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Introduction

Systemic lupus erythematosus (SLE) is a chronic autoimmune multisystem inflammatory disease that can result in nephritis, cardiovascular issues, hematological disorders, gastrointestinal complications, neuropsychiatric conditions, as well as skin lesions and inflammation of the joints and the membranes

Effect of Stress on Disease Activity among Systemic Lupus Erythematosus Patients: A Descriptive Cross-Sectional Study

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ABSTRACT

Objective: A cross-sectional study examines the effect of stress on disease activity. Study the link between stress and disease activity and investigate the relationship between demographic factors, stress, and SLE disease activity. Examines which demographic features affect these study variables.

Methods and Materials: Stress levels were assessed using the Perceived Stress Scale (PSS-14), while disease activity was measured using SLEDAI-24 scores. Spearman's correlation analyzed links between stress, demographic factors, and clinical indicators. Linear regression evaluated the impact of stress on disease activity. Alcohol use was omitted due to a lack of data. Statistical significance was set at $p < 0.05$.

Findings: The study included 85.7% female participants, averaging 32.96 ± 8.25 years in age. High stress levels were reported by 69.5% of participants (PSS-14: 33.10 ± 8.99), driven by emotional exhaustion and loss of control. Smoking correlated with increased stress ($r = 0.198$, $p = 0.043$), while psychotropic medication reduced inflammation ($r = -0.236$, $p = 0.015$). Severe disease activity was observed in 91.4% of patients (SLEDAI: 30.40 ± 11.96). Stress accounted for 4.1% of disease variations. Data analysis showed a positive correlation between stress and SLE disease activity, with a value of $r = 0.193$ at $p = 0.038$.

Conclusion: Stress greatly increases SLE disease activity in Iraqi patients, with socioeconomic factors like smoking and low income contributing to increased risk. Psychotropic drugs reduce inflammation, which emphasizes the importance of including mental health and socioeconomic assistance in SLE care plans.

Keywords: Systemic Lupus Erythematosus, Stress, Disease Activity.

surrounding the heart and lungs, The symptoms may present either gradually or abruptly, oscillating between active and remission phases (Piga et al., 2018).

Stress correlates with emotions of melancholy, fatigue, and exacerbations of sickness, frequently seen by patients with Systemic Lupus Erythematosus. Healthcare practitioners, especially physicians, can

design a multidisciplinary treatment plan to efficiently deploy resources by identifying individuals at elevated risk for controllable stress (Jolly & Katz, 2022).

Systemic lupus erythematosus can impact individuals of all ages, particularly females in the reproductive age range of 15 to 44 years. Women of all ages are at a far higher risk for systemic lupus erythematosus (SLE) than males, with a ratio of 4 to 12 women for every one man (Billino & Pilz, 2019).

The pathophysiology of systemic lupus erythematosus remains incompletely elucidated; however, numerous environmental and genetic risk factors have been identified (4). The symptoms characterizing the disease arise from tissue inflammation across various organ systems due to immunological dysfunction, including the generation of auto-antibodies (Dörner & Furie, 2019).

Emphasizing the importance of healthcare practitioners taking nonphysical elements into account when creating treatment plans, the study shows the complicated interaction of socioeconomic elements and demographic identities in forming the experiences of SLE patients (Fusco et al., 2024).

Disease activity refers to the manifestations of inflammatory diseases that can potentially be reversed with immunomodulatory therapies. Assessing disease activity is essential due to the strong correlation between heightened disease activity or flare-ups and adverse health outcomes, including irreversible organ damage, increased mortality, and reduced quality of life (García et al., 2023).

One important psychological element influencing disease activity in SLE sufferers is stress. Studies reveal that lifestyle changes, including stress management, can help to lower HR-QoL as well as disease activity (Nadeem et al., 2024).

Stress is common in SLE patients and is linked to depression, tiredness, and flare-ups of the illness (Barber et al., 2021). Stress is connected in SLE patients to flare-ups and disease activity (Dehghan et al., 2023).

