Section: Miscellaneous

Original Research Article

EVALUATION OF CARDIOVASCULAR MANIFESTATIONS IN SYSTEMIC LUPUS ERYTHEMATOSUS PATIENTS IN A TERTIARY CARE HOSPITAL

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ABSTRACT

Background: Systemic lupus erythematosus (SLE) is a chronic autoimmune disease that affects multiple organ systems, including the cardiovascular system. Cardiovascular manifestations are a major cause of morbidity and mortality in patients with SLE, with complications such as pericarditis, valvular diseases, myocarditis, and pulmonary hypertension. This study aimed to evaluate the cardiovascular manifestations in patients with SLE attending a tertiary care hospital. **Material and Methods:** This prospective study was conducted over two years on 50 patients with SLE who attended Tirunelveli Medical College. Detailed clinical history and cardiovascular examinations were performed. Routine blood investigations, urine analysis, ANA antibody and dsDNA tests were conducted. ECG, chest radiography, and echocardiography were performed to assess cardiac involvement. **Results:** Cardiovascular manifestations were observed in 80% of the patients. The most common finding was pericarditis or pericardial effusion (38%), followed by valvular heart disease, primarily mitral regurgitation or mitral valve prolapse (28%). Systemic hypertension was noted in 32% of patients and pulmonary hypertension in 16%. Left ventricular dysfunction was observed in 24% of patients, with 14% having systolic and 10% having diastolic dysfunction. Sinus tachycardia was the most common arrhythmia, while conduction abnormalities included the right bundle branch block and left anterior hemiblock. Left ventricular hypertrophy was significantly higher in patients with a disease duration of fewer than five years (p=0.041). **Conclusion:** Cardiovascular manifestations are prevalent in patients with SLE, with pericarditis, valvular disease, and hypertension being the most common findings. Early detection through echocardiography and ECG is crucial for timely intervention and management to reduce morbidity and mortality.

INTRODUCTION

Systemic lupus erythematosus (SLE) is a systemic disease characterised by immune-mediated destruction of target organs through the formation of autoantibodies and immune complexes. The formation of autoantibodies occurs a few years before the onset of the first symptom.[1] Most commonly, women in the reproductive age group, people of both sexes, ages, and ethnic groups are more prone to the development of systemic lupus erythematosus. The female-to-male ratio of involvement of systemic lupus erythematosus is 9:1.[2]

The most common cardiovascular complications of systemic lupus erythematosus are pericarditis and pericardial effusion. Valvular heart diseases are the second most common manifestation, including mitral regurgitation, mitral valve prolapse, and aortic regurgitation.[3] The most serious cardiac involvement is myocarditis and Libman-Sack's endocarditis. The smooth muscles of the blood vessels are also involved and there is acceleration in the development of atherosclerosis.[4]

Patients with systemic lupus erythematosus also have the formation of autoantibodies against phospholipids which makes them more prone to hypercoagulability and acute thrombotic events.[5] Myocardial infarction is the most prevalent primary manifestation of accelerated atherosclerosis. Other cardiac manifestations include arrhythmias, conduction disturbances, pulmonary hypertension, coronary atherosclerosis, and hypertension.[6] The

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third most common cause of mortality in patients with systemic lupus erythematosus is cardiovascular involvement. The cause of mortality in earlier stages is due to active disease and infection and the death in the later stages is due to cardiac involvement.[7]

Aim

This study aimed to evaluate the cardiovascular manifestations in patients with SLE.

MATERIALS AND METHODS

This prospective study was conducted on 50 patients with SLE who attended the Departments of Rheumatology, General Medicine, Dermatology, and OPD at Tirunelveli Medical College for 2 years. The Institutional Ethics Committee (Ref no. 1204/GM/2017) approved this study prior to its initiation. Informed consent was obtained from all patients.

Inclusion Criteria

Patients of both sexes diagnosed with SLE based on the 1997 update of the 1982 American College of Rheumatology classification criteria for SLE were included.

Exclusion Criteria

Patients diagnosed with other associated autoimmune diseases, such as Sjögren's syndrome, rheumatoid arthritis, Hashimoto's thyroiditis, and cardiovascular disease due to other comorbidities, such as diabetes mellitus and hypertension, were also excluded.

