

Prevalence and Sociodemographic Predictors of Depression and Anxiety among Patients with Diabetes Mellitus: A Cross-Sectional Study from an Urban Field Practice Area in Southern India

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ABSTRACT

Background: Diabetes mellitus is associated with significant psychological comorbidities. Limited data exist from community-based urban settings in Southern India on the prevalence and predictors of depression and anxiety among diabetic patients. The objective was to determine the prevalence of depression and anxiety among diabetes patients attending an urban field practice area and identify their sociodemographic predictors.

Methods: A cross-sectional study was conducted among 100 diabetic patients (April-September 2024) at an urban field practice area, Vijayapura. Depression and anxiety were assessed using validated PHQ-9 and GAD-7 scales. Socioeconomic status was evaluated using the Modified Kuppaswamy Scale. Multivariable logistic regression identified independent predictors.

Results: Depression was present in 29% (95% CI: 20.5%-38.9%) and anxiety in 31% (95% CI: 22.4%-40.9%) of participants. Muslim religion (AOR=3.1; 95% CI:1.4-9.0) and widowed/separated/divorced marital status (AOR=3.2; 95% CI:1.1-9.2) were independently associated with depression. Widowed/ separated/ divorced status (AOR=3.1; 95% CI:1.0-9.0) and illiteracy (AOR=0.2; 95% CI:0.04-0.9) were significant predictors of anxiety.

Conclusion: Psychological comorbidities are highly prevalent among diabetic patients. Integrating routine mental health screening into diabetes care, particularly targeting socially and economically vulnerable individuals, is strongly recommended.

Keywords: Glycaemic control, mental health, PHQ-9, GAD-7, Psychological comorbidity

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INTRODUCTION

Diabetes mellitus is a long-term metabolic condition marked by sustained elevations in blood glucose levels due to insufficient insulin production, reduced insulin effectiveness, or a combination of both. India has witnessed a rapid increase in the prevalence of diabetes over the past few decades, particularly in urban areas, making it a major public health concern. The clinical presentation and severity of symptoms often differ depending on the type of diabetes and how long the individual has been living with the disease.¹ Beyond its well-known physical complications, diabetes is also linked to a substantial psychological burden. Many individuals with diabetes experience mental health challenges, including major depression, anxiety disorders, depressive symptoms, and diabetes-related emotional distress.² These conditions can interfere with daily self-management behaviors and hinder effective glycaemic control. People living with type 2 diabetes appear to be particularly susceptible, as studies indicate that the occurrence of depression in this group is almost double that observed in the general population.³ In India, studies have reported a high prevalence of depression and anxiety among patients with diabetes mellitus. A study from Northern India found that 58% of patients had depression and 27% had anxiety.⁴

Depression is a debilitating psychiatric disorder characterized by persistent low mood and/or loss of interest or pleasure in previously enjoyed activities, leading to functional impairment.⁵ Anxiety disorders are characterized by excessive worry, tension, and associated physiological symptoms such as tachycardia, sweating, and elevated blood pressure. Several studies have reported that individuals with diabetes have a higher risk of developing anxiety disorders compared to the general population⁶. Globally, depression affects a substantial proportion of the population and is among the leading causes of Disability-Adjusted Life Years (DALYs), contributing significantly to global disease burden.⁷ According to the Diagnostic and Statistical Manual of Mental Disorders, Fifth Edition (DSM-5), Major Depressive Disorder is diagnosed when either depressed or irritable mood, or anhedonia, is present along with at least four additional symptoms persisting for a minimum of two weeks.⁸

Recent global estimates indicate that approximately 279.6 million people were living with depression (5% of the global population), while 301.39 million were affected by anxiety disorders (4% of the global population). Patients with diabetes are reported to be two to three times more likely to experience depression compared to individuals without diabetes.^{7,9} Population-based data from the United States have similarly demonstrated a substantial prevalence of depression among adults with diabetes.¹⁰ Previous research has identified several sociodemographic and clinical factors associated with depression and

anxiety among patients with diabetes.¹¹ However, limited data are available from community-based urban field practice settings in Southern India examining the prevalence and sociodemographic predictors of these conditions.

Therefore, this study was undertaken to determine the prevalence of depression and anxiety among patients with diabetes mellitus attending an urban field practice area and to identify their sociodemographic predictors.