The diagnosis of SLE relies on a combination of identifiable immunologic markers, such as anti-nuclear antibodies (ANA), anti-double-stranded DNA (dsDNA) antibodies, and anti-Smith antibodies, alongside diminished complement levels and consistent clinical features (Li et al., 2025).

Alongside lupus nephritis, hematologic issues, constitutional symptoms, and serositis, as many as 90% of patients with systemic lupus erythematosus (SLE) exhibit mucocutaneous and musculoskeletal manifestations (Fanouriakis et al., 2021). The benefits of achieving low disease activity states and remission are well-established (Shi et al., 2021).

Accurate prediction of changes in SLE disease activity may enable enhanced monitoring and preventative therapy. Current clinical, demographic, and serologic indicators demonstrate limited predictive capacity. Consequently, developing new proactive methods for managing this illness is essential (Thanou et al., 2021).

Clinical disease activity changes correlate with shifts in the balance of pro-inflammatory and regulatory soluble mediators, detectable weeks before a clinical flare-up (Thanou et al., 2021).

A soluble mediator score, independent of prior knowledge regarding specific pathway activity in patients, has demonstrated significant predictive capability for imminent flares in both European American and African American SLE patients (Thanou et al., 2021).

Given that individuals with high stress had more disease activity, the intensity of flares, damage, and comorbidities, this is reasonable. Among individuals with less stress, quality of care metrics were satisfied far more (Jolly & Katz, 2022).

The most severe symptoms of the disease, such as renal and neuropsychiatric issues, are prioritized in global disease activity and damage indices. The primary concerns of specialists treating SLE are outlined here. Patients primarily express concerns regarding issues such as pain, fatigue, and their capacity to function in daily activities (Golder et al., 2018; Shi et al., 2021; Thanou et al., 2021).

Stress has been recognized as a possible catalyst for autoimmunity and the exacerbation of symptoms in patients with systemic lupus erythematosus (SLE). The physiological alterations that transpire during stress encompass several catecholamines, hormones, and cytokines, all of which intricately engage with the immune system. Studies suggest that these systems may become dysregulated in individuals with autoimmune disorders (Molina et al., 2022).

Individuals with Systemic Lupus Erythematosus typically exhibit exacerbated symptoms and heightened

disease activity during periods of stress. Individual stressors, including life events, show considerable variability, and there exist contradictory findings about their influence on SLE activity and patient perceptions (Faria et al., 2024).

Consequently, we performed a cross-sectional and descriptive study to examine the effect of stress on disease activity while studying the link between stress and disease activity. The study investigates the relationship between demographic factors, stress, and SLE disease activity.

Methods and Materials

Study Design and Participants

This study was designed as a descriptive cross-sectional study and carried out among SLE patients in the Department of Dermatology and Venereology at Baghdad Teaching Hospital. Examining the correlation between stress levels and disease activity in SLE patients, for the period 26 November 2024 to 5th March 2025. Based on the American College of Rheumatology (ACR) criteria, a clinical diagnosis of SLE (Jolly & Katz, 2022).

A minimum of one disease activity evaluation was documented by a rheumatologist in the six months before the research. Inclusion Criteria: Adults in the 18–65 age range are the target population. The participant must possess the ability to freely sign the informed consent form and understand the requirements of the study. The capacity to offer information about individual psychological support through questionnaires or interviews.

We excluded participants if they had any of the following items:

(a) Patients with serious mental disorders and cognitive issues cannot understand study guidelines or provide accurate information. (b) History of the treatment of mental disease; (c) history of substance abuse; (d) serious illnesses of the heart, liver, kidney, or other main organs; (e) pregnant and lactating women; (f) diagnosed with any disease or disability that would prohibit them from independently completing the questionnaire.

All of the participants gave written informed consent, and the Medical City Department, Baghdad Teaching Hospital, approved the study.

Instruments

The questionnaire includes three sections. The opening section comprises socio-demographic data, including sex, age, marital status, educational level, monthly income (Abdulwahhab et al., 2020), past smoking and drinking habits, and diagnosed mental illness and use of psychotropic medications. The second section is the Perceived Stress Scale (PSS), one of the most widely used stress perception assessment instruments in the world (Lee, 2012).

