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Retrospective analysis of pregnancy outcomes in women with systemic lupus erythematosus

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ABSTRACT

Background: Systemic Lupus Erythematosus (SLE) is a complex autoimmune disorder associated with various pregnancy complications. Understanding the relationship between SLE, serological markers, and pregnancy outcomes can improve maternal and neonatal care.

Methods: This retrospective study included 124 pregnant women diagnosed with SLE, with a mean age of 34.4 years ± 6.5 years. Data on demographic details, comorbidities, SLE complications, seropositivity, and pregnancy outcomes were collected and analyzed. Statistical tests were performed to evaluate the association between seropositivity, disease activity markers, and pregnancy and neonatal outcomes.

Results: The most common comorbidities among the participants were kidney stones (8.1%), hypertension (6.5%), and hypothyroidism (5.6%). Notable SLE complications included lupus nephritis (18.5%) and antiphospholipid antibody syndrome (17.7%). Pregnancy complications were miscarriage (40.3%), preterm delivery (16.9%), and preeclampsia (7.2%). Neonatal complications included cardiac issues (2.4%) and neonatal death (2.4%). Significant associations were found between C3 and C4 positivity and neonatal death, and between anti-Ro antibody positivity and cardiac complications in neonates. Elevated ESR levels in mothers were also significantly associated with neonatal cardiac complications. In contrast, no significant association was found between antibody positivity and preterm birth, miscarriage, or preeclampsia.

Conclusion: The study highlights the critical role of specific serological markers and disease activity in influencing pregnancy and neonatal outcomes in SLE patients. Enhanced preconception counseling and personalized monitoring during pregnancy can potentially mitigate risks and improve outcomes for both mothers and neonates.

Keywords: systemic lupus erythematosus, pregnancy complications, serological markers, neonatal outcomes, autoimmune disorder

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INTRODUCTION

Systemic Lupus Erythematosus (SLE) is a complex autoimmune disease characterized by a wide range of symptoms and unpredictable behavior. Clinically, SLE is known for its fluctuating nature, presenting with periods of remission and exacerbation, and can onset either suddenly or gradually [1]. This condition can potentially affect any organ in the body, though it commonly targets the skin, kidneys, serous membranes, joints, and heart. Immunologically, SLE is associated with a spectrum of autoantibodies, with Anti-Nuclear Antibodies (ANA) being the most classically recognized [2].

SLE is relatively prevalent, with an incidence rate that can reach one in every 2,500 individuals in some populations. Like many autoimmune diseases, SLE disproportionately affects f emales, with a female-to-male ratio of approximately 9:1 [3]. Statistically, one in every 700 women of childbearing age is diagnosed with SLE. The disease is more common and severe among African Americans, with one in 245 African American women affected. SLE typically manifests in the second or 3rd decade of life, though it can appear at any age, including early childhood [4].

As an autoimmune or collagen vascular disease, the pathophysiology of SLE remains not fully understood, though it may involve autoantibodies directed against autoantigens. The exact causes of SLE are unclear, but it is believed that hormonal factors (since it is more prevalent in women and potentially linked to estrogen and other hormones), environmental triggers (e.g., sun exposure exacerbating symptoms such as the butterfly rash), and certain medications might play roles in its development [5]. Given the uncertainty surrounding the exact causes of SLE, there is no definitive cure for the disease. Women of childbearing age are nine times more likely to develop SLE than men, often facing significant psychological stress due to the early age of onset and the potential severity of the disease, which can range from asymptomatic to life-threatening [6, 7].

Pregnancy in women with systemic lupus erythematosus poses significant risks to both mother and fetus compared to pregnancies in healthy individuals. The best prognosis occurs when the disease has been under control for at least 6 months prior to conception. Nevertheless, there is evidence that SLE can flare up during pregnancy, necessitating close monitoring of both mother and fetus throughout gestation due to associated risks [8]. Other hormones besides estrogen have also been implicated in the

disease's pathogenesis. Historically, more than half of SLE patients experienced disease flares during pregnancy. These flares can occur at any stage of pregnancy but are often observed immediately after childbirth [9]. Some experts believe that the frequency of disease exacerbation during pregnancy is similar to non-pregnant periods, while others view pregnancy as a significant risk factor [10]. The likelihood of disease flares during pregnancy varies with the disease's activity level at conception, ranging from 7%-33% in women in complete remission to 61%-67% in women with active disease at pregnancy onset. There is no consensus on whether these flares are directly due to pregnancy or merely spontaneous fluctuations coinciding with pregnancy [7].

