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Research Article

# Prevalence of Anxiety and Depressive Disorders among Patients with Leprosy: A Cross-Sectional Study

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## ABSTRACT

**Background:** Leprosy, caused by *Mycobacterium leprae*, is a chronic infectious disease that imposes significant physical, social, and psychological burden. Stigma, disability, and chronicity may increase the risk of anxiety and depressive disorders. This study aimed to estimate the prevalence of anxiety and depressive disorders among patients with leprosy and explore their association with demographic and clinical variables. **Methods:** A cross-sectional study was conducted among 100 consecutive adults (18–60 years) with dermatologist-confirmed leprosy attending the Department of Psychiatry, S.V. Medical College, Tirupati, from January 2019 to June 2020. After ethics approval and informed consent, participants were screened using the General Health Questionnaire-12 (GHQ-12). Psychiatric diagnoses were made using ICD-10 symptom checklists. Severity of depression and anxiety was assessed using the Hamilton Depression Rating Scale (HAM-D) and Hamilton Anxiety Rating Scale (HAM-A). Sociodemographic and clinical details were collected. Data were analyzed using $\chi^2$, t-tests, ANOVA, and Fisher's exact test ($p \leq 0.05$). **Results:** The mean age was 45.2 ± 10.8 years; most participants were male (69%), married (98%), illiterate (69%), and belonged to lower socioeconomic status (71%). Tuberculoid and borderline forms were the most common, and 85% had multibacillary disease. While only 4% screened positive on GHQ-12, ICD-10 diagnoses revealed that 47% had depressive disorders and 39% had anxiety disorders (12% panic disorder, 27% generalized anxiety disorder). No demographic or clinical variable showed a significant association with anxiety or depression. **Conclusion:** Anxiety and depressive disorders are highly prevalent among patients with leprosy, independent of sociodemographic or clinical characteristics. Routine mental health screening and integrated psychosocial interventions are essential. Larger multicentric studies are warranted.

**Keywords:** Leprosy; Anxiety disorders; Depressive disorders; Prevalence; Psychiatry

## INTRODUCTION

Leprosy, caused by *Mycobacterium leprae*, is a chronic granulomatous infectious disease affecting the skin, peripheral nerves, and other tissues. Despite effective multidrug therapy, leprosy remains a public health challenge in endemic regions, with 2,02,286 new cases reported globally in 2019 (22.9 per million population)[1].

The disease is associated with substantial social stigma, functional disability, and chronicity, all of which adversely affect mental health. Patients often face social exclusion, employment challenges, and marital strain, contributing to anxiety, depression, and diminished quality of life[2–6]. Previous studies report psychiatric morbidity in leprosy ranging from 30–85%, with depressive disorders often predominating[3,4,7].

However, there is limited evidence on the association of psychiatric morbidity with sociodemographic or clinical variables in Indian leprosy populations, and most studies are either small or lack standardized psychiatric assessment tools. Understanding these associations is essential for integrating mental health interventions into leprosy care programs.

**Aims and Objectives:**

1. **Primary Objective:** To estimate the prevalence of anxiety and depressive disorders among patients with leprosy.
2. **Secondary Objective:** To explore the association between anxiety and depressive disorders and sociodemographic and clinical variables.

## Methods

**Study Design and Setting:**

A descriptive cross-sectional study was conducted at the Department of Psychiatry, S.V. Medical College, Tirupati, Andhra Pradesh, from January 2019 to June 2020.

**Sample Size Determination:**

Based on previous prevalence estimates of psychiatric morbidity in leprosy (~40%)[3], with a 95% confidence interval and 10% margin of error, a minimum sample size of 92 was calculated. We recruited 100 consecutive patients to account for possible dropouts.

**Sampling Technique:**

Consecutive sampling of adult patients (18–60 years) with dermatologist-confirmed leprosy attending the outpatient and inpatient services.

