



ORIGINAL RESEARCH PAPER

Community Medicine

DEPRESSION AND ANXIETY IN NEWLY
 DIAGNOSED SOUTH INDIAN ADULTS WITH
 SYSTEMIC LUPUS ERYTHEMATOSUS:
 ASSOCIATION WITH DISEASE SEVERITY

KEY WORDS: Systemic Lupus Erythematosus, Depression, Anxiety, South India, Disease Activity, Social Support.

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ABSTRACT	Introduction: Systemic Lupus Erythematosus (SLE) is a chronic autoimmune disease with significant psychological comorbidities, notably depression and anxiety, which may exacerbate disease activity. Data on these associations in newly diagnosed South Indian patients are limited, where cultural and socioeconomic factors amplify distress. Methods: This cross-sectional study enrolled 152 South Indian adults newly diagnosed with SLE (within 6 months) at outpatient rheumatology clinics in Hyderabad, Telangana, from March 2024 to March 2025. Depression and anxiety were assessed using the Patient Health Questionnaire-9 (PHQ-9; ≥ 10 for clinical depression) and Generalized Anxiety Disorder-7 (GAD-7; ≥ 8 for clinical anxiety). Disease activity was measured with the Systemic Lupus Erythematosus Disease Activity Index 2K (SLEDAI-2K). Spearman's rank correlation analyzed associations between psychological distress and disease activity, while multivariable logistic regression evaluated sociodemographic influences (age, gender, education, income, social support). Results: Clinical depression prevalence was 34.2% (95% CI: 26.8–42.3%), and clinical anxiety was 28.9% (95% CI: 22.0–36.7%), with 18.4% co-occurrence. Depression ($p = 0.42, p < 0.001$) and anxiety ($p = 0.38, p < 0.001$) correlated moderately with SLEDAI-2K scores. Co-occurring depression and anxiety were associated with higher mean SLEDAI-2K scores (11.2, SD = 5.1) versus no distress (7.1, SD = 3.8; $p = 0.002$). Higher income ($>50,000$ INR; OR = 0.39, 95% CI: 0.15–0.99, $p = 0.048$) and social support (OR = 0.85, 95% CI: 0.77–0.94, $p = 0.002$) reduced depression odds. Conclusion: High depression and anxiety prevalence in newly diagnosed South Indian SLE patients correlates with increased disease activity. Routine PHQ-9/GAD-7 screening and culturally sensitive interventions are essential for integrated care. Longitudinal studies are needed to explore causality.
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INTRODUCTION Systemic Lupus Erythematosus (SLE) is a chronic autoimmune disorder characterized by immune-mediated damage to multiple organ systems, including the skin, joints, kidneys, lungs, heart, and nervous system, driven by dysregulated inflammatory pathways [1]. The disease's unpredictable trajectory, with periods of remission and flares, results in significant physical morbidity and profoundly affects patients' quality of life. Beyond its physical burden, SLE is associated with a high prevalence of psychiatric comorbidities, with depression and anxiety affecting 20–40% of patients, particularly in the early post-diagnosis period [2, 3]. For newly diagnosed individuals, the emotional toll of a lifelong condition, uncertainty about disease progression, and complex treatment regimens can precipitate or exacerbate psychological distress. The relationship between psychological distress and SLE is bidirectional. Depression and anxiety can amplify SLE disease activity through stress-induced immune dysregulation, including elevated levels of pro-inflammatory cytokines such as interleukin-6 (IL-6) and tumor necrosis factor-alpha (TNF-α), which may exacerbate autoimmune flares [4, 5]. Conversely, SLE's physical symptoms, such as pain and fatigue, can worsen mental health, creating a vicious cycle. Psychological distress may also reduce adherence to medical therapies, complicating disease management [5]. In South India, these challenges are intensified by systemic barriers, including limited access to mental health services,	socioeconomic constraints, and cultural stigma surrounding psychological care, which often discourages help-seeking [6]. Gender-specific cultural expectations—particularly for women, who comprise ~90% of SLE patients—such as familial responsibilities and societal pressure to prioritize physical over mental health, heighten vulnerability to distress [7]. Despite global evidence on psychiatric comorbidities in SLE, research in South India, particularly among newly diagnosed patients, remains limited. Studies like Radhakrishnan et al. (2023) highlight a high prevalence of depression and anxiety in Indian patients with lupus nephritis, but data on the broader SLE population are scarce [8]. Hyderabad, Telangana, with its diverse urban and rural populations, offers a unique setting to investigate these issues. This study addresses this gap by estimating the prevalence of depression and anxiety in newly diagnosed South Indian adults with SLE using validated tools (Patient Health Questionnaire-9 [PHQ-9] and Generalized Anxiety Disorder-7 [GAD-7]). It also examines associations with SLE disease activity (Systemic Lupus Erythematosus Disease Activity Index 2K [SLEDAI-2K]) and sociodemographic factors (age, gender, education, income, social support), aiming to inform integrated care strategies in a resource-constrained setting. OBJECTIVES To estimate the prevalence of depression and anxiety in newly diagnosed South Indian adults with SLE in Hyderabad using PHQ-9 and GAD-7.
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- To assess the correlation between depression, anxiety, and SLE disease activity measured by SLEDAI-2K.
- To explore associations between depression, anxiety, and sociodemographic factors (age, gender, education, income, social support) in this population.