The third section is the SLE disease activity assessment. The SLEDAI-2K serves as an assessment tool that measures disease activity levels in systemic lupus erythematosus (SLE) patients. It took about 5–15 minutes for participants to complete the questionnaire. The patient's medical records were taken from the hospital's medical database concurrently including the main diagnosis, comorbid diseases (i.e., other CTDs, thyroid diseases, diabetes, hypertension, coronary heart disease and stroke), major organ involvement (i.e., arthritis, renal involvement, interstitial lung disease and pulmonary arterial hypertension), and results of laboratory tests (i.e., serum complement level, anti-dsDNA antibody titer and blood cell counts).

SLE Disease Activity Assessment: The disease activity of SLE was evaluated with rheumatologist-assessed SLEDAI-2K (Gladman et al., 2002). The SLEDAI-2K serves as an assessment tool that measures disease activity levels in systemic lupus erythematosus (SLE) patients. The SLEDAI-2K consists of 24 items covering nine organ systems. The recall period for disease activity is the previous 10 days. The score ranges from 0 to 105 points, with higher values signifying greater disease activity. Based on the scores, four categories were identified for the results: 0–4 represents illness inactivity, 5–9 indicates mild activity, an activity score between 10–14 represents moderate activity, while any score higher than 15 indicates severe activity to the researchers (Cohen et al., 1983).

Stress Assessment: The Perceived Stress Scale (PSS) is one of the most widely used stress perception assessment instruments in the world (Lee, 2012). The scale was originally developed in 1983 by Cohen et al. (20) and was designed to assess the degree of stress people felt in unpredictable, out-of-control, and overloaded situations. The original version of the PPS

had 14 items (PSS-14) with seven negative items (e.g., “Unable to control the important things in your life?”) and seven positive items (e.g., “Confident about your ability to handle your problems?”). Based on factor analysis, the researchers removed the four items with the lowest factor loadings on the PSS-14 to create a shortened 10-item version (PSS-10) (Cohen et al., 1988). An even briefer four-item version (PSS-4) was developed for ease of use when there are time constraints on data collection (e.g., in telephone interviews) (Cohen et al., 1988). The PSS-14 serves as an effective tool to assess stress effects on health results in chronic conditions such as SLE since it helps to understand symptom intensification from stress alongside its impact on overall well-being. The PSS was initially created in English. It consists of 14 items organized into two subscales: the negative subscale (items 1, 2, 3, 8, 11, 12, and 14) and the positive subscale (items 4, 5, 6, 7, 9, 10, and 13). The items are evaluated using a 5-point Likert-type scale, spanning from 0 to 4, with scores on the positive subscale recorded inversely. The scores of the 14 items are aggregated to get the total score of the PSS, with a higher score signifying greater felt stress. The internal consistency reliability, test-retest reliability, criterion validity, concurrent validity, and factorial validity of the PSS-14 have been confirmed (Cohen et al., 1983; Cohen et al., 1988). Two abbreviated versions of the PSS were later developed: the PSS-10 (negative subscale: items 1, 2, 3, 8, 11, and 14; positive subscale: items 6, 7,

9, and 10) and the PSS-4 (single subscale: items 2, 6, 7, and 14) (Cohen et al., 1988).

Data Analysis

Statistical analysis was done with IBM SPSS Statistics for Windows version 24. Categorical variables are presented as frequency and percentage. Categorical variables were compared with a Chi-square test. Multiple linear regression was used to evaluate the association of Stress with disease activity. The Spearman correlation coefficient was used to examine the relationship between psychological stress and demographic and clinical variables. For continuous variables, the t-test was used to compare two groups and ANOVA to compare variables with more than two groups. A p-value of less than 0.05 was considered significant.

Findings and Results

A total of 105 participants enrolled in the study, with most being females who averaged 32.96 years, exhibiting a range of ± 8.25 years in age. A total of 71.4% or 75 participants had marriages ($n = 75$), while half of the sample had obtained college degrees ($n = 53$ or 50.5%). About half of the participants considered their income as “fairly enough” (49.5%, $n = 52$), but 24.8% ($n = 26$) felt they lacked enough money. Patient demographics and Clinical Characteristics are shown in Table 1.