METHODOLOGY

It was a cross-sectional study conducted between April to September 2024 at an urban field practice area of Chandaboudi, under the Department of Community Medicine, Shri B M Patil Medical College. Study participants are all the adults above 18 years. Diabetic patients both type I and type II are included in the study.

Sample size: The sample size was calculated using standard prevalence formula. Based on a previously reported prevalence of depression (39.5%) among patients with diabetes from a study by Karpha K et al.¹², with a 95% confidence level ($Z = 1.96$) and an absolute precision of 10%, the minimum required sample size was calculated to be 92. To account for potential non-response and to improve precision, the sample size was rounded to 100 participants.

Sampling Method: Participants were recruited using consecutive sampling, wherein all eligible patients attending the outpatient clinic during the study period were invited to participate.

Eligibility criteria: Participants were included in the study if they were adults aged 18 years or older, had a confirmed diagnosis of Type 1 or Type 2 diabetes mellitus, and had provided informed consent. Individuals were excluded if they had a known psychiatric illness diagnosed prior to their diabetes, were currently on psychotropic medication, had cognitive impairment that prevented them from completing the questionnaire, or refused to participate.

Statistical Analysis: All relevant sociodemographic variables (age, gender, religion, marital status, education, socioeconomic status, occupation, and family history variables) were included simultaneously in the multivariable logistic regression model using the Enter method, irrespective of their significance in univariate analysis. Adjusted Odds Ratios (AORs) with 95% confidence intervals were reported. Model fitness was evaluated using the Hosmer-Lemeshow goodness-of-fit test. The data obtained were entered in a Microsoft Excel sheet, and statistical analysis was performed using statistical package for the social sciences (Version 27). A p-value <0.05 was considered statistically significant. All statistical tests were performed with two tailed.

After obtaining informed oral consent from the par-

ticipants, as approved by the Institutional Ethics Committee, data were collected. Oral consent was considered appropriate due to the field-based setting and varying literacy levels among participants, and confidentiality was strictly maintained.

A pre-structured questionnaire was developed for the study and pre-tested in a pilot sample of 20 patients attending the same outpatient clinic to assess clarity, feasibility, and comprehension. Minor modifications were made based on feedback before final administration. The questionnaire was administered in Kannada and English according to participant preference. Validated versions of the Patient Health Questionnaire-9 (PHQ-9) and Generalized Anxiety Disorder-7 (GAD-7) scales were used. Where necessary, locally translated versions were employed to ensure linguistic and cultural appropriateness.

Socio-demographic details of the patients were collected using a structured proforma according to the patient's convenience. Socioeconomic status was assessed using the Modified Kuppaswamy scale (updated for 2024)¹³, which classifies families into five socioeconomic classes (I-V) based on education, occupation, and monthly family income.

The Patient Health Questionnaire-9 (PHQ-9)¹⁴ was utilized to evaluate depression severity, comprising 9 items with response options scored 0-3. The cumulative score (range: 0-27) was categorized into five depression severity levels: minimal (1-4), mild (5-9), moderate (10-14), moderately severe (15-19), and severe (20-27). A PHQ-9 score ≥ 10 was used to define the presence of depression for prevalence estimation and logistic regression analysis. The Generalized Anxiety Disorder 7-item scale (GAD-7)¹⁵ was utilized to evaluate anxiety severity, comprising 7 items with response options scored 0-3. The cumulative score (range: 0-21) was categorized into four anxiety severity levels: minimal (0-4), mild (5-9), moderate (10-14), and severe (15-21).

Ethical Approval: The study was approved by the Institutional Ethics Committee of Shri B M Patil Medical College, Vijayapura (IEC No: BLDE (DU)/IEC-SBMPMC/ 154-B/2024-25).

RESULTS

Depression was present in 29% (95% CI: 20.5%-38.9%) and anxiety in 31% (95% CI: 22.4%-40.9%) of participants.

Table 1 summarizes the socio-demographic characteristics of the study participants. Most participants were aged 51-60 years (40%), and 52% were male. The majority were married (85%) and belonged to Class III and IV socioeconomic categories. Detailed distribution is presented in Table 1.