Pregnancy-related risks for women with SLE can affect various organs, with studies highlighting complications such as eclampsia, preeclampsia, venous thrombosis, myocardial infarction, and pulmonary diseases. Furthermore, SLE increases the likelihood of adverse pregnancy outcomes, including miscarriage, preterm birth, and stillbirth [11].

This retrospective study aimed to evaluate the pregnancy outcomes of women with SLE hospitalized in a tertiary hospital in Kerman, Iran, between 2005 and 2015. By analyzing medical records, we sought to assess the prevalence of SLE among pregnant women and explore the relationships between lupus-related complications, demographic and clinical factors, and the presence of specific autoantibodies. Furthermore, we investigated pregnancy outcomes in patients with and without common SLE-related antibodies. Ultimately, this study intends to contribute to better patient care and provide valuable insights for healthcare providers managing pregnancies complicated by SLE.

MATERIALS AND METHODS

Study settings

This study was designed as a retrospective, descriptive, and analytical cross-sectional analysis of all pregnant women diagnosed with Systemic Lupus Erythematosus (SLE) who were admitted to a tertiary hospital in Zanjan, Iran, over a ten-year period from 2005 to 2015. The medical records of a total of 124 patients were thoroughly reviewed and analyzed. All pregnant women with a confirmed diagnosis of SLE, who were hospitalized during the specified timeframe were included. Records with incomplete or inaccessible data were excluded from the study.

Data collection

Data was collected using a detailed checklist that captured the following information from the medical records:

Demographic information:

Age, delivery mode (normal vaginal delivery or cesarean section), number of children from previous pregnancies, and family history of SLE.

Clinical data:

Presence of comorbidities, pregnancy complications (e.g., preterm delivery, miscarriage, eclampsia, pre-eclampsia, thrombotic thrombocytopenic purpura), and overall pregnancy outcomes.

Neonatal data:

Birth weight, gender, prevalence of complications in neonates, and mortality.

Immunological markers:

Prevalence and levels of seropositivity for common SLE-related markers, including Antinuclear Antibodies (ANA), anti-dsDNA, anti-Ro, anti-La, lupus anticoagulant, IgG, IgM, C3, C4, CH50, and ESR Erythrocyte Sedimentation Rate (ESR).

Statistical analysis

Statistical analyses were performed using SPSS software version 20. Descriptive statistics were used to summarize the data, including frequencies for categorical variables and means with standard deviations for continuous variables. Chi-square test was used to compare the frequency of categorical variables such as delivery mode and presence of complications between the groups. Independent samples t-test was utilized to compare the mean values of continuous variables, such as antibody levels, between the 2 groups (mothers classified based on neonatal complications or pregnancy outcomes). The Mann-Whitney U test was applied for non-normally distributed continuous data. Statistical significance was set at a p-value of less than 0.05.

Ethical considerations

As this study was retrospective in nature, it relied on pre-existing medical records. All data collected was anonymized, ensuring the confidentiality of patient identities and sensitive information. This study was conducted in accordance with the principles of the Declaration of Helsinki and was approved by the Institutional Review Board (IRB) of the hospital. Consent was waived due to the retrospective design, as no new interventions or direct contact with patients was required. All research findings are reported in aggregate form, maintaining the privacy and confidentiality of all participants involved.

RESULTS

A total of 124 patients were included in the study, with a mean age of 34.4 years ± 6.5 years. Other demographic details are presented in table 1. The most common comorbidities among the studied patients were kidney stones (8.1%), hypertension (6.5%), hypothyroidism (5.6%), deep vein thrombosis (4%), and osteoporosis (2.4%). There was a total of 50 miscarriages, 19 stillbirths, and 62 live births, of which 34 (54.8%) were male and 24 (38.7%) were female neonates.

The most prevalent lupus complications among the patients were lupus nephritis (18.5%), antiphospholipid antibody syndrome (17.7%), hematological complications (13.7%), psychiatric complications (6.5%), central nervous system complications (4%), Sjögren's syndrome (4%), avascular necrosis (3.2%), convulsions (2.4%), vasculitis (2.4%), carditis (1.6%), pulmonary complications (1.6%), skin complications (1.6%), Rowell syndrome (0.8%), and ocular complications (0.8%) (Figure 1).

