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Cardiovascular Manifestations in Systemic Lupus Erythematosus: A Cross-Sectional Study at a Tertiary Care Center

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Abstract

Background: Cardiovascular disease is a major cause of morbidity and mortality in systemic lupus erythematosus (SLE), often underdiagnosed due to subclinical presentations.
Objective: This study aimed to evaluate the prevalence and pattern of cardiovascular involvement in SLE patients using echocardiography, correlating findings with clinical and laboratory parameters.
Methods: In a hospital-based cross-sectional study over 18 months, 100 adult patients diagnosed with SLE based on ACR criteria were enrolled. Detailed clinical evaluation, laboratory investigations, and 2D echocardiographic assessments were performed.
Results: The mean age was 36.77 ± 13.61 years, with the majority in the 18–30 age group. Echocardiographic abnormalities were found in 52% of patients, with valvular defects (44%) and diastolic dysfunction (18%) being the most common. Pericardial effusion and left ventricular hypertrophy (LVH) were seen in 8% and 11% of cases respectively. Laboratory analysis indicated frequent anemia and elevated inflammatory markers (ESR, CRP).
Conclusion: Cardiovascular involvement is prevalent among SLE patients, often without overt clinical symptoms. Regular echocardiographic screening and a multidisciplinary approach are vital for early detection and intervention.

Keywords: Systemic Lupus Erythematosus, Cardiovascular Manifestations, Echocardiography, Diastolic Dysfunction, Valve Abnormalities, Subclinical Cardiac Involvement

INTRODUCTION

Systemic lupus erythematosus (SLE) is a chronic autoimmune condition marked by persistent inflammation, immune complex deposition, and multisystem involvement. Among the various organs affected, the cardiovascular system is a significant contributor to morbidity and mortality, especially in long-term disease courses[1].
Cardiac involvement in SLE encompasses a wide spectrum—from pericardial and myocardial inflammation to valvular disease and coronary artery atherosclerosis. Notably, over 50% of SLE patients exhibit subclinical cardiac abnormalities detectable by echocardiography, despite an absence of overt cardiovascular symptoms[2].
The underlying pathogenesis of cardiovascular manifestations in SLE is multifactorial. Chronic immune-mediated endothelial injury, accelerated atherosclerosis, and increased prevalence of conventional risk factors such as hypertension, dyslipidaemia, and diabetes mellitus collectively contribute to vascular damage[3]. In addition, antiphospholipid antibodies promote a prothrombotic state, enhancing the risk of both valvular lesions and thromboembolic events[4].
SLE predominantly affects women of reproductive age, with a female-to-male ratio nearing 10:1[5]. As a result, young women with SLE are at increased risk for premature cardiovascular events including myocardial infarction, stroke, and heart failure, often occurring before age 45[5].

Valvular abnormalities such as Libman-Sacks endocarditis, diastolic dysfunction, and pericardial effusion are frequently underrecognized due to their often-subtle clinical presentation. Advanced imaging techniques have demonstrated a high prevalence of subclinical myocardial dysfunction among SLE patients[6].

Management is further complicated by the dual role of medications—while corticosteroids, a cornerstone of therapy, may aggravate cardiovascular risk, hydroxychloroquine has demonstrated a protective effect against cardiovascular morbidity in SLE[7].

Given these concerns, early and routine cardiac screening, particularly using echocardiography, is essential for effective management. This study was conducted to assess the prevalence and types of cardiovascular involvement in SLE patients at a tertiary care centre and to identify key clinical and laboratory correlates.

MATERIALS AND METHODS

Study Design and Setting

This hospital-based, cross-sectional observational study was conducted over a period of 18 months (June 2023 to November 2024) in the Department of Medicine at Sri Aurobindo Institute of Medical Sciences and Postgraduate Institute, Indore, Madhya Pradesh, India. Ethical clearance was obtained from the Institutional Ethics Committee, and written informed consent was obtained from all participants in accordance with the Declaration of Helsinki guidelines[8].

Study Population

A total of 100 adult patients (≥18 years) with a confirmed diagnosis of systemic lupus erythematosus (SLE) were enrolled based on the revised American College of Rheumatology (ACR) classification criteria[2]. All included cases were proven SLE patients, confirmed through clinical examination and serological testing. Patients with pre-existing cardiovascular diseases, active malignancies, multiorgan failure, or systemic infections were excluded to avoid confounding factors.

Data Collection

Demographic details (age, sex, socioeconomic status), clinical history (presenting symptoms, duration of illness, treatment history), and laboratory data were collected using a structured proforma. Investigations included complete blood count, erythrocyte sedimentation rate (ESR), C-reactive protein (CRP), serum urea and creatinine, liver function parameters (bilirubin, albumin, globulin), and autoimmune markers including antinuclear antibody (ANA) and anti-double-stranded DNA (anti-dsDNA). Urinalysis was performed to evaluate for proteinuria, hematuria, and urinary sediments[9].