Table 1

Demographic and Clinical Characteristics (N = 105)

Variable	Option	F	%
Sex	Male	15	14.3
	Female	90	85.7
	Total	105	100.0
Age	17- Less than 25	15	14.3
	25- Less than 33	38	36.2
	33- Less than 41	33	31.4
	41- Less than 49	15	14.3
	49- 56	4	3.8
	Total	105	100.0
M \pm SD = 32.96 \pm 8.254			
Marital state	Unmarried	25	23.8
	Married	75	71.4
	Divorce	4	3.8
	Widower	1	1.0
	Total	105	100.0
Level of Education	Read and write	5	4.8
	Primary	14	13.3
	Secondary	28	26.6

Monthly Income	College	53	50.5
	Postgraduate	5	4.8
	Total	105	100.0
	Enough	27	25.7
	Fairly Enough	52	49.5
Smoking	Not Enough	26	24.8
	Total	105	100.0
	Smoke	6	5.7
	Non-smoke	96	91.4
	Used to be a smoker	3	2.9
Do you drink Alcohol	Total	105	100.0
	Yes	0	0
	No	105	100.0
	Total	105	100.0
	Yes	57	54.3
Do you have a chronic illness or physical disabilities	No	48	45.7
	Total	105	100.0
	Yes	4	3.8
	No	101	96.2
	Total	105	100.0
Does the psychiatrist prescribe psychotropic medications	Yes	7	6.7
	No	98	93.3
	Total	105	100.0

F: frequency %: percentage M: mean SD: standard deviation

The relationship between psychological stress and the demographic and clinical variables.

Table 2 lists the results of Spearman's correlation, revealing that psychological stress scores on the PSS scale showed a weak positive relationship with smoking habits ($r = 0.198$, $p = .043$). Consideration of psychological stress revealed no substantial correlations with either demographic characteristics or clinical

measures such as sex ($r = 0.129$, $p = 0.190$), age ($r = 0.128$, $p = 0.192$), marital status ($r = 0.109$, $p = 0.268$), education level ($r = -0.042$, $p = 0.667$), monthly income ($r = 0.062$, $p = 0.532$), chronic physical comorbidities ($r = -0.077$, $p = 0.433$), or mental illness diagnoses ($r =$ Research excluded alcohol-related data because all participants omitted alcohol use information in the cohort survey.

Table 2

The relationship between psychological stress and the demographic and clinical variables.

Variable	Variable	Spearman r coefficient	P-value	Sig
PSS	Sex	.129	.190	NS
	Age	.128	.192	NS
	Marital state	.109	.268	NS
	Level of Education	-.042	.667	NS
	Monthly Income	.062	.532	NS
	Smoking	.198	.043	S
	Do you drink Alcohol?	.	.	.
	Do you have a chronic illness or physical	-.077	.433	NS
	Do you have a mental illness that a psychiatrist diagnosed	.075	.448	NS
	Does the psychiatrist prescribe psychotropic medications	-.080	.417	NS

The relationship between lupus erythematosus activity and the demographic and clinical variables.

The examination using Spearman's correlation technique in Table 3 showed that SLE disease activity recorded through SLEDAI measurements was strongly linked with both patients' monthly earnings and psychiatric drug usage ($r = 0.211$, $p = 0.030$ for both).

The patients' income levels showed a weak positive trend related to disease activity levels, yet patients who received psychotropic medications showed a weak negative response in their SLEDAI scores. The patient variables of sex ($r = -0.028$, $p = .774$) and age ($r = 0.080$, $p = .415$) did not show any relationships with systemic lupus erythematosus (SLE) disease activity (SLEDAI)

scores based on the findings of this study. The association with alcohol was not taken into account, as

previously stated, since no participant reported consuming it.

Table 3

The relationship between lupus erythematosus activity and the demographic and clinical variables.