As shown in Table 2, religion, marital status, and socioeconomic status were significantly associated with depression on bivariate analysis ($p < 0.05$). In

multivariable logistic regression analysis, Muslim participants had significantly higher odds of depression compared to Hindu participants (AOR = 3.5; 95% CI: 1.4-9.0). Participants who were widowed, separated, or divorced had higher odds of depression compared to married individuals (AOR = 3.2; 95% CI: 1.1-9.2). Participants in Class IV socioeconomic status demonstrated lower odds of depression compared to Class I (AOR = 0.2; 95% CI: 0.1-0.9). Gender, education, occupation, and family history were not significantly associated with depression.

As detailed in Table 3, marital status, education, showed significant associations with anxiety on bivariate analysis. On bivariate analysis, socioeconomic status showed a statistically significant association with anxiety (χ^2 value, $p < 0.001$). However, in the multivariable logistic regression model, none of the individual socioeconomic categories demonstrated a statistically significant independent association with anxiety when compared to the reference category. This suggests that the observed overall association may reflect distributional differences rather than a strong independent effect of any specific socioeconomic class.

Table 1: Socio-demographic characteristics of the study participants (N=100)

Basic characteristics	Cases (%)
Age (Years)	
<= 40	4 (4)
41 - 50	23 (23)
51 - 60	40 (40)
61 - 70	20 (20)
71 - 80	11 (11)
81+	2 (2)
Age (Mean \pm SD)	56.9 \pm 11.4 years.
Gender	
Female	48 (48)
Male	52 (52)
Religion	
Hindu	69 (69)
Muslim	31 (31)
Marital Status	
Married	85 (85)
widowed/ Separated/Divorced	15 (15)
Education level	
Illiterate	29 (29)
Primary	30 (30)
Higher Secondary	22 (22)
PUC	10 (10)
Degree and PG	9 (9)
Socio Economic Status	
Class I	8 (8)
Class II	23 (23)
Class III	32 (32)
Class IV	33 (33)
Class V	4 (4)
Occupation	
Business	29 (29)
clerk	17 (17)
Home Makers	48 (48)
Professional	6 (6)
Family History of Diabetes	71 (71)

Table 2: Association of Socio-demographic and Clinical Variables with Depression

Variable	Depression		p-value	OR (95% CI)	p-value	AOR (95% CI)	p-value
	Present (n=29) (%)	Absent (n=71)(%)					
Age (years)							
≤40	1 (3.3)	5 (7.5)	0.19	Ref	NA	Ref	NA
41-50	4 (13.3)	18 (26.9)		1.1 (0.1-12.1)	0.94	1.2 (0.1-14.2)	0.88
51-60	14 (46.7)	20 (29.9)		3.5 (0.4-32.5)	0.27	3.9 (0.5-36.8)	0.22
61-70	6 (20.0)	12 (17.9)		2.5 (0.2-25.6)	0.46	2.7 (0.3-28.4)	0.41
71-80	4 (13.3)	9 (13.4)		2.2 (0.2-23.4)	0.53	2.4 (0.2-26.8)	0.49
81+	1 (3.3)	3 (4.5)		1.7 (0.1-24.2)	0.70	1.8 (0.1-26.9)	0.66
Gender							
Female	13 (44.8)	35 (49.3)	0.685	1.2 (0.5-2.9)	0.685	Ref	NA
Male	16 (55.2)	36 (50.7)				1.3 (0.5-2.9)	0.68
Religion							
Hindu	14 (48.3)	55 (77.5)	0.004*	3.7 (1.5-9.4)	0.004*	Ref	NA
Muslim	15 (51.7)	16 (22.5)				3.1 (1.4-9.0)	0.008*
Marital Status							
Married	21 (72.4)	64 (90.1)	0.024*	3.5 (1.2-9.8)		Ref	NA
Wid/Separated/Divorced	8 (27.6)	7 (9.9)			0.024*	3.2 (1.1-9.2)	0.03*
Education							
Degree/PG	4 (13.8)	5 (7.0)	0.241	Ref	NA	Ref	NA
Higher Secondary	6 (20.7)	16 (22.5)		0.5 (0.1-1.8)	0.29	0.3 (0.1-1.8)	0.2
Illiterate	9 (31.0)	20 (28.2)		0.6 (0.2-1.9)	0.39	0.4 (0.2-1.9)	0.41
Primary	10 (34.5)	20 (28.2)		0.6 (0.2-1.8)	0.37	0.7 (0.3-1.7)	0.39
PUC	0 (0.0)	10 (14.1)		-	-	-	-
Socioeconomic Status							
Class I	4 (13.8)	4 (5.6)	0.017*	Ref	NA	Ref	NA
Class II	12 (41.4)	11 (15.5)		1.1 (0.3-4.5)	0.87	1.4 (0.23-4.8)	0.88
Class III	7 (24.1)	25 (35.2)		0.3 (0.1-1.1)	0.07	0.2 (0.08-1.15)	0.08
Class IV	6 (20.7)	27 (38.0)		0.3 (0.1-0.9)	0.03*	0.2 (0.05-0.8)	0.04*
Class V	0 (0.0)	4 (5.6)		-	-	-	-
Occupation							
Business	8 (27.6)	21 (29.6)	0.403	Ref	NA	Ref	NA
Clerk	6 (20.7)	11 (15.5)		1.4 (0.4-4.5)	0.58	1.3 (0.2-4.3)	0.60
Homemaker	15 (51.7)	33 (46.5)		1.2 (0.4-3.4)	0.74	1.25 (0.3-3.5)	0.76
Professional	0 (0.0)	6 (8.5)		-	-	-	-
Family History of Diabetes							
No	7 (24.1)	22(31.0)	0.493	1.4 (0.3-1.8)	0.49	1.3 (0.4-3.8)	0.5
Yes	22 (75.9)	49 (69.0)				Ref	NA
Family History of Depression							
No	25 (86.2)	68 (95.8)	0.089	0.3 (0.1-1.1)	0.08	Ref	NA
Yes	4 (13.8)	3 (4.2)				0.4 (0.2-1.0)	0.07