Tab. 1. Demographic information of patients and newborns

Demographic		Patient (n = 124)
Age (yr)		34.4 ± 6.5
Delivery	NVD	18 (14.5%)
	C/S	42 (33.8%)
	Miscarriage	50 (40.3%)
	Unspecified	14 (11.2%)
Familial History of SLE	Positive	9 (7.3%0
	Negative	115 (92.7%)
Comorbidities	Kidney Stones	10 (8.1%)
	HTN	8 (6.5%)
	Hypothyroidism	7 (5.6%)
	DM	6 (4.8%)
	DVT	5 (4%)
	Osteoporosis	3 (2.4%)
	SAH	2 (1.6%)
	CVA	2 (1.6%)
	DJD	2 (1.6%)
	TTP	2 (1.6%)
	Hyperthyroidism	1 (0.8%)
	IBS	1 (0.8%)
	MG	1 (0.8%)
	Hepatitis	1 (0.8%)
	ILD	1 (0.8%)
	Diaphragmatic Paralysis	1 (0.8%)
	Thalassemia	1 (0.8%)
Children		1.5 ± 1.2
		Live Neonate (n = 62)
Gender	Male	34 (54.8%)
	Female	24 (38.7%)
	Ambiguous	4 (6.5%)
Weight (g)		2398.8 ± 1078.3

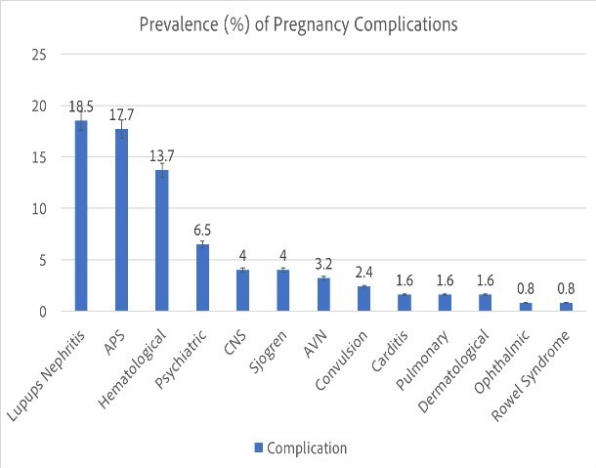

Fig. 1. Prevalence of complications associated with pregnancy in patients (APS: Antiphospholipid Syndrome; AVN: Avascular Necrosis; CNS: Central Nervous System). Note that some patients had more than one complication

The most common pregnancy outcomes among the studied patients were miscarriage (40.3%), preterm delivery (16.9%), preeclampsia (7.2%), eclampsia (1.6%), and thrombotic thrombocytopenic purpura (0.8%) (Figure 2).

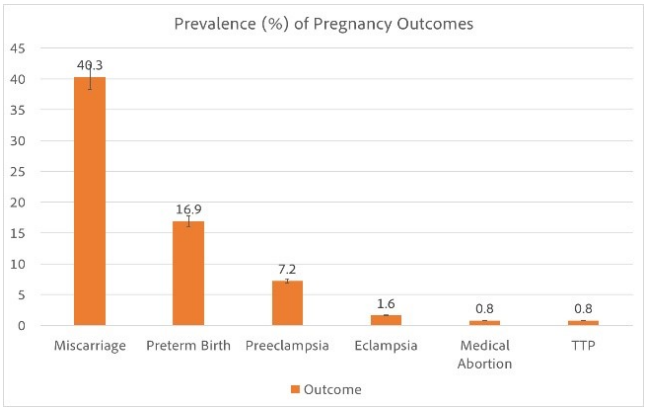

Fig. 2. Prevalence of pregnancy outcomes in patients (TTP: Thrombotic Thrombocytopenic Purpura)

The most frequent neonatal complications observed in the study were neonatal death (2.4%), cardiac complications (2.4%), hydrocephalus (1.6%), and club foot (1.6%) (Figure 3).