Variable	Variable	Spearman r coefficient	P-value	Sig
SLEDAI	Sex	-.028	.774	NS
	Age	.080	.415	NS
	Marital state	.138	.161	NS
	Level of Education	-.171	.081	NS
	Monthly Income	.211*	.030	S
	Smoking	.152	.122	NS
	Do you drink Alcohol?	.	.	.
	Do you have a chronic illness or physical	-.089	.365	NS
	Do you have a mental illness that a psychiatrist diagnosed	-.148	.132	NS
	Does the psychiatrist prescribe psychotropic medications	-.236*	.015	S

Individual PSS-14 Items

Table 4 indicated that A high stress level existed because 11 out of 14 items (78.6%) scored between 2.11 and 3.09 on the 14-item Perceived Stress Scale. Survey results primarily showed that participants experienced trouble managing their conditions, along with excessive workload combined with emotional stress. Psychological stress levels were rated as high by 78.6% of participants after evaluating the 14 items, while 7.1% and 14.3% of

respondents indicated moderate stress through two specific items (means 1.77 to 1.80 and 3.09 ± 1.08). The individual assessment items offer substantial support to the quality evaluation since high stress was identified by 69.5% of participants. Results from the study show that SLE patients across the board experience psychological stress; therefore, specialty care services should focus on resolving stress problems to maintain disease control.

Table 4

Individual PSS-14 Items

Question Summary	SD	Mean (M)	Stress Category (Ass.)	Item
Unexpected stressors	1.376	2.24	High (H)	1
Lack of control over important things	1.256	2.45	High (H)	2
Feeling stressed, anxious, or fatigued	1.075	3.09	Very High (VH)	3
Coping with worries	3.210	2.42	High (H)	4
Handling life changes	1.325	2.11	High (H)	5
Confidence in problem-solving	1.350	2.29	High (H)	6
Feeling things go favorably.	1.339	1.77	Moderate (M)	7
Inability to complete tasks	1.253	2.67	High (H)	8
Controlling stressful things	1.187	2.07	High (H)	9
Sense of control	1.172	1.80	Moderate (M)	10
Anger due to uncontrollable events	1.345	2.68	High (H)	11
Concerns about responsibilities	1.319	2.76	High (H)	12
Time management control	1.357	2.15	High (H)	13
Overwhelming difficulties	1.292	2.69	High (H)	14

M: mean, SD: standard deviation

(0-1) Low Stress, (1.1-2) Moderate Stress, (2.1-3) High Stress, (3.1-4) Very high Stress

Total PSS-14 Score Classification

Participant stress levels in Table 5 reached high levels based on their scores from the 14-item Perceived Stress Scale (PSS). The study participants scored 33.10 ± 8.99

on average in the PSS questionnaire, which placed them in the “high stress” group (28.1–42). The study divided stress severity into four distinct categories, starting from low (0–14), continuing through moderate (14.1–28) and

high (28.1–42), and finally very high (42.1–56). The data indicated that 69.5% ($n = 73$) of participants faced high stress, while moderate stress affected 19.0% ($n = 20$), and 8.6% ($n = 9$) experienced very high stress levels, respectively. Only 2.9% ($n = 3$) experienced low stress. The results demonstrate that psychological stress affects most members of this group, since 69.5% of them showed clinically important stress levels. The

participants gave high scores to 11 out of 14 stress scale items that measured pressure stress variables like inability to control important life events and overwhelming difficulties. The mean scores for these items were 2.11 to 3.09. The research results reveal a spectrum of stress-related problems experienced by the study group, primarily affecting psychological stress and feelings of helplessness.