* p <0.05 considered statistically significant.; Ref = Reference category.; - Odds ratio not estimable due to zero frequency in one or more cells.; OR = Odds Ratio.; NA- Reference Category not able to Calculate P Value.; AOR = Adjusted Odds Ratio (adjusted for all variables included in the multivariable logistic regression model).

After adjustment, widowed/separated/divorced participants had higher odds of anxiety compared to married individuals (AOR = 3.1; 95% CI: 1.0-9.0). Illiterate participants had significantly lower odds of anxiety compared to those with degree/ postgraduate education (AOR = 0.2; 95% CI: 0.04-0.9).

Age showed a borderline association with anxiety, whereas gender and religion were not significantly associated after adjustment.

DISCUSSION

In this cross-sectional study of 100 patients with diabetes mellitus, the prevalence of depression (29.0%) and anxiety (31.0%) was comparable to findings reported in several Indian studies. For example, Tripathi P et al.¹⁶ reported prevalence rates of

20.3% for depression and 17.3% for anxiety among patients with type 2 diabetes mellitus in Pune, identifying female gender, poor glycaemic control, comorbidities, obesity, and unmarried status as significant predictors. Similarly, Raval A et al.¹⁷ reported a substantial burden of depressive symptoms among patients attending a tertiary care center in western India, highlighting the psychological vulnerability of individuals with diabetes.

In southern India, Poongothai S et al.¹⁸ observed notable levels of depressive symptoms in a large urban population-based cohort, suggesting that psychological comorbidity extends beyond hospital settings into the community. A cross-sectional study from Saudi Arabia reported a high prevalence of depression, anxiety, and stress among patients with type 2 diabetes attending primary healthcare centres¹⁹.