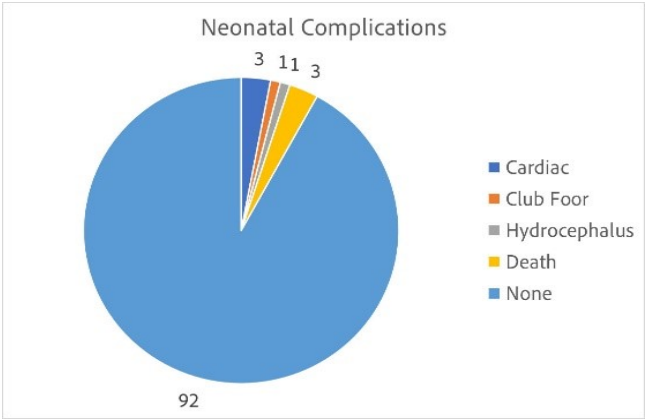

Fig. 3. Prevalence of complications in neonates born to mothers with SLE

Seropositivity rates among the participants were as follows: anti-Ro antibodies (25%), anti-dsDNA antibodies (50.8%), IgM antibodies (8.1%), ANA (91.9%), IgG antibodies (11.3%), anti-La antibodies (7.3%), C3 (16.9%), C4 (23.9%), and CH50 (13.7%). Additionally, the mean serum levels of ESR and lupus antibodies were 29.3 ± 4.4 and 37.5 ± 9.6, respectively, as shown in table 2.

Tab. 2. Prevalence of seropositivity for SLE-related serum biomarkers in patients

Serum Biomarkers		Patient (n = 124)
ANA		114 (91.9%)
Anti-RO		31 (25%)
Anti-dsDNA	Normal	61 (48.6%)
	2-fold	22 (17.7%)
	3-fold	2 (1.6%)
	4-fold	39 (31.5%)
Anti-LA		9 (7.3%)
Immunoglobulin	IgG	14 (11.3%)
	IgM	10 (8.1%)
Lupus antibody (U/mL)		37.5 ± 9.6
Complement component	C3	21 (16.9%)
	C4	42 (23.9%)
	CH50	17 (13.7%)
ESR (mm/h)		29.3 ± 4.4

In patients with live births compared to those with neonatal deaths, C3 and C4 positivity was significantly higher among the neonatal death cases (p=0.001 and p=0.014, respectively). Moreover, CH50 was positive in two cases from mothers of deceased neonates, which also showed a statistically significant difference (p=0.007). No other statistically significant differences were observed (Table 3).

Tab. 3. Prevalence of seropositivity for SLE-related serum biomarkers in patients based on neonate mortality

Serum Biomarkers		Neonate Mortality		p-value
		Live	Dead	
ANA		111 (97.4%)	3 (2.6%)	0.604
Anti-RO		30 (96.8%)	1 (3.2%)	0.736
Anti-dsDNA	0-fold	–	38 (100%)	0.526
	1-fold	–	23 (100%)	
	2-fold	21 (95.5%)	1 (4.5%)	
	3-fold	2 (100%)	–	
	4-fold	37 (94.9%)	2 (5.1%)	
Anti-LA		9 (100%)	–	0.624
Immunoglobulin	IgG	14 (100%)	–	0.437
	IgM	10 (100%)	–	0.531
Complement component	C3	18 (85.7%)	3 (14.3%)	0.001
	C4	39 (92.9%)	3 (7.1%)	0.014
	CH50	15 (88.2%)	2 (11.8%)	0.007
ESR (mm/h)		29.1 ± 2.2	37.3 ± 12.3	0.572

In all 3 neonates with cardiac complications, their mothers had a significantly higher anti-Ro antibody positivity (p=0.002). Additionally, the mothers of these neonates showed significantly elevated ESR levels compared to mothers of neonates without cardiac issues (p=0.036) (Table 4).