Table 5

Total PSS-14 Score Classification

ASS	Frequency (n)	%	Mean \pm SD	Stress Level
High	3	2.9	-	Low Stress
	20	19.0	-	Moderate Stress
	73	69.5	33.10 \pm 8.988	High Stress
	9	8.6	-	Very High Stress
	105	100.0	-	Total

F: frequency %: percentage M: mean SD: standard deviation

(0-14) Low Stress, (14.1-28) Moderate Stress, (28.1-42) High Stress, (42.1-56) Very high Stress

Distribution of disease activity severity based on Total SLEDAI scores

The Systemic Lupus Erythematosus Disease Activity Index (SLEDAI with 24 items) showed high disease severity among the participants, as shown in Table 6. Most participants ($n = 96$) received a severe activity classification (score >15) based on their mean SLEDAI score of 30.40 ± 11.96 , with a range from 0 to 56. SLEDAI

assessments revealed that most of the patients (97.7%, $n = 102$) had severe disease activity, while only 7.7% ($n = 11$) presented mild to moderate symptoms, and 1.0% ($n = 1$) had no evidence of disease activity. Advanced SLE pathology presented with severe systemic involvement as the main clinical characteristic affecting most of the sample participants.

Table 6

Distribution of disease activity severity based on Total SLEDAI scores (N = 105).

Disease Activity	SLEDAI Score Range	Mean \pm SD	Frequency	Percentage (%)
No activity	0–4	–	1	1.0
Mild activity	5–9	–	3	2.9
Moderate activity	10–14	–	5	4.8
Severe activity	≥ 15	30.40 \pm 11.96	96	91.4
Total	–	–	105	100.0

F: frequency %: percentage M: mean SD: standard deviation

(0-4) No active, (5-9) Mild activity, (10-14) Moderate activity, more than (15) severe activity

The correlation between the disease activity and stress.

Our study found a strong link ($r = 0.193$) between psychological stress scores from the Perceived Stress Scale and systemic lupus erythematosus disease activity measured by the SLEDAI. The results with $p = 0.038$ are

shown in Table 7. Patients who report higher degrees of psychological stress experience worse SLE disease severity, which results in higher SLEDAI scores that average at 30.40 ± 11.96 . The fact that 91.4% of study participants had "severe activity" (SLEDAI >15) makes this relationship very important in the clinical setting.

Table 7

Correlation between SLEDAI and PSS scores (N = 105).

Variable	Variable	r Spearman coefficient	P-value	Sig
PSS	SLEDAI	.193*	.038	S

HS: Highly Significant, S: Significant

Effect of Stress on Disease Activity

The results from regression analysis in Table 8 show that perceived stress creates positive impacts on SLE disease activity ($B = 0.270$, $\beta = 0.203$, $p < .05$). The research indicated that every measure of perceived

stress elevation by 1 unit resulted in a simultaneous SLEDAI score increase of 0.27 while explaining 4.1% of overall disease severity. The results indicate that psychological stress serves as a factor that intensifies the clinical symptoms of SLE.

Table 8

Effect of Stress on Disease activity.

Model		Sum of Squares	Df	Mean Square	F	p-value.	Sig
1	Regression	613.573	1	613.573	4.433	.038 ^a	S
	Residual	14255.817	103	138.406			
	Total	14869.390	104				

$B = 0.270$ (unstandardized coefficient), $\beta = 0.203$ (standardized coefficient).

The study's linear regression analysis in Table 9 showed that psychological stress (PSS) was a major positive factor that affected the levels of activity in SLE. The results in Table 9 indicated that SLEDAI scores augmented by 0.27 units for each point rise in stress perception ($B = 0.270$, $SE = 0.128$, $p = .038$). The

standardized coefficient ($\beta = 0.203$) indicated a low to moderate effect size, showing perceived stress explained 4.1% of disease activity variations. Psychological stress seems to play an active role in making clinically important SLE symptoms worse.

Table 9

Effect of Stress on Disease Activity.

Model		Unstandardized Coefficients		Standardized Coefficients (β)	t	P-value	Sig
		B	Std. Error	Beta			
1	(Constant)	21.463	4.401		4.877	.000	
	PSS	.270	.128	.203	2.106	.038	S

Perceived Stress Scale. B: Unstandardized coefficient; β : Standardized coefficient. $R^2 = 0.041$ (4.1% of variance in SLEDAI explained by perceived stress). $p < .05$ (two-tailed).