**Inclusion Criteria:**

1. Adults (18–60 years) with confirmed leprosy diagnosis
2. Both sexes
3. Patients willing to provide informed consent

**Exclusion Criteria:**

1. Serious comorbid medical or surgical illnesses
2. Other dermatological conditions
3. Pre-existing psychiatric disorders before leprosy onset
4. Substance use (except tobacco or caffeine) prior to leprosy

**Data Collection:** Sociodemographic information (age, sex, marital status, education, occupation, socioeconomic status) was collected using a structured interview.

**Psychiatric Assessment:**

Screening: General Health Questionnaire-12 (GHQ-12)

Diagnosis: ICD-10 symptom checklist for depressive and anxiety disorders

Severity: Hamilton Depression Rating Scale (HAM-D) and Hamilton Anxiety Rating Scale (HAM-A)

**Socioeconomic Status:** Modified Kuppuswamy Scale appropriate for the study period

**Ethical Considerations:** Ethical committee approval was obtained. Written informed consent was obtained from all participants.

**Statistical Analysis:**

- Continuous variables: mean ± standard deviation
- Categorical variables: frequency and percentages

- Statistical tests: $\chi^2$, Fisher's exact test, Student's t-test, ANOVA as appropriate
- Significance threshold: $p \leq 0.05$
- Analysis performed using SPSS version 20.0

## RESULTS

### Sociodemographic and Clinical Characteristics

(Table 1 placeholder: Age, sex, marital status, education, occupation, socioeconomic status, religion, leprosy type, disease classification, duration of illness, treatment details)

Mean age: 45.2 ± 10.8 years
Male: 69%, Married: 98%
Illiterate: 69%, Lower socioeconomic status: 71%
Rural residence: 100%
Tuberculoid: 34%, Borderline tuberculoid: 31%, Other types: 35%
Paucibacillary: 15%, Multibacillary: 85%
Mean disease duration: 1.34 ± 0.75 years

### Psychiatric Morbidity

GHQ-12 positive (>15): 4%
Depressive disorders: 47% (mild 28%, moderate 15%, severe 4%)
Anxiety disorders: 39% (panic disorder 12%, generalized anxiety disorder 27%)
Mean HAM-D: 9.26 ± 3.21, Mean HAM-A: 14.48 ± 3.67

No significant association was found between anxiety or depression and age, sex, marital status, education, socioeconomic status, leprosy subtype, or disease duration (all $p > 0.05$).

**Table 1: Age Distribution**

| | HAM-A SCORE | | | |
|---|---|---|---|---|
| **AGE** | **<17** | **18-24** | **25-30** | **TOTAL** |
| 18-30 | 4 | 3 | 0 | 7 |
| 31-40 | 13 | 7 | 0 | 20 |
| 41-50 | 21 | 10 | 0 | 31 |
| 51-60 | 35 | 7 | 0 | 42 |
| TOTAL | 73 | 27 | 0 | 100 |

**Table 16 depicts the association between leprosy patients' age distribution and anxiety.**

| **Pearson chi-square** | **Value** | **df** | **P** |
|---|---|---|---|
| | 4.253 | 3 | 0.235 |

**Table 2: Data regarding gender**

| | HAM-A SCORE | | | |
|---|---|---|---|---|
| **GENDER** | **<17** | **18-24** | **25-30** | **TOTAL** |
| MALE | 52 | 17 | 0 | 69 |
| FEMALE | 21 | 10 | 0 | 31 |
| TOTAL | 73 | 27 | 0 | 100 |

The association between gender distribution and anxiety among leprosy patients is seen in Table 17.

| Pearson chi- square | Value | df | P |
|---|---|---|---|
| | 0.630 | 1 | 0.427 |

**Table 3: Marital Status**

| | HAM-A SCORE | | | |
|---|---|---|---|---|
| **Marital status** | **<17** | **18-24** | **25-30** | **TOTAL** |
| Single | 1 | 1 | 0 | 2 |
| Married | 72 | 26 | 0 | 98 |
| Others | 0 | 0 | 0 | 0 |
| Total | 73 | 27 | 0 | 100 |

The link between marital status and anxiety in leprosy patients is seen in Table 18.

| Pearson chi- square | Value | df | P |
|---|---|---|---|
| | 0.458 | 1 | 0.459 |