Tab. 4. Prevalence of seropositivity for SLE-related serum biomarkers in patients based on the presence of cardiac complications in neonates

Serum Biomarkers		Cardiac Complication		p-value
		Yes	No	
ANA		3 (2.6%)	111 (97.4%)	0.604
Anti-RO		3 (9.7%)	28 (90.3%)	0.002
Anti-dsDNA	0-fold	–	38 (100%)	0.222
	1-fold	–	23 (100%)	
	2-fold	2 (9.1%)	20 (90.9%)	
	3-fold	–	2 (100%)	
	4-fold	1 (2.6%)	38 (97.4%)	
Anti-LA		1 (11.1%)	8 (88.9%)	0.0.078
Immunoglobulin	IgG	–	14 (100%)	0.528
	IgM	–	10 (100%)	0.611
Complement component	C3	1 (4.8%)	20 (95.2%)	0.443
	C4	1 (2.4%)	41 (97.6%)	0.984
	CH50	–	17 (100%)	0.458
ESR (mm/h)		58.6 ± 26.6	28.6 ± 2.1	0.036

No significant statistical association was found between any of the studied antibodies and hydrocephalus in neonates (Table 5).

Tab. 5. Prevalence of seropositivity for SLE-related serum biomarkers in patients based on the presence of hydrocephalus in neonates

Serum Biomarkers		Hydrocephalus		p-value
		Yes	No	
ANA		2 (1.8%)	112 (98.2%)	0.673
Anti-RO		1 (3.2%)	30 (96.8%)	0.41
Anti-dsDNA	0-fold	–	38 (100%)	0.654
	1-fold	–	23 (100%)	
	2-fold	1 (4.5%)	21 (95.5%)	
	3-fold	–	2 (100%)	
	4-fold	1 (2.6%)	38 (97.4%)	
Anti-LA		1 (11.1%)	8 (88.9%)	0.078

Immunoglobulin	IgG	–	14 (100%)	0.528
	IgM	1 (10%)	9 (90%)	0.079
Complement component	C3	1 (4.8%)	20 (95.2%)	0.209
	C4	1 (2.4%)	41 (97.6%)	0.627
	CH50	–	17 (100%)	0.57
ESR (mm/h)		45.5 ± 19.5	29.1 ± 2.2	0.448
Lupus antibody		31	37.7 ± 9.7	0.449

Similarly, no significant association was found between antibody positivity and preterm birth (Table 6).

Tab. 6. Prevalence of seropositivity for SLE-related serum biomarkers in patients based on the occurrence of preterm birth

Serum Biomarkers		Preterm Birth		p-value
		Yes	No	
ANA		1 (0.9%)	113 (99.1%)	0.766
Anti-RO		–	31 (100%)	0.41
Anti-dsDNA	0-fold	3 (16.7%)	15 (83.3%)	0.654
	1-fold	2 (18.2%)	9 (81.8%)	
	2-fold	5 (35.7%)	9 (64.3%)	
	3-fold	2 (100%)	–	
	4-fold	9 (47.4%)	10 (52.6%)	
Anti-LA		–	9 (100%)	0.779
Immunoglobulin	IgG	–	14 (100%)	0.657
	IgM	–	10 (100%)	0.72
Complement component	C3	–	21 (100%)	0.65
	C4	–	42 (100%)	0.472
	CH50	–	17 (100%)	0.689
ESR (mm/h)		5	29.5 ± 2.2	0.32
Lupus antibody		35.1 ± 3.5	35.3 ± 2.9	0.84

No significant statistical association was observed between antibody positivity and miscarriage (Table 7).

Tab. 7. Prevalence of seropositivity for SLE-related serum biomarkers in patients based on the occurrence of miscarriage

Serum Biomarkers		Miscarriage		p-value
		Yes	No	
ANA		20 (34.5%)	38 (65.5%)	0.376
Anti-RO		5 (25%)	15 (75%)	0.369
Anti-dsDNA	0-fold	19 (50%)	19 (50%)	0.911
	1-fold	11 (47.8%)	12 (52.2%)	
	2-fold	7 (32.8%)	15 (68.2%)	
	3-fold	–	2 (100%)	
	4-fold	13 (34.3%)	22 (66.7%)	
Anti-LA		1 (25%)	3 (75%)	0.731
Immunoglobulin	IgG	2 (50%)	2 (50%)	0.437
	IgM	1 (25%)	3 (75%)	0.734
Complement component	C3	4 (30.8%)	9 (69.2%)	0.86
	C4	7 (25.9%)	20 (74.6%)	0.472
	CH50	5 (38.5%)	8 (61.5%)	0.627
ESR (mm/h)		28.8 ± 4.4	29.4 ± 3.8	0.92
Lupus antibody		35.1 ± 3.2	35.4 ± 2.9	0.778

In patients without eclampsia, compared to those with eclampsia, the frequencies of IgM (1 *vs.* 9), IgG (1 *vs.* 13), and CH50 (1 *vs.* 16) antibodies were significantly higher, with these differences being statistically significant (p=0.005, p=0.023, and p=0.012, respectively) (Table 8).

