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Association of Depression Among Diabetic and Non-Diabetic Jail Inmates of a District Jail Raebareli: A Comparative Cross-Sectional Study

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ABSTRACT

Background: Diabetes mellitus and depression share a well-recognised bidirectional relationship, and incarcerated populations are independently vulnerable to both conditions. Data on this comorbidity among Indian prison inmates are scarce. We compared the burden of depressive symptoms between diabetic and non-diabetic inmates of a district jail Raibareli, Uttar Pradesh. **Methods:** A comparative cross-sectional study was conducted among 100 jail inmates (33 diabetic, 67 non-diabetic). Depression was assessed using the nine-item Patient Health Questionnaire (PHQ-9). Anthropometric and metabolic parameters (BMI, blood pressure, random blood sugar) were recorded. Group comparisons used the independent t-test and chi-square test; associations were expressed as odds ratios (OR) with 95% confidence intervals (CI). **Results:** The mean PHQ-9 score was significantly higher in diabetic inmates (13.8 ± 7.0) than in non-diabetic inmates (8.1 ± 6.7; $p < 0.001$). Clinically significant depression (PHQ-9 ≥ 10) was present in 69.7% of diabetic versus 32.8% of non-diabetic inmates ($p = 0.001$; OR 4.70, 95% CI 1.91–11.58). Random blood sugar correlated positively with PHQ-9 score ($r = 0.40$, $p < 0.001$). **Conclusion:** Diabetic jail inmates carried a substantially higher burden of depression than their non-diabetic counterparts. Routine mental-health screening of diabetic inmates within correctional facilities is warranted.

1. INTRODUCTION:

Depression is among the leading contributors to the global burden of disease and is projected to remain a principal cause of disability worldwide.[1] It is a chronic, frequently relapsing disorder that impairs occupational, social and physical functioning and is strongly associated with premature mortality.[2] The disorder is particularly common when it coexists with chronic physical illness, where it complicates self-management, worsens prognosis and raises healthcare costs.

Diabetes mellitus is one of the most prevalent non-communicable diseases of the twenty-first century. The Indian Council of Medical Research–India Diabetes (ICMR-INDIAB) national survey

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estimated the overall prevalence of diabetes in India at 11.4%, with a further large proportion of the population affected by prediabetes, underscoring an escalating metabolic epidemic.[3] Diabetes and depression share a robust and bidirectional relationship: depression increases the risk of incident type 2 diabetes, while the metabolic, inflammatory and psychosocial burden of diabetes predisposes affected individuals to depressive disorders.[4,5]

In a landmark meta-analysis, Anderson and colleagues demonstrated that the presence of diabetes doubles the odds of comorbid depression, with a pooled odds ratio of 2.0 across controlled studies.[6] Comorbid depression in people with diabetes is clinically important because it is associated with poorer glycaemic control, reduced adherence to medication and self-care, a higher incidence of micro- and macrovascular complications, and increased mortality.[7,8] Conversely, effective treatment of depression has been linked with improved glycaemic outcomes, highlighting the value of early detection.

Prison inmates constitute a distinct and disadvantaged population in whom both diabetes and mental illness are over-represented. A systematic review and meta-regression of more than 33,000 prisoners worldwide reported a pooled prevalence of major depression of approximately 10–14%, several-fold higher than community estimates.[9] Incarceration itself imposes chronic psychosocial stress—loss of liberty, overcrowding, separation from family, uncertainty about legal outcomes and limited access to healthcare—that may precipitate or aggravate depressive symptoms.[10] At the same time, the prison environment, with its sedentary routine, institutional diet and irregular medical supervision, can adversely affect glycaemic control among inmates with diabetes.

Despite the plausibility of an amplified diabetes–depression association in correctional settings, empirical data from Indian jails are sparse. Most existing Indian research has examined depression in community or hospital-based diabetic cohorts,[11,12] or has assessed the general mental-health burden of prisoners without stratifying by metabolic status.[13] The present study was therefore designed to estimate and compare the prevalence and severity of depressive symptoms between diabetic and non-diabetic inmates of a district jail Raebareli, and to examine the relationship between blood glucose levels and depression severity. We hypothesised that diabetic inmates would demonstrate a significantly higher burden of depression than non-diabetic inmates.

MATERIALS AND METHODS:

Study design and setting. A comparative cross-sectional study was carried out among inmates of a district jail situated Raebareli, Uttar Pradesh, India. The correctional facility houses both convicted and undertrial prisoners and provides basic medical services through an attached prison dispensary.