**Table 4: Religion and anxiety**

| | HAM-A SCORE | | | |
|---|---|---|---|---|
| **Religion** | **<17** | **18-24** | **25-30** | **TOTAL** |
| Hindu | 66 | 22 | 0 | 88 |
| Muslim | 7 | 5 | 0 | 12 |
| christian | 0 | 0 | 0 | 0 |
| others | 0 | 0 | 0 | 0 |
| Total | 73 | 27 | 0 | 100 |

**The link between religion and anxiety in leprosy patients is seen in Table 19.**

| **Pearson chi-square** | **Value** | **df** | **P** |
|---|---|---|---|
| | 1.488 | 1 | 0.222 |

**Table 5: Educational Status And Anxiety**

| | HAM-A SCORE | | | |
|---|---|---|---|---|
| **Educational status** | **<17** | **18-24** | **25-30** | **TOTAL** |
| Illiterate | 52 | 17 | 0 | 69 |
| 1-10$^{th}$ class | 17 | 7 | 0 | 24 |
| Intermediate | 4 | 2 | 0 | 6 |
| Degree | 0 | 1 | 0 | 1 |
| Graduate | 0 | 0 | 0 | 0 |
| Post graduate | 0 | 0 | 0 | 0 |
| Total | 73 | 27 | 0 | 100 |

**Table 20: Shows educational status and anxiety among leprosy patients.**

| **Pearson chi-square** | **Value** | **df** | **P** |
|---|---|---|---|
| | 3.078 | 3 | 0.380 |

**Table 6: Occupation and anxiety**

| | HAM-A SCORE | | | |
|---|---|---|---|---|
| **Occupation** | **<17** | **18-24** | **25-30** | **TOTAL** |
| Unskilled worker | 55 | 22 | 0 | 77 |
| Semi skilled worker | 18 | 5 | 0 | 23 |
| Skilled worker | 0 | 0 | 0 | 0 |

| | | | | |
|---|---|---|---|---|
| Non working | 0 | 0 | 0 | 0 |
| total | 73 | 27 | 0 | 100 |

Table shows occupation and anxiety among leprosy patients.

| Pearson chi- square | Value | df | P |
|---|---|---|---|
| | 0.419 | 1 | 0.517 |

**Table 7: Socio economic status and anxiety**

| | **HAM-A SCORE** | | | |
|---|---|---|---|---|
| **Socio economic status** | **<17** | **18-24** | **25-30** | **TOTAL** |
| Upper class | 0 | 0 | 0 | 0 |
| Upper middle class | 4 | 2 | 0 | 6 |
| Lower middle class | 17 | 6 | 0 | 23 |
| Lower class | 52 | 19 | 0 | 71 |
| total | 73 | 27 | 0 | 100 |

**Table shows socio economic status and anxiety among leprosy patients.**

| **Pearson chi-square** | **Value** | **df** | **P** |
|---|---|---|---|
| | 0.134 | 2 | 0.935 |

**Table 8: Domicile and anxiety**

| | **HAM-A SCORE** | | | |
|---|---|---|---|---|
| **Domicile** | **<17** | **18-24** | **25-30** | **TOTAL** |
| Urban | 0 | 0 | 0 | 0 |
| Semi urban | 0 | 0 | 0 | 0 |
| Rural | 73 | 27 | 0 | 100 |
| Total | 73 | 27 | 0 | 100 |

**Table shows domicile and anxiety among leprosy patients.**

| **Pearson chi-square** | **Value** | **df** | **P** |
|---|---|---|---|
| | --- | --- | --- |

No statistics are computed because domicile is constant.