Tab. 8. Prevalence of seropositivity for SLE-related serum biomarkers in patients based on the occurrence of eclampsia

Serum Biomarkers		Eclampsia		p-value
		Yes	No	
ANA		1 (0.9%)	113 (99.1%)	0.766
Anti-RO		–	31 (100%)	0.562
Anti-dsDNA	0-fold	1 (2.6%)	37 (97.4%)	0.871
	1-fold	–	23 (100%)	
	2-fold	–	23 (100%)	
	3-fold	–	2 (100%)	
	4-fold	1 (2.6%)	38 (97.4%)	
Anti-LA		–	9 (100%)	0.779
Immunoglobulin	IgG	1 (7.1%)	13 (92.9%)	0.023
	IgM	1 (10%)	9 (90%)	0.005
Complement Component	C3	1 (4.8%)	20 (95.2%)	0.026
	C4	1 (2.4%)	41 (97.6%)	0.161
	CH50	1 (5.9%)	16 (94.1%)	0.012
ESR (mm/h)		17	29.48 ± 2.21	0.614
Lupus Antibody		39.8	37.48 ± 9.77	0.916

No significant statistical association was found between antibody positivity and preeclampsia (Table 9).

Tab. 9. Prevalence of seropositivity for SLE-related serum biomarkers in patients based on the occurrence of preeclampsia

Serum Biomarkers		Preeclampsia		p-value
		Yes	No	
ANA		2 (1.8%)	112 (98.2%)	0.673
Anti-RO		–	31 (100%)	0.41
Anti-dsDNA	0-fold	1 (2.6%)	37 (97.4%)	0.357
	1-fold	–	23 (100%)	
	2-fold	2 (9.1%)	20 (90.9%)	
	3-fold	–	2 (100%)	
	4-fold	4 (10.3%)	33 (84.6%)	
Anti-LA		–	9 (100%)	0.69
Immunoglobulin	IgG	–	14 (100%)	0.528
	IgM	–	10 (100%)	0.611
Complement component	C3	1 (4.8%)	20 (95.2%)	0.209
	C4	1 (2.4%)	41 (97.6%)	0.627
	CH50	–	17 (100%)	0.57
ESR (mm/h)		26	29.44 ± 2.22	0.614
Lupus antibody		37.47 ± 2.64	37.55 ± 10.02	0.916

DISCUSSION

Systemic Lupus Erythematosus (SLE) poses significant challenges for pregnant women, with various studies highlighting the spectrum of complications and outcomes associated with SLE pregnancies. In our study of 124 pregnant women with SLE, we found that kidney stones (8.1%) and hypertension (6.5%) were the most common comorbidities, while lupus nephritis (18.5%) and antiphospholipid antibody syndrome (17.7%) were the primary lupus-related complications. Notably, miscarriage was the most prevalent adverse pregnancy outcome, occurring in 40.3% of cases, with preterm delivery following at 16.9%. These findings align with existing literature, emphasizing the complex interplay of factors influencing pregnancy outcomes in women with SLE.

Our study's findings align with Lu et al. (2024), who emphasized that active disease in early pregnancy is a significant predictor of adverse neonatal and maternal outcomes in SLE patients. Their research found that disease activity was an independent risk factor for both Adverse Neonatal Outcomes (ANOs) and Adverse Maternal Outcomes (AMOs), highlighting the need for rigorous disease management during pregnancy [12]. Similarly, our study identified significant associations between specific serological markers and adverse pregnancy outcomes, such as elevated C3 and C4 levels correlating with neonatal death and higher anti-Ro antibody positivity linked to neonatal cardiac complications. Clowse et al. (1991) reported a flare-up of SLE symptoms in 60% of pregnancies studied, suggesting a significant risk of disease exacerbation during pregnancy [13]. In contrast, Urowitz et al. (1993) found that disease activity at the onset of pregnancy was not a predictor of flares during pregnancy, although inactive lupus

at conception was associated with a lower risk of flares [14]. This discrepancy highlights the variability in disease course and the importance of individualized patient monitoring and management during pregnancy.