Methods

A detailed history was obtained, followed by a thorough clinical examination. A structured proforma was used to document the patient's presenting illness, and all patients underwent a comprehensive physical examination, including a detailed cardiovascular assessment.

Routine blood investigations, including complete haemograms, blood sugar, blood urea, serum creatinine, serum electrolytes, and erythrocyte sedimentation rate (ESR) tests were performed. A complete urine analysis, including urine albumin, urinary deposits, and 24-hour urinary protein estimation, was conducted. All patients underwent antinuclear antibody (ANA) and anti-double-stranded DNA (dsDNA) testing. Cardiac assessment included electrocardiography (ECG) and chest X-ray for all patients, followed by an echocardiographic evaluation.

Statistical Analysis

Data were presented as frequency and percentage. Categorical variables were compared using the Pearson chi-square test. Significance was defined by P values less than 0.05 using a two-tailed test. Data analysis was performed using IBM-SPSS version 21.0.

RESULTS

Among the patients, 46% were aged below 30 years, 34% were between 31-40 years, 16% were between 41-50 years, and 4% were between 51-60 years. Regarding sex, the majority were female (90%), while males were 10%. The duration of illness exceeded five years in 52% of patients, whereas 48% had a disease duration of less than five years.

Regarding cardiovascular parameters, 66% of the patients had a pulse rate below 100 bpm, whereas 34% had a pulse rate > 100 bpm. Hypertension (blood pressure >140/80 mmHg) was observed in 32% of patients, whereas 68% had blood pressure within normal limits.

Renal parameters indicated that 24-hour urinary protein excretion was below 500 mg in 8% of patients, between 500-1000 mg in 70%, and above 1000 mg in 22% of patients. Serological analysis revealed that 92% of the patients tested positive for antinuclear antibodies (ANA), while 8% were negative. Additionally, ds-DNA positivity was noted in 98% of patients, with only 2% testing negative (Table 1).

Table 1: Demographic and clinical characteristics of SLE patients

		N (%)
Age (years)	< 30	23(46%)
	31-40	17(34%)
	41-50	8(16%)
	51-60	2(4%)
Sex	Male	5(10%)
	Female	45(90%)
Duration of disease (years)	> 5	26(52%)
	< 5	24(48%)
Pulse rate (bpm)	< 100	33(66%)
	> 100	17(34%)
Blood pressure (mmHg)	> 140/80	16(32%)
	< 140/80	34(68%)
24-hour urinary protein	< 500	4(8%)
	500-1000	35(70%)
	> 1000	11(22%)
Anti-Nuclear Antibody	Positive	46(92%)
	Negative	4(8%)
DS - DNA	Positive	49(98%)
	Negative	1(2%)

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ST segment depression was observed in 12% of patients, PR segment depression in 6%, and left ventricular hypertrophy (LVH) with a strain pattern in 14% of patients. Sinus tachycardia was recorded in 34%, T-wave inversion in 28%, LVH without strain in 10%, right bundle branch block (RBBB) in 8%, and left anterior hemiblock (LAHB) in 8% of patients.

Pericardial effusion was present in 38% of patients, mitral valve prolapse syndrome (MVPS) in 22%, mitral regurgitation in 28%, aortic regurgitation in 10%, and tricuspid regurgitation in 14%. Pulmonary hypertension, systolic dysfunction, and diastolic dysfunction were detected in 16%, 14%, and 10% of the patients, respectively. Regional and global hypokinesia were observed in 10% of patients (Table 2).