Discussion and Conclusion

The research included 105 participants whose primary demographic included women with an average age of 32.96 years ($SD=8.25$) belonging to both young and middle-aged population groups(24). The research participants differed in terms of financial satisfaction because 49.5% ($n=52$) reported adequate earnings, yet 24.8% ($n=26$) faced financial struggles, which negatively impacted health and psychosocial well-being.

These findings are also supported by a study that revealed young women mostly experience SLE. At the same time, prevalence rates and incidence numbers relate to social and economic status, environmental elements, and the demographic characteristics of populations. High-income nations have a higher prevalence of SLE, while socioeconomic factors affect both morbidity rates and mortality differences between ethnic communities (Barber et al., 2021; Tian et al., 2023).

Section two: Descriptive analysis of the effect of stress on disease activity among systemic lupus erythematosus patients

Psychological stress levels were rated as high by 78.6% of participants after evaluating the 14 items, while 7.1% and 14.3% of respondents indicated moderate stress through two specific items (means 1.77 to 1.80 and 3.09 ± 1.08). The results demonstrate psychological stress affects most members of this group since 69.5% of them showed clinically important stress levels. This result agrees with studies that find stress is common in patients with SLE, and quality of life is significantly affected. A high percentage of patients with SLE deal with some degree of distress (Dehghan et al., 2023).

The data indicated that 69.5% ($n = 73$) of participants faced high stress, while moderate stress affected 19.0% ($n = 20$), and 8.6% ($n = 9$) experienced very high stress levels, respectively. Only 2.9% ($n = 3$) experienced low stress. The results demonstrate that psychological stress affects most members of this group, as 69.5% of them showed clinically significant stress levels. Studies also support these findings, showing elevated mental stress among lupus patients. The association between stress leads to depression as well as fatigue and disease flares that result in diminished quality of life across physical, psychological, environmental, and social domains (Dehghan et al., 2023; Jolly & Katz, 2022).

Longitudinal studies indicate that heightened perceived stress is independently correlated with worse disease activity and higher symptom load, underscoring the necessity for stress management strategies (Patterson et al., 2023).

The previous analysis showed that most of the 49.5% studied patients experienced moderate stress, while 34% reported mild stress, but the majority of 55% demonstrated insufficient disease coping capabilities (Mokbel et al., 2024).

The Systemic Lupus Erythematosus Disease Activity Index (SLEDAI with 24 items) showed high disease severity among the participants. Most participants ($n = 96$) received a severe activity classification (score >15) based on their mean SLEDAI score of 30.40 ± 11.96 , with a range from 0 to 56. The SLEDAI tests showed that most of the patients (97.7%, or 102) had severe disease activity. Only 7.7% (or 11) had mild to moderate symptoms,

and 1.0% (or 1) had no signs of disease activity. This agrees with the studies found. A high SLEDAI score at the start of the disease was a favorable indicator of future comorbidities and damage because it meant the disease was very active. The severity of the disease activity measured at diagnosis was linked to adverse outcomes (Mokbel et al., 2024), which aligns with the participants' reported severity.

The average SLEDAI-2K score from another study showed that people with active SLE had a moderate level of disease activity. The level of disease severity seen in SLE patients is different from the results of our study, which show that SLE disease severity varies by population (Dyball et al., 2024).

Our study found a strong link ($r = 0.193$) between psychological stress scores from the Perceived Stress Scale and systemic lupus erythematosus disease activity measured by the SLEDAI. This link was significant at the p-value of 0.038. Patients who report higher degrees of psychological stress experience worse SLE disease severity, which results in higher SLEDAI scores that average at 30.40 ± 11.96 . The fact that 91.4% of study participants had "severe activity" (SLEDAI >15) makes this relationship critical in the clinical setting. A meta-analysis also supports these findings: there is a strong link between SLE disease activity and psychosomatic symptoms like depression, anxiety, and stress ($r = 0.42$ with $p < 0.001$) (Mudenda et al., 2022; Pratama & Murni, 2025).

Additionally, A new study indicates that neuropsychiatric systemic lupus erythematosus (NPSLE) is very complicated and needs to be diagnosed quickly so that symptoms can be managed. The finding is important because psychological factors may affect how the disease progresses (Turek et al., 2024), and this supports the study results.