Cardiovascular assessment was done using two-dimensional transthoracic echocardiography (2D ECHO) performed by an experienced cardiologist following a standard protocol. Echocardiographic evaluation included detection of pericardial effusion, valvular abnormalities, left ventricular hypertrophy (LVH), diastolic dysfunction, and any evidence of myocardial involvement such as myocarditis or infarction[10].

Data Management and Statistical Analysis

All collected data were entered into Microsoft Excel and analysed using IBM SPSS Statistics Version 26.0. Descriptive statistics (mean, SD, frequency, percentage) were used to summarize data. Associations between clinical/laboratory features and cardiovascular manifestations were analysed using Chi-square or independent t-tests as appropriate. A p-value of <0.05 was considered statistically significant.

RESULTS

Demographic Profile

A total of 100 patients diagnosed with SLE were enrolled. The age of participants ranged from 18 to 78 years, with a mean age of 36.77 ± 13.61 years. The majority of patients (38%) were in the 18–30-year age group, followed by 25% in the 31–40 range, 17% in the 41–50 range, and 20% above 50 years.

Table 1. Age Distribution of Study Participants (n = 100)

Age Group (Years)	Frequency	Percentage (%)
18–30	38	38.0
31–40	25	25.0
41–50	17	17.0
>50	20	20.0
Total	**100**	**100.0**

Interpretation: The study cohort was predominantly young, consistent with the known epidemiology of SLE which primarily affects women of reproductive age.

Urinary Abnormalities

Urinalysis revealed that 21% of patients had proteinuria, 10% had hematuria, and 30% showed urinary sediments. Normal urine analysis was observed in 39% of patients.

Table 2. Urinary Findings in SLE Patients

Finding	Frequency	Percentage (%)
Proteinuria	21	21.0
Hematuria	10	10.0
Urinary Sediments	30	30.0
Normal Analysis	39	39.0
Total	**100**	**100.0**

Interpretation: Mild renal involvement was present in a subset of patients, although most had preserved renal function.

Laboratory Parameters

Hematologic abnormalities were common, including anemia (mean hemoglobin: 10.15 ± 1.71 g/dL) and leukocytosis. Inflammatory markers such as ESR and CRP were elevated in several patients. Renal and hepatic parameters were largely within normal limits.

Table 3. Summary of Laboratory Parameters

Parameter	Mean ± SD	Range
PT (sec)	13.28 ± 3.47	11.4 – 41.0
INR	1.08 ± 0.29	1.0 – 3.4
Total Bilirubin	0.47 ± 0.30 mg/dL	0.1 – 2.3
Direct Bilirubin	0.03 ± 0.11	0 – 1.0
Indirect Bilirubin	0.56 ± 2.52	0 – 23.0
Serum Protein	6.43 ± 1.45 g/dL	3.2 – 10.1
Albumin	3.27 ± 0.88 g/dL	1.3 – 4.8
Globulin	3.26 ± 0.87 g/dL	1.9 – 5.8
ESR	29.73 ± 13.11	5 – 58 mm/hr
CRP	3.13 ± 8.55 mg/L	0.4 – 76.2
Urea	27.85 ± 19.04 mg/dL	6.0 – 116.0
Creatinine	0.74 ± 0.41 mg/dL	0.3 – 3.0
Hemoglobin	10.15 ± 1.71 g/dL	5.9 – 13.9
Platelet Count	2.66 ± 2.93 lakh/cmm	0.5 – 29.4
WBC Count	6857 ± 4073 /mm³	4500 – 31600

Interpretation: Most patients had laboratory evidence of chronic inflammation and anemia. Hepatic and renal parameters were within acceptable limits for the majority, indicating mild systemic involvement.

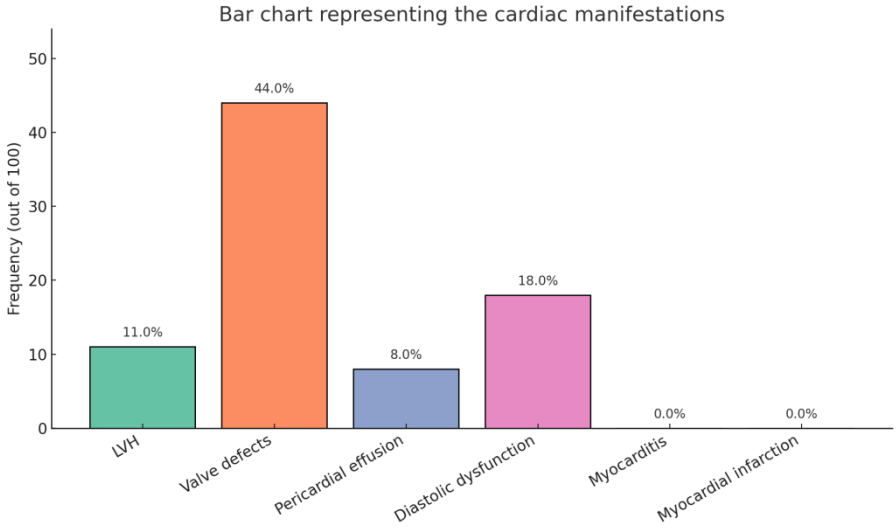
Echocardiographic Findings

Echocardiographic abnormalities were observed in 52% of patients, indicating a high burden of cardiac involvement. Valve defects were the most common abnormality, followed by diastolic dysfunction and left ventricular hypertrophy. No cases of myocarditis or myocardial infarction were identified.