Table 2: Electrocardiographic and Echocardiographic findings in SLE patients

			N (%)
ECG findings	ST depression	Present	6(12%)
		Absent	44(88%)
	PR depression	Present	3(6%)
		Absent	47(94%)
	LVH strain	Present	7(14%)
		Absent	43(86%)
	Sinus tachycardia	Present	17(34%)
		Absent	33(66%)
	T inversion	Present	14(28%)
		Absent	36(72%)
	LVH	Present	5(10%)
		Absent	45(90%)
	RBBB	Present	4(8%)
		Absent	46(92%)
	LABH	Present	4(8%)
		Absent	46(92%)
ECHO findings	Pericardial effusion	Present	19(38%)
		Absent	31(61%)
	MVPS	Present	11(22%)
		Absent	39(78%)
	Mitral regurgitation	Present	14(28%)
		Absent	36(72%)
	Aortic regurgitation	Present	5(10%)
		Absent	45(90%)
	Tricuspid regurgitation	Present	7(14%)
		Absent	43(86%)
	Pulmonary hypertension	Present	8(16%)
		Absent	42(84%)
	Systolic dysfunction	Present	7(14%)
		Absent	43(86%)
	Diastolic dysfunction	Present	5(10%)
		Absent	45(90%)
	Regional hypokinesia	Present	5(10%)
		Absent	45(90%)
	Global hypokinesia	Present	5(10%)
		Absent	45(90%)

Chest pain was present in 38% of patients, dyspnoea in 28%, palpitations in 18%, syncope in 10%, oral ulcers in 40%, seizures in 8%, photosensitivity in 14%, Raynaud's phenomenon in 18%, and arthralgia in 14%.

Regarding clinical signs, malar rash was observed in 36% of patients, arthritis in 12%, elevated jugular venous pressure (JVP) in 22%, loud P2 heart sound in 18%, S3 heart sound in 4%, basal crackles in 6%, and pericardial rub in 18%. An accentuated A2 heart sound was not detected in any of the patients (Table 3).

Table 3: Clinical symptoms and signs in SLE patients

		N (%)	
		Present	**Absent**
Symptoms	Chest pain	19(38%)	31(62%)
	Dyspnoea	14(28%)	36(72%)
	Palpitation	9(18%)	41(82%)
	Syncope	5(10%)	45(90%)
	Oral ulcer	20(40%)	30(60%)
	Seizures	4(8%)	46(92%)
	Photosensitivity	7(14%)	43(86%)
	Raynaud phenomenon	9(18%)	41(82%)
	Arthralgia	7(14%)	43(86%)

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Signs	Malar rash	18(36%)	32(64%)
	Arthritis	6(12%)	44(88%)
	Elevated JVP	11(22%)	39(78%)
	A2	0(0%)	50(100%)
	P2	9(18%)	41(82%)
	S3	2(4%)	48(96%)
	Basal crackles	3(6%)	47(94%)
	Pericardial rub	9(18%)	41(82%)

Regarding ECG findings, LVH was observed only in patients with a disease duration of less than five years, showing a significant difference (p=0.041). No significant difference was observed in ST segment depression (p=0.971), PR segment depression (p = 0.98), sinus tachycardia (p=0.623), T wave inversion (p=0.873), left ventricular conduction abnormalities (p=0.486), right bundle branch block (RBBB) (p=0.481), and left anterior hemiblock (LAHB) (p=0.481).

Echocardiographic findings, showed no significant difference for pericardial effusion (p=0.344), mitral valve prolapse syndrome (p=0.364), mitral regurgitation (p=0.613), aortic regurgitation (p=0.486), tricuspid regurgitation (p=0.594), and pulmonary hypertension (p=0.82), systolic dysfunction (p=0.235), diastolic dysfunction (p=0.765), regional hypokinesia (p=0.091), and global hypokinesia (p=0.196) (Table 4).

Table 4: Comparison of ECG and Echocardiographic findings with disease duration

		Disease duration N (%)		P value
		> 5 years	< 5 years	
ECG findings	ST depression	2(4%)	4(8%)	0.971
	PR	1(2%)	2(4%)	0.98
	LVH	0	7(14%)	0.041
	Sinus tachycardia	5(10%)	12(24%)	0.623
	T inversion	5(10%)	9(18%)	0.873
	LVC	1(2%)	4(8%)	0.486
	RBBB	2(4%)	2(4%)	0.481
	LAHB	2(4%)	2(4%)	0.481
ECHO findings	Pericardial effusion	8(16%)	11(22%)	0.344
	MVPS	5(10%)	6(12%)	0.364
	MR	4(8%)	10(20%)	0.613
	AR	1(2%)	4(8%)	0.486
	TR	3(6%)	4(8%)	0.594
	PHT	3(6%)	5(10%)	0.82
	Systolic dysfunction	2(4%)	3(6%)	0.235
	Diastolic dysfunction	0	5(10%)	0.765
	Regional hypokinesia	3(6%)	2(4%)	0.091
	Global hypokinesia	3(6%)	2(4%)	0.196

