve prolapse. These findings are comparable with previous studies. Maione et al [7]. Reported cardiac involvement in 43% of RA patients, with left ventricular diastolic dysfunction being the most common abnormality (26%). Pericardial involvement and valvular lesions were reported in 9% and 8% of patients, respectively. Similarly, Corrao et al [8] observed cardiac abnormalities in 57.1% of RA patients and highlighted the increased prevalence of ventricular filling abnormalities. Levendoglu et al [9] also demonstrated a significantly higher incidence of left ventricular diastolic dysfunction among RA patients compared with controls. Pulmonary hypertension was identified in one patient (2.5%) in the present study, which is lower than the 21% prevalence reported by Dawson et al [10]. In an Indian study by Kaushal et al [11] cardiac abnormalities were identified in 20% of RA patients, with pericardial involvement being the predominant manifestation, findings that are broadly consistent with the present study. Several epidemiological studies have established the increased cardiovascular risk associated with RA. Solomon et al [12]., in the Nurses' Health Study cohort, demonstrated a twofold increased risk of myocardial infarction in patients with RA. Meta-analyses have further shown that cardiovascular mortality in RA patients is approximately 50% higher than in the general population. The QUEST-RA study13 also reported significant associations between cardiovascular disease, extra-articular manifestations, age, and male gender in RA patients.

In the present study, the mean age of RA patients was 38.6 ± 9.89 years, with a female predominance (male: female ratio of 1:2.3). Cardiac abnormalities were most frequently observed in the 30–50-year age group. These observations are comparable to studies by Maione et al. and Kaushal et al., both of which reported female predominance and increased cardiovascular involvement with advancing age.

Disease duration was found to be significantly associated with cardiac involvement. The mean disease duration among patients with cardiac abnormalities was 5.14 years, while patients with left ventricular diastolic dysfunction had a mean disease duration of 6.25 years. Franco et al [14]. similarly demonstrated a direct relationship between longer disease duration and increased incidence of diastolic dysfunction in RA patients.

Apart from cardiac abnormalities, rheumatoid nodules were observed in eight patients, pleural effusion in one patient, and interstitial lung disease in one patient. Patients with rheumatoid nodules demonstrated a significantly increased incidence of cardiac abnormalities (odds ratio = 10, p = 0.009).

Similar observations were reported by Wislowska et al [15]., who found a strong association between subcutaneous nodules and cardiovascular involvement in RA patients.

Most patients presented with classical symptoms of RA, including joint pain, swelling, and morning stiffness. However, none of the patients had overt symptoms suggestive of cardiac disease, emphasizing the largely subclinical nature of cardiovascular involvement in RA. Similar findings have been reported by Corrao et al [16]. and Franco et al., who concluded that cardiac involvement in RA is frequently silent and detectable only through echocardiographic evaluation.

Tender joint counts were significantly higher among patients with cardiac abnormalities, suggesting a relationship between disease activity and cardiovascular involvement. However, swollen joint counts did not show a significant association. Elevated ESR values were more common in patients with cardiac abnormalities, although the association was not statistically significant. Rheumatoid factor positivity was significantly higher in patients with cardiac involvement, indicating a possible association between seropositivity and cardiovascular manifestations.

Electrocardiographic abnormalities in the present study were nonspecific and included minor ST-T changes and conduction abnormalities. One patient demonstrated left ventricular hypertrophy associated with hypertension. Similar findings were reported by Wislowska et al., who found no significant ECG differences between RA patients and controls.

Chest radiographs were largely unremarkable, except for one patient with rheumatoid pleural effusion. No cases of cardiomegaly or radiologically evident pericardial calcification were observed. Higher Steinbrocker radiological stages were significantly associated with cardiac abnormalities, suggesting a relationship between advanced joint disease and cardiovascular involvement.

Echocardiography proved to be the most sensitive modality for detecting subclinical cardiac abnormalities. Left ventricular diastolic dysfunction was the most frequent finding and was characterized by reduced E/A ratio and altered S/D ratio, indicating impaired ventricular relaxation. Most patients had preserved systolic function and normal left ventricular mass, suggesting early myocardial involvement rather than advanced cardiomyopathy.