Table 3: Association of Socio-demographic and Clinical Variables with Anxiety

Variable	Anxiety		p-value	OR (95% CI)	p-value	AOR (95% CI)	p-value
	Present (n=31) (%)	Absent (n=69) (%)					
Age (years)							
≤40	2 (6.5)	2 (2.9)	0.058	Ref	NA	Ref	NA
41-50	2 (6.5)	21 (30.4)		0.1 (0.01-1.0)	0.06	0.1 (0.01-1.0)	0.06
51-60	18 (58.1)	22 (31.9)		0.8 (0.1-5.0)	0.82	0.8 (0.1-5.0)	0.83
61-70	6 (19.4)	14 (20.3)		0.4 (0.1-2.9)	0.37	0.4 (0.1-2.9)	0.39
71-80	3 (9.7)	8 (11.6)		0.4 (0.06-3.4)	0.41	0.4 (0.06-3.4)	0.42
81+	0 (0.0)	2 (2.9)		-	-	-	-
Gender							
Female	14 (45.2)	34 (49.3)	0.703	Ref	NA	Ref	NA
Male	17 (54.8)	35 (50.7)		1.2 (0.5-2.9)	0.70	1.2 (0.5-2.9)	0.70
Religion							
Hindu	21 (67.7)	48 (69.6)	0.855	Ref	NA	Ref	NA
Muslim	10 (32.3)	21 (30.4)		1.1 (0.5-2.7)	0.85	1.1 (0.5-2.7)	0.85
Marital Status							
Married	23 (74.2)	62 (89.9)	0.043*	Ref	NA	Ref	NA
Wid/Separated/Divorced	8 (25.8)	7 (10.1)		3.1 (1.0-9.0)	0.04*	3.1 (1.0-9.0)	0.04*
Education							
Degree/PG	4 (12.9)	5 (7.2)	0.004*	Ref	NA	Ref	NA
Higher Secondary	12 (38.7)	10 (14.5)		1.5 (0.3-6.7)	0.61	1.5 (0.3-6.7)	0.62
Illiterate	4 (12.9)	25 (36.2)		0.2 (0.04-0.9)	0.04*	0.2 (0.04-0.9)	0.04*
Primary	11 (35.5)	19 (27.5)		0.7 (0.2-3.0)	0.65	0.7 (0.2-3.0)	0.66
PUC	0 (0.0)	10 (14.5)		-	-	-	-
Socioeconomic Status							
Class I	2 (6.5)	6 (8.7)	0.0001*	Ref	NA	Ref	NA
Class II	13 (41.9)	10 (14.5)		3.9 (0.7-20.0)	0.09	3.9 (0.7-20.0)	0.09
Class III	16 (51.6)	16 (23.2)		3.0 (0.6-15.0)	0.14	3.0 (0.6-15.0)	0.14
Class IV	2 (6.5)	31 (44.9)		0.2 (0.02-1.8)	0.16	0.2 (0.02-1.9)	0.17
Class V	0 (0.0)	4 (5.8)		-	-	-	-
Occupation							
Business	9 (29.0)	20 (29.0)	0.776	Ref	NA	Ref	NA
Clerk	5 (16.1)	12 (17.4)		0.93 (0.25-3.4)	0.91	0.9 (0.2-3.5)	0.92
Homemaker	16 (51.6)	32 (46.4)		1.1 (0.4-3.1)	0.85	1.1 (0.4-3.2)	0.86
Professional	1 (3.2)	5 (7.2)		0.44 (0.04-4.6)	0.50	0.4 (0.04-4.8)	0.52
Family History of Diabetes							
Yes	22 (71.0)	49 (71.0)	0.99	1.0 (0.4-2.5)	0.99	1.1 (0.3-2.6)	0.95
No	9 (29.0)	20 (29.0)				Ref	NA
Family History of Anxiety							
Yes	2 (6.5)	5 (7.2)	0.90	1.13 (0.2-5.4)	0.88	1.1 (0.2-5.6)	0.89
No	29 (93.5)	64 (92.8)				Ref	NA

*p < 0.05 considered statistically significant.; Ref = Reference category.; - Odds ratio not estimable due to zero frequency in one or more cells.; OR = Odds Ratio.; NA- Reference Category not able to Calculate P Value.; AOR = Adjusted Odds Ratio (adjusted for all variables included in the multivariable logistic regression model).

In the present study, marital status was significantly associated with both depression and anxiety, while education and socio-economic status were associated with anxiety. These findings reinforce the importance of socio-demographic determinants in shaping psychological outcomes among individuals with diabetes.

The association with religion should be interpreted cautiously and may reflect socio-cultural, economic, or contextual factors rather than religion per se. Muslim participants had higher odds of depression compared to Hindu participants (AOR = 3.5), and widowed, separated, or divorced individuals had higher odds compared to married participants. These findings should be interpreted cautiously. Reduced emotional and social support among individuals without a partner may partly explain the increased psychological distress observed. Social support is

widely recognized as a protective factor against psychological distress, consistent with the stress-buffering hypothesis, which proposes that supportive relationships mitigate the adverse effects of stress on mental health.^{20,21}

Educational attainment did not show a significant relationship with depression in this study. However, individuals without formal education had lower adjusted odds of anxiety compared to those with higher educational levels (AOR = 0.2). This observation should be interpreted cautiously, as it may be influenced by variations in awareness of symptoms, reporting behavior, or levels of health literacy rather than indicating a genuinely protective effect. In contrast, research conducted in Eastern India has identified lower educational status, insulin use, retinopathy, and marital status as significant predictors of both depression.¹⁷ Differences in study design, as-

assessment instruments, and participant characteristics may account for these inconsistencies.