Study population and sampling. A total of 100 adult inmates were enrolled and categorised into two groups on the basis of their diabetes status—33 diabetic and 67 non-diabetic inmates. Diabetes status was ascertained from existing medical records, current anti-diabetic treatment and random blood sugar (RBS) measurement. Inmates aged 18 years and above who consented to participate were included. Those who were acutely unwell, unable to comprehend the questionnaire, or unwilling to participate were excluded.

Data collection and instruments. After obtaining informed consent, a structured proforma was used to record socio-demographic details (age, sex) and clinical parameters. Height and weight were measured using standard techniques and body mass index (BMI) was calculated as weight in kilograms divided by height in metres squared. Blood pressure was recorded with a mercury sphygmomanometer, heart rate by radial pulse, and random blood sugar using a calibrated glucometer.

Assessment of depression. Depressive symptoms were assessed using the nine-item Patient Health Questionnaire (PHQ-9), a validated, self-administered instrument that scores each of the nine DSM-IV criteria for depression from 0 (“not at all”) to 3 (“nearly every day”), yielding a total score of 0–27.[14] Standard cut-points were applied: 0–4 (none/minimal), 5–9 (mild), 10–14 (moderate), 15–19 (moderately severe) and 20–27 (severe) depression. A PHQ-9 score of ≥ 5 was taken to indicate the presence of depressive symptoms and a score of ≥ 10 to indicate clinically significant depression, consistent with the recommended threshold for probable major depressive disorder.

Statistical analysis. Data were entered in a spreadsheet and analysed using standard statistical software. Continuous variables were summarised as mean ± standard deviation (SD) and categorical variables as frequencies and percentages. The independent-samples t-test was used to compare mean PHQ-9 scores and continuous parameters between groups, and the chi-square test was used for categorical comparisons. The strength of association between diabetes and depression was expressed as an odds ratio (OR) with a 95% confidence interval (CI). The Pearson correlation coefficient was used to examine the relationship between random blood

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sugar and PHQ-9 score. A two-tailed p-value < 0.05 was considered statistically significant.

Ethical considerations. The study was conducted in accordance with the principles of the Declaration of Helsinki. Necessary administrative and ethical permissions were obtained from the competent jail authority and the institutional ethics committee. Written informed consent was obtained from every participant, confidentiality was maintained, and inmates identified with significant depressive symptoms were referred for appropriate care.

RESULTS:

Table 1. Baseline characteristics of diabetic and non-diabetic jail inmates

Characteristic	Diabetic (n = 33)	Non-diabetic (n = 67)	p-value
Age (years), mean ± SD	37.9 ± 13.2	38.2 ± 12.9	0.90
Male, n (%)	29 (87.9)	56 (83.6)	—
Female, n (%)	4 (12.1)	11 (16.4)	—
BMI (kg/m²), mean ± SD	22.5 ± 4.6	22.1 ± 4.2	0.67
Random blood sugar (mg/dL), median	276	104	< 0.001
PHQ-9 score, mean ± SD	13.8 ± 7.0	8.1 ± 6.7	< 0.001

SD = standard deviation; BMI = body mass index; PHQ-9 = nine-item Patient Health Questionnaire.

A total of 100 inmates were studied. The two groups were comparable in age (mean 37.9 vs 38.2 years; p = 0.90), sex distribution and BMI (22.5 vs 22.1 kg/m²; p = 0.67), indicating that any difference in depression was unlikely to be explained by these factors. As expected, the median random blood sugar was markedly higher in the diabetic group (276 vs 104 mg/dL). The mean PHQ-9 score was substantially higher among diabetic inmates (13.8 ± 7.0) than non-diabetic inmates (8.1 ± 6.7), a difference that was highly statistically significant (t = 3.89, p < 0.001). The overall prevalence of depressive symptoms (PHQ-9 ≥ 5) in the combined sample was 71% (Table 1).

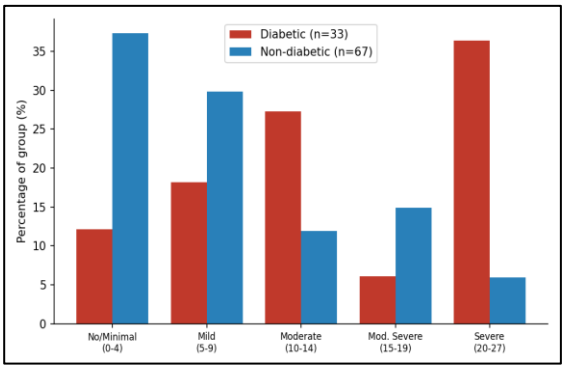

Figure 1. Distribution of PHQ-9 depression severity categories by diabetes status.