Pericardial involvement was identified in four patients, predominantly as small pericardial effusions without significant hemodynamic compromise. Similar observations were reported by Guedes et al [17] and Corrao et al. Aortic root dilatation was noted in one patient, which has also been previously described in RA patients.

In the SLE group, left ventricular diastolic dysfunction was identified in 2 (20%) patients. Cardiovascular involvement is a well-established complication of SLE and contributes significantly to morbidity and mortality. Previous studies have demonstrated that more than 50% of SLE patients develop cardiac abnormalities during the course of the disease. Pericardial disease remains the most common manifestation, although myocardial dysfunction and accelerated atherosclerosis are also frequently encountered. Kalke et al [18]. Demonstrated significant cardiac abnormalities in 17% of SLE patients, including ventricular dysfunction and pericardial effusion. Similarly, Chen et al [19], in a systematic review and meta-analysis, reported significantly reduced E/A ratios and increased prevalence of pericardial effusion among SLE patients, emphasizing the role of echocardiography in early detection. No significant association was observed between the type or duration of treatment and cardiac abnormalities in the present study. None of the patients were receiving selective COX-2 inhibitors. Previous studies have demonstrated cardioprotective effects of disease-modifying antirheumatic drugs (DMARDs), particularly methotrexate and biologic agents. Choi et al [20]. reported a significant reduction in cardiovascular mortality among methotrexate-treated patients. The role of corticosteroids remains controversial, with both adverse cardiovascular effects and potential anti-inflammatory benefits being reported.

Summary

The present study demonstrates that cardiovascular involvement is common in patients with rheumatoid arthritis and systemic lupus erythematosus, even in the absence of overt cardiac symptoms. Left ventricular diastolic dysfunction and pericardial involvement were the most frequent abnormalities identified. Echocardiography was found to be a valuable non-invasive tool for detecting early and subclinical cardiac involvement. The relatively lower incidence of cardiac abnormalities observed in the present study compared with some Western studies may be attributed to shorter disease duration and lower prevalence of extra-articular manifestations among Indian patients. Nevertheless, the findings highlight the importance of routine cardiovascular screening in CTD patients for early detection and timely management of cardiovascular complications, thereby improving long-term outcomes and survival.

Conclusion

1. Cardiovascular involvement was frequently observed in patients with connective tissue diseases, particularly rheumatoid arthritis (RA) and systemic lupus erythematosus (SLE).
2. Cardiac abnormalities were detected in 35% of patients with rheumatoid arthritis and 20% of patients with systemic lupus erythematosus.
3. The most common cardiac manifestation identified in the present study was left ventricular diastolic dysfunction, observed in 20% of RA patients.
4. Other cardiovascular abnormalities included pericardial involvement and pulmonary hypertension.
5. Most patients with cardiac abnormalities were clinically asymptomatic, suggesting that cardiovascular involvement in connective tissue diseases is often subclinical.
6. Cardiac abnormalities in RA patients showed significant association with longer disease duration, higher tender joint counts, subcutaneous nodules, and erosive arthritis.
7. No significant association was observed between cardiac abnormalities and swollen joint counts, erythrocyte sedimentation rate (ESR), seropositivity, or functional class.
8. Chest radiography and electrocardiography showed limited diagnostic utility in detecting early cardiac involvement, whereas echocardiography proved to be an effective non-invasive modality for identifying subclinical cardiovascular abnormalities.
9. Connective tissue diseases may affect multiple cardiac structures including the myocardium, pericardium, valves, pulmonary vasculature, and conduction system, thereby increasing long-term cardiovascular morbidity and mortality.
10. Routine cardiovascular screening, particularly with echocardiographic evaluation, should be considered in patients with RA and SLE for early detection and timely management of cardiac involvement.
11. Early identification and management of cardiovascular risk factors may improve long-term prognosis and reduce cardiovascular complications in patients with connective tissue diseases.

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