Socio-economic status was significantly related to both depression and anxiety. Participants categorized under Class IV demonstrated lower odds of depression compared to those in Class I. Although a greater proportion of anxiety was observed among individuals in lower socio-economic groups, some of the adjusted associations were not statistically significant. Similar links between socio-economic disadvantage and psychological distress among people with diabetes have been reported in studies from Saudi Arabia and Ethiopia²². Together, these findings highlight the important role that social and economic conditions may play in shaping mental health outcomes.

In this study, gender was not significantly associated with either depression or anxiety. This finding contrasts with previous literature, including the meta-analysis by Anderson et al.⁹ published in *Diabetes Care*, which reported a higher prevalence of depression among women with diabetes. Similarly, Ali et al.²³, in a systematic review published in *Diabetic Medicine*, identified female gender as a significant predictor of depressive symptoms in individuals with type 2 diabetes. In addition, Khaledi et al.²⁴, in a large systematic review and meta-analysis published in *Acta Diabetologica*, reported a substantial prevalence of comorbid depression among patients with type 2 diabetes and highlighted several demographic factors, including female gender, as contributors to increased vulnerability. The divergence observed in our study may be attributable to the relatively small sample size, limited statistical power, and the nearly equal gender distribution in our cohort. Additionally, sociocultural factors and healthcare-seeking behaviors in the local context may influence the reporting and expression of psychological symptoms.

Family history of diabetes and family history of depression were not significantly associated with depression or anxiety, although the latter showed a borderline association. Previous research has emphasized family history of mental illness and inadequate social support as important contributors to psychological morbidity among individuals with diabetes²². The absence of strong associations in the present study may be related to limited statistical power or potential underreporting. Further research using multi-centre prospective and longitudinal study designs is recommended to explore causal associations between diabetes and depression or anxiety. Future studies should also evaluate structured psychosocial and behavioral interventions to determine their impact on glycemic control and mental health outcomes among diabetic patients.

LIMITATIONS

This study has certain limitations. First, its cross-sectional design limits the ability to establish causal

relationships between sociodemographic factors and psychological outcomes. Second, the study was conducted in a single urban field practice area with a relatively small sample size (N=100), which may limit generalizability and statistical power for subgroup analyses. Third, participants were selected through consecutive sampling, which may introduce selection bias.

Additionally, glycaemic control indicators (such as HbA1c), duration of diabetes, and diabetes-related complications were not assessed, which restricts the ability to examine their association with depression and anxiety. The use of screening instruments (PHQ-9 and GAD-7) rather than structured clinical interviews may have led to misclassification. Finally, self-reported responses may be subject to reporting bias, particularly among participants with lower literacy levels.

CONCLUSION

In the present study, a substantial proportion of individuals with diabetes were found to experience psychological comorbidities, with 29.0% screening positive for depression and 31.0% for anxiety. Marital status and socio-economic status demonstrated significant associations with both conditions. Additionally, religion was linked to depression, whereas educational level was associated with anxiety. No significant relationships were observed for gender, age, or family history variables.

These findings highlight the need to strengthen the integration of mental health assessment within routine diabetes care. Systematic screening and timely psychosocial interventions particularly for individuals facing social or economic disadvantage may help enhance treatment adherence, overall disease control, and quality of life for people living with diabetes.

Informed Consent: Informed oral consent was obtained from all participants prior to data collection. Patient confidentiality and anonymity were strictly maintained.

Individual Authors' Contributions: **VS** contributed to the conceptualization and study design, as well as data interpretation and overall supervision of the research. **SDP** was responsible for data collection, data management, and drafting of the manuscript. **AMR** carried out the statistical analysis, interpreted the results, and performed critical revision of the manuscript. **RD** conducted the literature review, prepared the background section, and edited the final version of the manuscript.

Availability of Data: The data supporting the findings of this study are available from the corresponding author upon reasonable request.

Declaration of Non-use of Generative AI Tools:

This article was prepared without the use of generative AI tools for content creation, analysis, or data generation. All findings and interpretations are based solely on the authors' independent work and expertise.

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