**Table 9: Bacillary subtypes and anxiety**

| | **HAM-A SCORE** | | | |
|---|---|---|---|---|
| **Bacillary subtype** | **<17** | **18-24** | **25-30** | **TOTAL** |
| Tuberculoid | 27 | 7 | 0 | 34 |
| Borderline tuberculoid | 22 | 9 | 0 | 31 |
| Borderline border line | 11 | 5 | 0 | 16 |
| Borderline lepromatous | 12 | 6 | 0 | 18 |
| Lepromatous | 1 | 0 | 0 | 1 |
| Total | 73 | 27 | 0 | 100 |

**Table 24 shows the relation between bacillary subtypes and anxiety.**

| **Pearson chi-square** | **Value** | **df** | **P** |
|---|---|---|---|
| | 1.657 | 4 | 0.799 |

**Table 10: Status of bacilli and anxiety**

| | HAM-A SCORE | | | |
|---|---|---|---|---|
| **Status of bacilli** | **<17** | **18-24** | **25-30** | **TOTAL** |
| Pauci bacillary | 12 | 3 | 0 | 15 |
| Multi bacillary | 61 | 24 | 0 | 85 |
| total | 73 | 27 | 0 | 100 |

Table 25 shows status of bacilli and anxiety.

| Pearson chi- square | Value | df | P |
|---|---|---|---|
| | 0.439 | 1 | 0.508 |

**Table 11: Lepra reaction anxiety**

| | HAM-A SCORE | | | |
|---|---|---|---|---|
| **Lepra reaction** | **<17** | **18-24** | **25-30** | **TOTAL** |
| Positive | 0 | 0 | 0 | 0 |
| negative | 73 | 27 | 0 | 100 |
| total | 73 | 27 | 0 | 100 |

Table 26: shows reaction f lepra and anxiety.
No statistics are computed because reaction of lepra is a constant.

**Age of onset of leprosy and anxiety**

| T test | R | P |
|---|---|---|
| | -.149 | 0.139 |

**Duration of illness and anxiety**

| T test | R | P |
|---|---|---|
| | 0.476 | 0.048 |

**DEPRESSION**

**Table 12: Age distribution**

| | HAM-D SCORE | | | | | |
|---|---|---|---|---|---|---|
| **AGE** | **0-7** | **8-13** | **14-18** | **19-22** | **>23** | **TOTAL** |
| 18-30 | 6 | 1 | 0 | 0 | 0 | 7 |
| 31-40 | 9 | 5 | 3 | 3 | 0 | 20 |
| 41-50 | 18 | 7 | 6 | 0 | 0 | 31 |
| 51-60 | 20 | 15 | 6 | 1 | 0 | 42 |
| TOTAL | 53 | 28 | 15 | 4 | 0 | 100 |

The link between age distribution and depression among leprosy patients is seen in Table 24.

| Pearson chi-square | Value | Df | p |
|---|---|---|---|
| | 13.088 | 9 | 0.159 |

**TABLE13: Gender and depression**

| | HAM-D SCORE | | | | | |
|---|---|---|---|---|---|---|
| Gender | 0-7 | 8-13 | 14-18 | 19-22 | >23 | TOTAL |

| | | | | | | |
|---|---|---|---|---|---|---|
| Male | 38 | 19 | 9 | 3 | 0 | 69 |
| Female | 15 | 9 | 6 | 1 | 0 | 31 |
| TOTAL | 53 | 28 | 15 | 4 | 0 | 100 |

The link between gender and depression in leprosy patients is seen in Table 25.

| Pearson chi- square | Value | df | P |
|---|---|---|---|
| | 0.833 | 3 | 0.842 |

**Table 14: Marital status and depression**

| | HAM-D SCORE | | | | | |
|---|---|---|---|---|---|---|
| **Marital status** | **0-7** | **8-13** | **14-18** | **19-22** | **>23** | **TOTAL** |
| Single | 2 | 0 | 0 | 0 | 0 | 2 |
| married | 51 | 28 | 15 | 4 | 0 | 98 |
| others | 0 | 0 | 0 | 0 | 0 | 0 |
| TOTAL | 53 | 28 | 15 | 4 | 0 | 100 |

The link between marital status and depression in leprosy patients is seen in Table 29.

| Pearson chi- square | value | df | P |
|---|---|---|---|
| | 1.810 | 3 | 0.613 |