DISCUSSION

In our study, most patients were female, with a higher prevalence in younger age groups. The duration of illness was similarly distributed between those with a disease duration of more than five years and those with a shorter duration. Cardiovascular parameters showed that many patients had an elevated pulse rate and hypertension. These findings align with previous studies reporting a higher prevalence of SLE in women and its association with cardiovascular disease. Studies by Siegel et al. and Samanta et al. have reported similar demographic distributions in SLE patients.[8,9]

In our study, the renal parameters showed varying levels of proteinuria, with many patients showing significant urinary protein excretion. Serological analysis revealed a high prevalence of antinuclear antibody (ANA) and anti-double-stranded DNA (dsDNA) positivity among the patients. These findings align with previous studies by Hochberg et al., who highlighted the strong association between ANA and dsDNA positivity with SLE diagnosis and disease activity.[10]

In our study, electrocardiographic findings showed abnormalities such as ST segment and PR depression, LVH, sinus tachycardia, and conduction disturbances such as right bundle branch block and left anterior hemiblock. T-wave inversion and left ventricular conduction abnormalities were also observed. These findings align with Brigden et al. who documented similar electrocardiographic abnormalities in SLE patients, indicating myocardial involvement.[11]

An echocardiographic evaluation revealed that pericardial effusion was the most common cardiac manifestation, followed by mitral valve prolapse, mitral and aortic regurgitation, and tricuspid regurgitation. Pulmonary hypertension and left ventricular dysfunction, including systolic and diastolic dysfunction, have also been reported. Regional and global hypokinesia were observed in some patients. A study by Leung et al. similarly reported pericarditis as the most common cardiovascular manifestation in SLE patients, with incidence ranging from 12% to 47%.[12] The prevalence of mitral regurgitation aligns with

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findings by Sturfelt et al., who documented an incidence of 25%–39%.[13] Pulmonary hypertension occurrence was higher than in previous studies by Fairfax et al. and Hejtmancik et al., where prevalence ranged between 1% and 9%.[14,15]

In our study, common clinical symptoms included chest pain, dyspnoea, palpitations, syncope, and oral ulcers, while Raynaud's phenomenon, arthralgia, and photosensitivity were also reported. The most frequent clinical signs include malar rash, arthritis, and elevated jugular venous pressure. Some patients reported abnormal heart sounds, basal crackles, and pericardial rubs. These findings align with Doberty et al.'s observations that systemic involvement in SLE frequently includes dermatological, musculoskeletal, and cardiovascular symptoms.[16]

In our study, a comparison of disease duration with cardiovascular findings showed that LVH was significantly more prevalent in patients with shorter disease duration, whereas other electrocardiographic and echocardiographic findings did not differ significantly based on disease duration. These results are supported by studies by Mandell et al., suggesting early cardiovascular involvement in SLE may be due to active inflammation, whereas chronic disease progression leads to structural heart changes.[17]

Our study supports the well-documented cardiovascular effects of SLE and highlights the need for regular cardiovascular evaluation. The occurrence of pericarditis, valve involvement, pulmonary hypertension, and impaired left ventricular function highlights the importance of appropriate diagnosis and suitable treatment to prevent long-term effects.

CONCLUSION

Our study concluded that 80% of the patients had cardiovascular manifestations. The most common condition in patients with SLE was pericarditis or pericardial effusion (38% of cases). Valvular heart disease was the second most common cause, with mitral regurgitation or mitral valve prolapse affecting 28% of patients. Systemic and pulmonary hypertension were present in 32% and 16%. Left ventricular dysfunction was observed in 24% of patients, with 14% having systolic and 10% having diastolic dysfunction. The most common arrhythmia was sinus tachycardia, while conduction disturbances included the right bundle branch block and left anterior hemiblock. The cardiovascular manifestations aligned with the literature, except for the higher prevalence of pulmonary hypertension.

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