Table 2. Severity of depression (PHQ-9 categories) by diabetes status, n (%)

PHQ-9 category (score)	Diabetic (n = 33)	Non-diabetic (n = 67)	Total (n = 100)
None/minimal (0–4)	4 (12.1)	25 (37.3)	29 (29.0)
Mild (5–9)	6 (18.2)	20 (29.9)	26 (26.0)
Moderate (10–14)	9 (27.3)	8 (11.9)	17 (17.0)
Moderately severe (15–19)	2 (6.1)	10 (14.9)	12 (12.0)
Severe (20–27)	12 (36.4)	4 (6.0)	16 (16.0)

Chi-square test for distribution of clinically significant depression (≥ 10) between groups: p = 0.001.

The distribution of depression severity differed strikingly between the two groups (Table 2, Figure 1). Among diabetic inmates, severe depression (PHQ-9 20–27) was the single most common category, affecting 36.4% of the group, and only 12.1% had no or minimal symptoms. In contrast, among non-diabetic inmates the modal category was none/minimal depression (37.3%), and severe depression was uncommon (6.0%). When the higher severity bands were combined, 69.7% of diabetic inmates met the threshold for clinically significant depression (PHQ-9 ≥ 10) compared with only 32.8% of non-diabetic inmates.

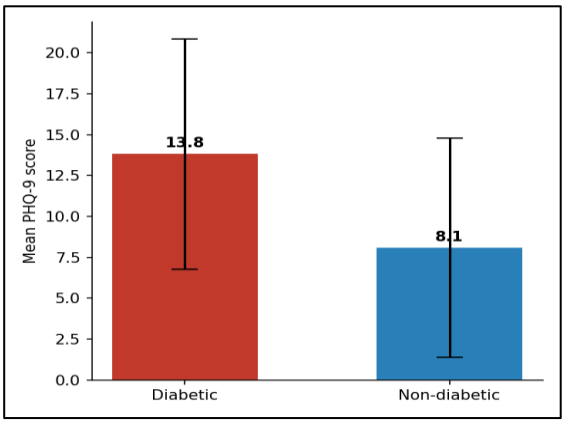

Figure 2. Mean PHQ-9 score by diabetes status (error bars = SD).

Table 3. Association between diabetes status and depression

Depression outcome	Diabetic	Non-diabetic	OR (95% CI)
Any depression (PHQ-9 ≥ 5)	29/33 (87.9%)	42/67 (62.7%)	4.32 (1.36–13.72)
Clinically significant (≥ 10)	23/33 (69.7%)	22/67 (32.8%)	4.70 (1.91–11.58)

OR = odds ratio; CI = confidence interval. Both associations statistically significant (p < 0.05).

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Diabetes was strongly associated with depression (Table 3). Inmates with diabetes were more than four times as likely to have any depressive symptoms (OR 4.32, 95% CI 1.36–13.72) and to have clinically significant depression (OR 4.70, 95% CI 1.91–11.58) than non-diabetic inmates. The chi-square test confirmed a significant association between diabetes status and clinically significant depression ($\chi^2 = 10.69$, $p = 0.001$).

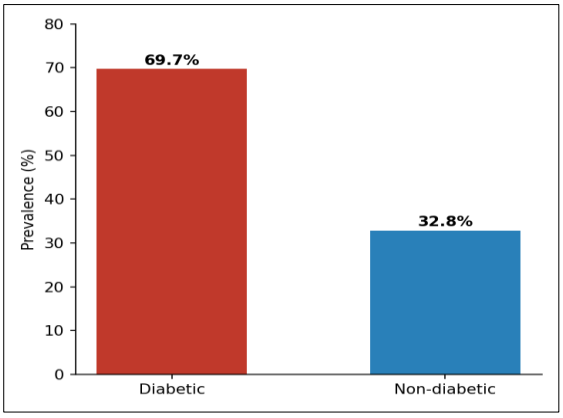

Figure 3. Prevalence of clinically significant depression (PHQ-9 ≥ 10) by diabetes status.

To explore whether glycaemic burden tracked with depression severity, the relationship between random blood sugar and PHQ-9 score was examined across the full sample. A significant positive correlation was observed (Pearson r = 0.40, p < 0.001), indicating that inmates with higher blood glucose levels tended to report more severe depressive symptoms (Figure 4). Suicidal ideation, captured by item 9 of the PHQ-9, was reported by 39.4% (13/33) of diabetic inmates compared with 19.4% (13/67) of non-diabetic inmates, a difference of borderline statistical significance (p = 0.06).