**Table 15: Religion and depression**

| | HAM-D SCORE | | | | | |
|---|---|---|---|---|---|---|
| **Religion** | **0-7** | **8-13** | **14-18** | **19-22** | **>23** | **TOTAL** |
| Hindu | 45 | 26 | 13 | 4 | 0 | 88 |
| Muslim | 8 | 2 | 2 | 0 | 0 | 12 |
| Christian | 0 | 0 | 0 | 0 | 0 | 0 |
| Others | 0 | 0 | 0 | 0 | 0 | 0 |
| TOTAL | 53 | 28 | 15 | 4 | 0 | 100 |

The link between religion and depression in leprosy patients is seen in Table 30.

| Pearson chi- square | value | df | P |
|---|---|---|---|
| | 1.677 | 3 | 0.642 |

**Table 16: Educational status and depression**

| | HAM-D SCORE | | | | | |
|---|---|---|---|---|---|---|
| **Educational status** | **0-7** | **8-13** | **14-18** | **19-22** | **>23** | **TOTAL** |
| Illiterate | 34 | 24 | 8 | 3 | 0 | 69 |
| 1-10$^{th}$ class | 16 | 3 | 4 | 1 | 0 | 24 |
| Intermediate | 3 | 1 | 2 | 0 | 0 | 6 |
| Degree | 0 | 0 | 1 | 0 | 0 | 1 |
| Graduate | 0 | 0 | 0 | 0 | 0 | 0 |
| Post graduates | 0 | 0 | 0 | 0 | 0 | 0 |
| TOTAL | 53 | 28 | 15 | 4 | 0 | 100 |

Table 31 indicates the link between leprosy patients' educational status and depression.

| Pearson chi- square | Value | Df | p |
|---|---|---|---|
| | 12.356 | 9 | 0.194 |

**Table 17: Occupation and depression**

| | HAM-D SCORE | | | | | |
|---|---|---|---|---|---|---|
| **Occupation** | **0-7** | **8-13** | **14-18** | **19-22** | **>23** | **TOTAL** |
| Unskilled worker | 40 | 22 | 12 | 3 | 0 | 77 |
| Semi skilled worker | 13 | 6 | 3 | 1 | 0 | 23 |
| Skilled worker | 0 | 0 | 0 | 0 | 0 | 0 |
| Non working | 0 | 0 | 0 | 0 | 0 | 0 |
| TOTAL | 53 | 28 | 15 | 4 | 0 | 100 |

The link between occupation and depression among leprosy patients is seen in Table 32.

| Pearson chi- square | Value | df | P |
|---|---|---|---|
| | 0.194 | 3 | 0.979 |

**Table 18: Socio-economic status and depression**

| | HAM-D SCORE | | | | | |
|---|---|---|---|---|---|---|
| **Socio economic status** | **0-7** | **8-13** | **14-18** | **19-22** | **>23** | **TOTAL** |
| Upper class | 0 | 0 | 0 | 0 | 0 | 0 |
| Upper middle class | 4 | 1 | 1 | 0 | 0 | 6 |
| Lower middle class | 13 | 3 | 6 | 1 | 0 | 23 |
| Lower class | 36 | 24 | 8 | 3 | 0 | 71 |
| TOTAL | 53 | 28 | 15 | 4 | 0 | 100 |

Table 33 depicts the link between leprosy patients' socioeconomic position and depression.

| Pearson chi- square | Value | df | P |
|---|---|---|---|
| | 6.114 | 6 | 0.411 |

**Table19: Domicile and depression**

| | HAM-D SCORE | | | | | |
|---|---|---|---|---|---|---|
| Domicile | 0-7 | 8-13 | 14-18 | 19-22 | >23 | TOTAL |
| Urban | 0 | 0 | 0 | 0 | 0 | 0 |
| Semi urban | 0 | 0 | 0 | 0 | 0 | 0 |
| Rural | 53 | 28 | 15 | 4 | 0 | 100 |
| TOTAL | 53 | 28 | 15 | 4 | 0 | 100 |

The link between leprosy patients' domicile and depression is shown in Table 34.

| Pearson chi- square | Value | df | P |
|---|---|---|---|
| | --- | --- | --- |

No statistics are computed because domicile is a constant.