METHODOLOGY

Study Design and Population

A cross-sectional study was conducted at outpatient rheumatology clinics in Hyderabad, Telangana, from March 2024 to March 2025. Eligible participants were South Indian adults (aged ≥18 years) diagnosed with SLE within the past 6 months, per the 2019 European League Against Rheumatism/ American College of Rheumatology (EULAR/ACR) classification criteria [9]. Exclusion criteria included:

- Cognitive impairment (Mini-Mental State Examination [MMSE] score <24, validated for Indian populations) [10].
- Pre-existing psychiatric disorders (other than depression or anxiety), confirmed via medical records and Mini-International Neuropsychiatric Interview (MINI).
- Prior use of psychotropic medications (except short-term anxiolytics post-SLE diagnosis).
- Coexisting autoimmune diseases or chronic conditions (e.g., diabetes, rheumatoid arthritis) that could confound mental health assessments.

Data Collection

After obtaining written informed consent, participants completed a structured, culturally sensitive data collection process in private settings to mitigate stigma. The following tools were used:

- Patient Health Questionnaire-9 (PHQ-9):** A 9-item tool to assess depression severity (scores 0–27; ≥10 indicates clinical depression) [11]. The Telugu-translated version, validated for South Indian populations, was used where preferred [12].
- Generalized Anxiety Disorder-7 (GAD-7):** A 7-item tool to assess anxiety severity (scores 0–21; ≥8 indicates clinical anxiety) [13]. The Telugu version was similarly validated [12].
- Systemic Lupus Erythematosus Disease Activity Index 2K (SLEDAI-2K):** A validated measure of SLE disease activity (scores 0–105), assessed by rheumatologists [14].
- Sociodemographic Questionnaire:** Collected data on age, gender, education (none/primary, secondary, tertiary), monthly household income (low [<20,000 INR], middle [20,000–50,000 INR], high [>50,000 INR]), marital status, and social support (5-item Brief Social Support Questionnaire [BSSQ], score range: 5–25) [15]. Clinical data were extracted from medical records.

Trained bilingual (Telugu/English) staff facilitated assessments, ensuring comprehension and cultural sensitivity. Psychoeducation materials were provided post-assessment.

Sample Size

The required sample size was estimated using the formula for prevalence studies:
 $n = Z^2 \times p \times (1-p) / d^2$
 where $Z = 1.96$
 (corresponding to a 95% confidence level), $p = 0.40$ (anticipated prevalence based on Zhang et al., 2017) [2], and $d = 0.08$ (absolute precision of 8%). The calculation yielded a minimum sample size of approximately 144 participants. To account for a potential 10% attrition, the final target sample size was set at 160.

Statistical Analysis

- Prevalence:** Proportions of depression (PHQ-9 ≥10) and anxiety (GAD-7 ≥8) were calculated with 95% confidence intervals.
- Correlation with Disease Activity:** Spearman's rank

- correlation coefficient assessed relationships between PHQ-9/GAD-7 and SLEDAI-2K scores.
- Sociodemographic Associations:** Multivariable logistic regression models evaluated associations between depression/anxiety and sociodemographic factors, adjusting for age and gender. Interaction terms (e.g., gender × income) were tested.
- Missing Data:** Multiple imputation by chained equations (MICE) was used for missing data (<15%). Sensitivity analyses used listwise deletion.
- Software:** R version 4.3.2 (packages: psych, mice, stats). P-value <0.05 was significant.

Quality Control

- Telugu translations of PHQ-9 and GAD-7 were pre-tested (n=10) for clarity [12].
- SLEDAI-2K assessments were blinded to PHQ-9/GAD-7 scores.
- Data were double-entered and audited weekly.
- Staff were trained in stigma reduction and cultural sensitivity.
- A community advisory board ensured cultural relevance.