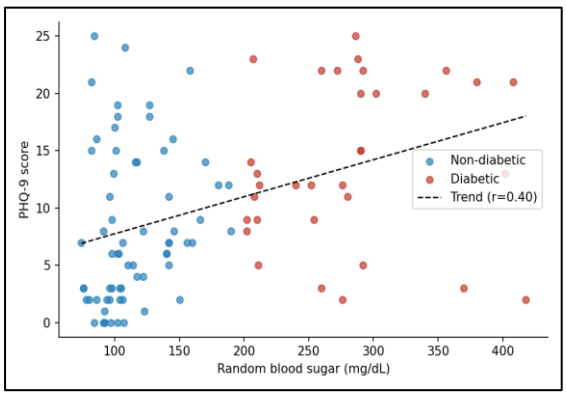

Figure 4. Correlation between random blood sugar and PHQ-9 depression score (r = 0.40).

DISCUSSION:

This comparative cross-sectional study of district jail inmates found a markedly higher burden of depression among those with diabetes than among those without. Diabetic inmates had a mean PHQ-9 score nearly 6 points higher than non-diabetic inmates, and were over four times as likely to have clinically significant depression. These findings are consistent with the broader literature on the diabetes–depression comorbidity and extend it to the understudied correctional setting.

The magnitude of association observed here (OR 4.70 for clinically significant depression) is greater than the pooled odds ratio of 2.0 reported by Anderson et al. in their classic meta-analysis of community and clinical samples.[6] Several factors may explain this amplification. The prison environment superimposes chronic psychosocial stress on the metabolic and inflammatory burden of diabetes; the combined effect of incarceration and chronic disease may be synergistic rather than merely additive.[9,10] Inmates with diabetes must contend simultaneously with the deprivations of confinement and the demands of a chronic illness whose management—dietary control, regular monitoring and medication adherence—is especially difficult to sustain within a custodial setting.

The bidirectional biology of the diabetes–depression link offers a further explanation. Chronic hyperglycaemia, insulin resistance and low-grade systemic inflammation are implicated in the pathophysiology of depression, while depression-related dysregulation of the hypothalamic–pituitary–adrenal axis and unhealthy behaviours worsen glycaemic control.[4,5] Our observation of a significant positive correlation between random blood sugar and PHQ-9 score (r = 0.40) is congruent with this mechanism and with prior reports linking poor glycaemic control to greater depressive symptom severity.[7,8]

The high overall prevalence of depressive symptoms in our sample (71%) reflects the well-documented mental-health vulnerability of prisoners. Systematic reviews have consistently reported that depression and other psychiatric disorders are several times more common among inmates than in the general population, with particularly high rates in low- and middle-income countries.[9] Indian studies of prison populations have similarly highlighted a substantial unmet burden of psychiatric morbidity.[13] Against this already elevated baseline, the additional excess attributable to diabetes is clinically meaningful and argues for targeted screening.

Our findings align with community-based Indian research demonstrating high rates of depression among people with diabetes. Studies from diverse Indian settings have reported depression prevalence among diabetic patients ranging widely but consistently exceeding that of non-diabetic

controls,[11,12] and the ICMR-INDIAB survey has underscored the sheer scale of the diabetes epidemic that underlies this comorbidity.[3] The near-doubling of self-reported suicidal ideation among diabetic inmates in our study, although of borderline statistical significance, is a particularly concerning signal given the elevated suicide risk documented in both diabetic and incarcerated populations and merits careful clinical attention.

The clinical and public-health implications are clear. Comorbid depression undermines diabetes self-care, worsens glycaemic control and increases the risk of complications and mortality,[7,8] yet it is eminently treatable. Routine, low-cost screening with a brief validated instrument such as the PHQ-9 could be integrated into prison diabetes care, enabling early identification and referral. Collaborative care models that jointly address metabolic and mental health have shown benefit in other settings and could be adapted for correctional facilities.

Several limitations should be acknowledged. First, the cross-sectional design precludes any causal inference about the direction of the diabetes–depression relationship. Second, the sample size was modest and drawn from a single facility, limiting the precision of estimates—reflected in the wide confidence intervals—and the generalisability of findings. Third, the male predominance of the sample mirrors the prison population but limits inferences for female inmates. Fourth, the PHQ-9 is a screening instrument rather than a diagnostic gold standard, and depressive symptoms were not confirmed by structured clinical interview. Finally, potential confounders such as duration of incarceration, substance use, duration and type of diabetes, and family history were not fully captured. Larger multi-centre longitudinal studies are needed to confirm these associations and to evaluate screening and treatment interventions.

CONCLUSION:

Among inmates of a district jail Raebareli, depression was highly prevalent and was significantly more common and more severe in those with diabetes than in those without. Diabetic inmates were over four times as likely to have clinically significant depression, and depression severity rose with increasing blood glucose. These findings highlight diabetic prisoners as a doubly vulnerable group in whom mental and metabolic illness reinforce one another. Routine integration of depression screening using the PHQ-9 into prison diabetes care, coupled with timely referral and collaborative management, is recommended to reduce this substantial and treatable burden of suffering.

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