Our findings regarding the high incidence of lupus nephritis and antiphospholipid antibody syndrome are consistent with the observations of McNeil et al. and Sachse et al., who identified antiphospholipid syndrome as a frequent complication leading to miscarriages and stillbirths in SLE pregnancies [15, 16]. Furthermore, the importance of monitoring kidney function and managing hypertension is underscored by our study and others, including the work by Mok et al. (2015), which noted that renal complications are a key prognostic factor for pregnancy outcomes in SLE patients [17].

The increased rate of preterm deliveries observed in our study mirrors the results of Clark et al. and Molad et al., who identified preterm birth as a common pregnancy outcome in women with SLE [18, 19]. This consistency across studies emphasizes the need for proactive measures to mitigate preterm birth risks, such as close fetal monitoring and timely interventions when necessary.

Preeclampsia, identified in 10% of our study population, represents a significant pregnancy complication in women with SLE. Lin et al. (2015) reported a meaningful association between SLE and complications such as preeclampsia and HELLP syndrome, reinforcing the findings of our study [20]. Similarly, a study by Park et al. in 2014 on SLE pregnancies in South Korea also identified preterm birth and antiphospholipid antibody positivity as predictors of adverse outcomes, echoing our results [21].

Interestingly, while some studies, like the one conducted in northwestern Iran, reported no cases of preeclampsia among pregnant women with SLE, the absence of this complication could be attributed to the small sample size of that study [22]. This variation in findings across studies highlights the need for larger, multicentric studies to better understand the true prevalence and risk factors associated with preeclampsia in SLE pregnancies.

Our study's finding of a significant association between anti-Ro seropositivity and neonatal cardiac complications further underscores the critical role of serological markers in predicting neonatal outcomes. This is supported by the work of Buyon et al. (2015), who found that active lupus and positive serological tests during the first trimester were significant risk factors for adverse pregnancy outcomes, including severe disease flares in the second and third trimesters [23].

Overall, our study contributes to the growing body of evidence that SLE pregnancies are associated with a high risk of complications, both maternal and fetal. These include renal and cardiovascular complications, preterm deliveries, and miscarriages. The findings of our study are consistent with those of Andreoli et al. (2015), who reported cardiac complications as the most common fetal complication and disease flare-ups as the most frequent maternal complication during pregnancy in women with SLE [24].

The management of SLE in pregnant women requires a multidisciplinary approach, involving rheumatologists, obstetricians, and pediatricians. Close monitoring of disease activity, kidney function, and blood pressure, along with tailored pharmacological interventions such as low-dose aspirin and heparin in antiphospholipid antibody-positive patients, are essential strategies to optimize pregnancy outcomes. Overall, while advancements in the understanding and management of SLE have improved pregnancy outcomes, women with SLE continue to face a higher risk of adverse outcomes compared to the general population. Future research should focus on identifying biomarkers and developing targeted therapies to reduce these risks and improve the quality of life for both mothers and their children.

CONCLUSION

This study provides valuable insights into the prevalence and impact of various comorbidities and complications associated with Systemic Lupus Erythematosus (SLE) in pregnant women. Among the notable findings, lupus nephritis emerged as the most common lupus-related complication, while miscarriage was the predominant adverse pregnancy outcome. Seropositivity for lupus-related antibodies, particularly anti-Ro, anti-dsDNA, and complement components C3 and C4, showed significant associations with adverse neonatal outcomes, including neonatal death and cardiac complications. These findings underscore the importance of vigilant monitoring and management of SLE and related serological markers in pregnant women to improve maternal and neonatal outcomes.