Compliance with Ethical Standards

Ethical clearance was obtained. Participants provided written informed consent, with the right to withdraw. Those with clinical PHQ-9/GAD-7 scores were offered mental health referrals with follow-up support.

RESULTS

Participant Characteristics

Of 160 enrolled participants, 152 completed assessments (95% response rate). Eight were excluded due to incomplete questionnaires (n=5) or withdrawal (n=3). The mean age was 32.4 years (SD = 8.7), with 85.5% female (n=130). Table 1 summarizes characteristics.

Table 1: Sociodemographic and Clinical Characteristics of Study Participants (n=152)

Characteristic	Value
Age (years), mean (SD)	32.4 (8.7)
Gender, n (%)	
Female	130 (85.5%)
Male	22 (14.5%)
Education, n (%)	
None/Primary	30 (19.7%)
Secondary	62 (40.8%)
Tertiary	60 (39.5%)
Monthly Household Income, n (%)	
Low (<20,000 INR)	55 (36.2%)
Middle (20,000–50,000 INR)	68 (44.7%)
High (>50,000 INR)	29 (19.1%)
Marital Status, n (%)	
Married	92 (60.5%)
Unmarried	60 (39.5%)
Social Support (BSSQ Score), mean (SD)	12.8 (3.2)
SLEDAI-2K Score, mean (SD)	8.6 (4.5)
Organ Involvement, n (%)	
Cutaneous	98 (64.5%)
Musculoskeletal	85 (55.9%)
Renal	42 (27.6%)
Hematologic	30 (19.7%)

Note: BSSQ = Brief Social Support Questionnaire (score range: 5–25); SLEDAI-2K = Systemic Lupus Erythematosus Disease Activity Index 2000 (score range: 0–105).

Prevalence and Severity of Depression and Anxiety

The prevalence of clinical depression (PHQ-9 ≥10) was 34.2% (95% CI: 26.8–42.3%), and clinical anxiety (GAD-7 ≥8) was 28.9% (95% CI: 22.0–36.7%). Co-occurring depression and anxiety was found in 18.4% (n=28). Table 2 details severity.

Table 2: Prevalence and Severity of Depression and Anxiety (n=152)

Condition	Severity Level	Prevalence, n (%)	95% CI
Depression	Minimal (0–4)	54 (35.5%)	28.5%–43.0%
	Mild (5–9)	46 (30.3%)	23.4%–38.0%
	Moderate (10–14)	31 (20.4%)	14.7%–27.7%
	Moderately Severe (15–19)	16 (10.5%)	6.4%–16.6%
	Severe (20–27)	5 (3.3%)	1.3%–8.3%
Anxiety	Minimal (0–4)	58 (38.2%)	31.0%–45.8%
	Mild (5–9)	49 (32.2%)	25.3%–40.0%
	Moderate (10–14)	32 (21.1%)	15.3%–28.4%
	Severe (15–21)	13 (8.6%)	4.9%–14.4%

Note: PHQ-9 = Patient Health Questionnaire-9 (score range: 0–27); GAD-7 = Generalized Anxiety Disorder-7 (score range: 0–21).

Correlation with SLE Disease Activity

Spearman's rank correlation showed moderate positive correlations between PHQ-9 ($\rho = 0.42, p < 0.001$) and GAD-7 ($\rho = 0.38, p < 0.001$) scores with SLEDAI-2K scores. Participants with co-occurring depression and anxiety had a higher mean SLEDAI-2K score (11.2, SD = 5.1) compared to those without either condition (7.1, SD = 3.8; $p = 0.002$) (Table 3).

Table 3: Mean SLEDAI-2K Scores by Mental Health Group

Mental Health Group	Mean SLEDAI-2K (SD)	p-value (vs. "No Distress")
No Depression or Anxiety	7.1 (3.8)	-
Depression Only	9.8 (4.1)	<0.05
Anxiety Only	9.1 (4.3)	<0.05
Co-occurring Depression and Anxiety	11.2 (5.1)	0.002

Associations with Sociodemographic Factors

Multivariable logistic regression, adjusted for age and gender, revealed:

- Income:** Higher income (>50,000 INR) was associated with lower odds of depression (OR = 0.39, 95% CI: 0.15–0.99, $p = 0.048$) but not anxiety ($p = 0.084$).
- Social Support:** Higher BSSQ scores reduced odds of depression (OR = 0.85, 95% CI: 0.77–0.94, $p = 0.002$) and anxiety (OR = 0.88, 95% CI: 0.79–0.98, $p = 0.019$).
- Education:** Tertiary education showed a trend toward lower odds of depression (OR = 0.45, $p = 0.073$) and anxiety (OR = 0.52, $p = 0.157$).
- Gender × Income Interaction:** Low-income females had higher odds of depression (OR = 2.10, $p = 0.106$) and anxiety (OR = 1.95, $p = 0.151$), though not significant.