The results indicate that psychological stress serves as a factor that intensifies the clinical symptoms of SLE. The study's linear regression analysis revealed that psychological stress (PSS) was a major positive factor that affected the levels of activity in SLE. These findings are also supported by a study showing that psychological stress produces a direct connection with SLE disease activity, which demonstrates how stress promotes symptom intensification (Pratama & Murni, 2025).

Another research study also indicates that SLE patients commonly face significant psychological

distress because pathological stress affects 42.2% of these patients (Faria et al., 2024).

Section three: association between the effect of stress on disease activity and patients' demographic characteristics

The current study revealed that stress was significantly associated with disease activity in patients with systemic lupus erythematosus. Those who had psychological stress scores on the PSS scale showed a weak positive relationship with smoking habits ($r = 0.198$, $p = .043$). These findings are also supported by a study that revealed a significant correlation between smoking behavior and stress levels (34). Higher stress sufferers are more likely to be smokers or to smoke more often (Zakiyah et al., 2023).

SLE disease activity recorded through SLEDAI measurements was strongly linked with both patients' monthly earnings and psychiatric drug usage ($r = 0.211$, $p = 0.030$ for both). These findings are also supported by a study indicating that patients on psychotropic medication maintained weak negative correlations with SLEDAI scores, suggesting better mental health (36) may translate into better illness control and reporting capacity (Elfar et al., 2024).

The patients' income levels showed a weak positive trend related to disease activity levels, yet patients who received psychotropic medications displayed a weak negative response in their SLEDAI scores. A study also supports these findings, demonstrating a correlation between lower income and higher damage ratings in individuals with systemic lupus erythematosus (Andrade Teixeira et al., 2017).

The present study exhibited specific limitations. The study was done at a single center, so the results lack generalizability. Secondly, the limited sample size may not accurately represent the entire population. Thirdly, there was no assessment of the relationship between the drugs used for SLE therapy and stress. Finally, individuals with comorbidities were not evaluated for their impact on illness severity and stress.

This study confirms that psychological stress creates an important relationship with disease activity levels among Iraqi patients who have systemic lupus erythematosus (SLE). 69.5 percent of participants who experienced heightened stress levels reported increased SLEDAI scores, which demonstrates how stress negatively impacts disease severity.

The study identified smoking behavior and income level as two risk factors that health professionals can improve, whereas treatment with psychotropic drugs helped the patients reduce their disease inflammation levels. The results of regression analysis demonstrated that psychological stress contributes to 4.1% of SLE disease activity variance, which establishes stress as a meaningful but minimal factor for worsening the disease. Research data indicate that mental stress influences SLE disease activity and reveal that low-resource patients experience significant psychological distress.

Healthcare providers must integrate mindfulness along with cognitive-behavioral therapy into Iraqi SLE patients' care plans since these interventions prove essential for severe disease activity and high stress management. The standard evaluation process for healthcare providers should include psychological assessments to achieve better control of smoking behavior alongside socioeconomic factor mitigation. Research shows that psychotropic drugs that decrease inflammation should prompt mental health treatments to be considered as another therapeutic approach. Various centers should conduct longitudinal studies that include numerous participants to affirm causal connections between disease elements. The process should be combined with policy updates that facilitate patients' access to mental healthcare and establish protocols for complete SLE care delivery skills for clinicians.

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Declaration of Interest

The authors of this article declared no conflict of interest.

Ethical Considerations

The study protocol adhered to the principles outlined in the Helsinki Declaration, which provides guidelines for ethical research involving human participants. Ethical considerations in this study were that participation was entirely optional. The study received ethical approval from the Committee of Scientific Research (CSR) at the College of Nursing, University of

Baghdad, Iraq, on 26 October 2024. Also, this study obtained approval from the Ministry of Planning (Central Statistical Organization) on 14th November 2024.

Transparency of Data

By the principles of transparency and open research, we declare that all data and materials used in this study are available upon request.

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Authors' Contributions

All authors equally contribute to this study.

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