Table 4. Echocardiographic Abnormalities in SLE Patients

Abnormality	Frequency	Percentage (%)
Valve Defects	44	44.0
Diastolic Dysfunction	18	18.0

Abnormality	Frequency	Percentage (%)
Left Ventricular Hypertrophy (LVH)	11	11.0
Pericardial Effusion	8	8.0
Myocarditis	0	0.0
Myocardial Infarction	0	0.0
Any abnormality	**52**	**52.0**



Interpretation: More than half of the study population demonstrated structural or functional cardiac abnormalities, underscoring the subclinical cardiovascular burden in SLE patients. Valvular lesions were predominant, consistent with previous echocardiographic studies in autoimmune populations[11].

DISCUSSION

This study highlights a high prevalence of cardiovascular involvement in patients with systemic lupus erythematosus (SLE), even in the absence of overt symptoms. More than half (52%) of the participants demonstrated echocardiographic abnormalities, with valvular defects being the most frequent. These findings align with recent literature indicating that subclinical cardiac involvement is common and often underdiagnosed in SLE populations[12,13].

Valvular abnormalities, detected in 44% of patients, likely reflect immune complex deposition and non-bacterial thrombotic endocarditis, such as Libman-Sacks lesions. Although commonly asymptomatic, these changes can progress and may predispose to embolic events if unrecognized[14]. Similarly, diastolic dysfunction observed in 18% of patients points to early myocardial involvement, which may occur without a decline in systolic performance. This is supported by recent echocardiographic studies showing that subclinical left ventricular dysfunction is a significant finding in SLE and can predict long-term cardiac outcomes[15].

Left ventricular hypertrophy (LVH), observed in 11% of the cohort, may be attributed to longstanding hypertension, chronic inflammation, or corticosteroid use—all of which are prevalent in SLE patients. Although pericardial effusion was infrequent (8%), its presence warrants regular monitoring, particularly in cases with active disease or serositis.

Hematologic abnormalities such as anemia and leukocytosis were frequently observed and are consistent with inflammatory activity in SLE. Raised ESR and CRP values in several patients further indicate low to moderate systemic inflammation, though CRP tends to be less elevated in SLE flares compared to other autoimmune diseases.

Urinary abnormalities including proteinuria and hematuria in a subset of patients suggest mild renal involvement. While renal function was largely preserved, subtle changes may precede the onset of lupus nephritis, reinforcing the need for close surveillance.

Importantly, many patients with cardiac abnormalities were asymptomatic, reiterating the value of routine echocardiographic screening in all SLE patients, regardless of cardiovascular symptoms. Several recent guidelines emphasize early cardiovascular assessment in autoimmune conditions due to their disproportionate risk for premature atherosclerosis and structural heart disease[16].

This study contributes to the growing evidence supporting comprehensive cardiovascular evaluation in lupus care protocols. The findings also underscore the importance of a multidisciplinary approach involving rheumatologists, cardiologists, and internists to manage SLE-associated cardiac manifestations proactively.

CONCLUSION

This study demonstrates that cardiovascular involvement is highly prevalent among patients with systemic lupus erythematosus, with 52% showing abnormal echocardiographic findings. Valvular abnormalities and diastolic dysfunction were the most common findings, even in patients without clinical cardiovascular symptoms. The presence of structural heart disease in a relatively young population emphasizes the silent but progressive nature of cardiac involvement in SLE.

These findings highlight the importance of incorporating routine echocardiographic screening into the standard care of all SLE patients. Early detection enables timely management of complications and may help mitigate long-term cardiovascular morbidity and mortality. A multidisciplinary approach, involving rheumatology, cardiology, and internal medicine, remains essential to achieving optimal outcomes in this complex patient population.

Limitations

- This study was conducted at a single tertiary care center, which may limit the generalizability of results to broader populations.
- Its cross-sectional design captures data at one point in time and cannot assess causality or disease progression.
- Lack of a healthy control group restricts direct comparison of cardiac findings to non-SLE populations.
- Some echocardiographic findings may have been influenced by treatment status or disease activity not controlled for in this study.

Recommendations

- All patients with SLE should undergo routine echocardiographic screening, even in the absence of cardiac symptoms.
- Longitudinal and multicentric studies are required to better understand the evolution and progression of cardiac abnormalities in lupus.
- Future research should include disease activity indices and medication profiles to refine the risk stratification of cardiovascular complications in SLE.
- Integrated care models involving rheumatologists, cardiologists, and nephrologists are necessary for comprehensive management.

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