**Table 20: Bacillary subtypes and depression**

| | HAM-D SCORE | | | | | |
|---|---|---|---|---|---|---|
| Subtypes | 0-7 | 8-13 | 14-18 | 19-22 | >23 | TOTAL |
| Tuberculoid | 18 | 4 | 9 | 3 | 0 | 34 |
| Borderline tuberculoid | 13 | 15 | 1 | 2 | 0 | 31 |
| Borderline borderline | 8 | 5 | 2 | 0 | 0 | 15 |
| Borderline lepromatous | 12 | 5 | 1 | 0 | 0 | 18 |
| lepromatous | 2 | 0 | 0 | 0 | 0 | 2 |

| | | | | | | |
|---|---|---|---|---|---|---|
| TOTAL | 53 | 29 | 13 | 5 | 0 | 100 |

| Pearson chi- square | Value | Df | p |
|---|---|---|---|
| | 53.866 | 44 | 0.146 |

**Table21: Status of bacilli and depression**

| | HAM-D SCORE | | | | | |
|---|---|---|---|---|---|---|
| Status of bacilli | 0-7 | 8-13 | 14-18 | 19-22 | >23 | TOTAL |
| Paucibacillary | 6 | 4 | 3 | 2 | 0 | 15 |
| Multibacillary | 47 | 24 | 12 | 2 | 0 | 85 |
| TOTAL | 53 | 28 | 15 | 4 | 0 | 100 |

The link between status of bacilli and depression is shown in Table 36.

**ICD – 10 DIAGNOSIS**

| S.No. | Diagnosis according to ICD-10 | Frequency (%) |
|---|---|---|
| 1. | Nil | 14 (14) |
| 2. | Panic disorder | 12 (12) |
| 3. | Generalised anxiety disorder | 27 (27) |
| 4. | Mild depression | 28 (28) |
| 5. | Moderate depression | 15 (15) |
| 6. | Severe depression | 4 (4) |

**Table 22: Reaction of leprae and depression**

| | HAM-D SCORE | | | | | |
|---|---|---|---|---|---|---|
| Reaction of leprae | 0-7 | 8-13 | 14-18 | 19-22 | >23 | TOTAL |
| Positive | 53 | 28 | 15 | 4 | 0 | 100 |
| Negative | 0 | 0 | 0 | 0 | 0 | 0 |
| TOTAL | 53 | 28 | 15 | 4 | 0 | 100 |

No statistics are computed, because reaction of lepra is a constant.

**Age of onset of leprosy and depression**

| T test | r | P |
|---|---|---|
| | 0.109 | 0.283 |

**Duration of illness and depression**

| T test | r | P |
|---|---|---|
| | 0.096 | 0.343 |

## DISCUSSION

This study demonstrates a high prevalence of depressive (47%) and anxiety disorders (39%) among patients with leprosy. The findings are consistent with previous Indian and international studies[3–6]. Notably, depressive disorders were slightly more common than anxiety disorders, aligning with prior reports[3,4].

No sociodemographic or clinical factor predicted psychiatric morbidity, suggesting that the psychological impact of leprosy is relatively independent of observable characteristics and may be influenced more by individual coping, perceived stigma, and social support[7–10].

Low educational attainment, rural residence, and lower socioeconomic status, although not statistically significant,

showed trends toward higher psychiatric morbidity, consistent with previous studies[3],[4],[7]. The predominance of older, married males in the sample may reflect local care-seeking patterns.

**Strengths:=**

Use of standardized psychiatric instruments (ICD-10, HAM-D, HAM-A)

Well-defined patient sample

**Limitations**

1. Single-center design limits generalizability
2. Cross-sectional design precludes causal inference
3. Homogeneous sample with strict inclusion/exclusion criteria
4. Modest sample size

**Implications:**

Routine mental health screening and psychosocial interventions should be integrated into leprosy care programs. Multi-center longitudinal studies are needed to explore additional psychosocial determinants.

## CONCLUSION

Depressive and anxiety disorders are highly prevalent among patients with leprosy, independent of sociodemographic or clinical characteristics. Mental health support should be offered universally to leprosy patients. Larger multicentric studies with representative samples are warranted to validate these findings.

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