Table 4: Multivariable Logistic Regression for Depression and Anxiety (n=152)

Variable	Depression (PHQ-9 ≥10)	Anxiety (GAD-7 ≥8)
	OR (95% CI)	p-value
Age (per year)	1.02 (0.98–1.06)	0.312
Gender (Female vs. Male)	1.85 (0.68–5.03)	0.224
Education		
None/Primary (ref)	1.00	-
Secondary	0.62 (0.28–1.39)	0.246
Tertiary	0.45 (0.19–1.08)	0.073
Income		
Low (<20,000 INR, ref)	1.00	-
Middle (20,000–50,000 INR)	0.58 (0.29–1.17)	0.128
High (>50,000 INR)	0.39 (0.15–0.99)	0.048
Marital Status (Married vs. Unmarried)	1.42 (0.72–2.80)	0.314
Social Support (BSSQ, per unit)	0.85 (0.77–0.94)	0.002

Gender × Income Interaction		
Female × Low Income	2.10 (0.85–5.18)	0.106

Note: OR = Odds Ratio; CI = Confidence Interval; BSSQ = Brief Social Support Questionnaire.

Missing Data

Missing data occurred in 3.1% of PHQ-9 responses, 2.6% of GAD-7 responses, and 1.3% of SLEDAI-2K scores. MICE was applied, with results consistent with listwise deletion sensitivity analyses.

DISCUSSION

This study highlights a significant burden of psychological distress among newly diagnosed South Indian adults with SLE, with 34.2% experiencing clinical depression and 28.9% clinical anxiety, alongside 18.4% co-occurrence. These rates underscore the early onset of mental health challenges post-diagnosis, potentially exacerbated by diagnostic uncertainty and treatment demands [1]. The prevalence of depression aligns with Mak et al.'s (2016) meta-analysis (36% for moderate-to-severe cases) but exceeds Zhang et al.'s (2017) pooled estimate (24%) [2, 3]. Anxiety prevalence (28.9%) is lower than Zhang et al.'s 37%, possibly due to our focus on newly diagnosed patients, where anxiety may intensify with disease progression [2, 4]. Co-occurrence (18.4%) is consistent with Palagini et al.'s (2013) findings of 20–30% comorbidity, linked to shared neuroinflammatory pathways [5].

Compared to Indian studies, our rates are lower than Radhakrishnan et al.'s (2023) findings in lupus nephritis patients (61% depression, 60% anxiety), likely due to their focus on a severe SLE subset with renal involvement (27.6% in our cohort) [8]. Another Indian study reported 89.6% depression prevalence using the Hamilton Rating Scale, reflecting differences in tools and tertiary care settings with more severe cases [16]. Our findings exceed general chronic disease estimates in India (20–30%), highlighting SLE's unique psychiatric burden [6].

Moderate correlations between depression ($\rho = 0.42$) and anxiety ($\rho = 0.38$) with SLEDAI-2K support a bidirectional relationship, consistent with Ward's (1999) correlation ($r = 0.42$) and Palagini et al.'s (2013) range (0.30–0.50) [4, 5]. Radhakrishnan et al. (2023) noted similar associations in LN patients, with higher disease activity in distressed individuals, mirroring our elevated SLEDAI-2K scores (11.2 vs. 7.1) in co-occurring cases [8]. This suggests stress-induced immune dysregulation as a potential mechanism [1,16].

Higher income (OR = 0.39, $p = 0.048$) and social support (OR = 0.85–0.88, $p < 0.05$) were protective, aligning with Zhang et al. (2017) and Kumar et al. (2022) [2, 6]. Trends in education and gender-income interactions reflect cultural vulnerabilities, particularly for low-income females, as noted by Chandra et al. (2017) [7]. Limitations include the cross-sectional design, precluding causality [17], potential self-report bias (despite validated tools) [18], and limited generalizability to rural settings [6]. Strengths include rigorous methodology, high response rate, and cultural sensitivity.

CONCLUSION

This study reveals a high prevalence of depression (34.2%) and anxiety (28.9%) in newly diagnosed South Indian adults with SLE, with significant correlations to disease activity ($r = 0.38–0.42$). Higher income and social support are protective, particularly for low-income females. Routine PHQ-9/GAD-7 screening and culturally sensitive interventions are recommended to integrate mental health care into early SLE management, improving outcomes in resource-constrained settings. Longitudinal studies are needed to explore causality and refine interventions.

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