REFERENCES

1. Siegel CH, Sammaritano LR. Systemic Lupus Erythematosus. JAMA. 2024;331:1480.
2. Fava A, Petri M. Systemic lupus erythematosus: Diagnosis and clinical management. J Autoimmun. 2019;96:1-13.
3. Tian J, Zhang D, Yao X, Huang Y, Lu Q. Global epidemiology of systemic lupus erythematosus: a comprehensive systematic analysis and modelling study. Ann Rheum Dis. 2023;82:351-356.
4. Barber MRW, Drenkard C, Falasinnu T, Hoi A, Mak A. Global epidemiology of systemic lupus erythematosus. Nat Rev Rheumatol. 2021;17:515-532.
5. Ameer MA, Chaudhry H, Mushtaq J, Khan OS, Babar M, et al. An Overview of Systemic Lupus Erythematosus (SLE) Pathogenesis, Classification, and Management. Cureus. 2022;14.
6. Crow MK. Pathogenesis of systemic lupus erythematosus: Risks, mechanisms and therapeutic targets. Ann Rheum Dis. 2023;82:999-1014.
7. Tan Y, Yang S, Liu Q, Li Z, Mu R, et al. Pregnancy-related complications in systemic lupus erythematosus. J Autoimmun. 2022;132:102864-.
8. Dao KH, Bermas BL. Systemic Lupus Erythematosus Management in Pregnancy. Int J Womens Health. 2022;14:199-211.
9. Zhang S, Han X, Liu W, Wen Q, Wang J. Pregnancy in patients with systemic lupus erythematosus: a systematic review. Arch Gynecol Obstet. 2023;308:63-71.
10. Zucchi D, Fischer-Betz R, Tani C. Pregnancy in systemic lupus erythematosus. Best Pract Res Clin Rheumatol. 2023;37:101860.
11. Petri M. Pregnancy and Systemic Lupus Erythematosus. Best Pract Res Clin Obstet Gynaecol. 2020;64:24-30.
12. Lu J, Xu D, Wan Q, Chen H. Pregnancy outcomes and risk factors analysis in patients with systemic lupus erythematous. BMC Pregnancy Childbirth. 2024;24:495.
13. Clowse MEB. Lupus Activity in Pregnancy. Rheum Dis Clin North Am. 2007;33:237-252.
14. Urowitz MB, Gladman DD, Farewell VT, Stewart J, McDonald J. Lupus and pregnancy studies. Arthritis Rheum. 1993;36:1392-1397.
15. McNeil HP. Immunology and clinical importance of antiphospholipid antibodies. Adv Immunol. 1991;49:193-280.
16. Sachse C, Lüthke K, Hartung K, Fricke M, Liedvogel B, et al. Significance of antibodies to cardiolipin in unselected patients with systemic lupus erythematosus: clinical and laboratory associations. Rheumatol Int. 1995;15:23-29.
17. Mok CC, Tse SM, Ho LY. FRI0392 Is Pregnancy a Risk Factor for the Onset of Systemic Lupus Erythematosus (SLE) in Women of the Reproductive Age: A Population Based Case-Control Study? Ann Rheum Dis. 2015;74:569.
18. Clark CA, Spitzer KA, Nadler JN, Laskin CA. Preterm deliveries in women with systemic lupus erythematosus. J Rheumatol. 2003;30:2127-2132.
19. Molad Y, Borkowski T, Monselise A, Ben-Haroush A, Sulkes J, et al. Maternal and fetal outcome of lupus pregnancy: A prospective study of 29 pregnancies. Lupus. 2005;14:145-151.
20. Lin AE, Shehata N, Reich H, Barth D, Laskin C, et al. A complicated pregnancy with preeclampsia, HELLP syndrome, and thrombotic microangiopathy in a woman with lupus and antiphospholipid syndrome. Pregnancy Hypertens. 2015;5:115-119.
21. Park EJ, Jung H, Hwang J, Kim H, Lee J, et al. Pregnancy outcomes in patients with systemic lupus erythematosus: A retrospective review of 62 pregnancies at a single tertiary center in South Korea. Int J Rheum Dis. 2014;17:887-897.
22. Makhdomi K, Ghaffari Moghaddam A, Ahmadpour P, Norouzinia F, Hosseini Arabloo M. Outcome of Pregnancy in Women with Systemic Lupus Erythematosus in Emam Khomeini Hospital - Urmia. Stud Med Sci. 2008;18:42-47.
23. Buyon JP, Kim MY, Guerra MM, Laskin CA, Petri M, et al. Predictors of pregnancy outcomes in patients with lupus: A cohort study. Ann Intern Med. 2015;163:153-163.
24. Andreoli L, Bertsias GK, Agmon-Levin N, Brown S, Cervera R, et al. EULAR recommendations for women's health and the management of family planning, assisted reproduction, pregnancy and menopause in patients with systemic lupus erythematosus and/or antiphospholipid syndrome. Ann Rheum Dis. 2017;76:476-485.