Research Square

Preprints are preliminary reports that have not undergone peer review.
They should not be considered conclusive, used to inform clinical practice,
or referenced by the media as validated information.

Depression as a comorbidity in Type 2 Diabetes Mellitus: Prevalence and Relationship with Glycaemic Status and Quality of Life among patients attending a Nigerian Primary Care Clinic

Temitope Oluwafemi OLAJUBU

temitope.olajubu@npmcn.edu.ng

Obafemi Awolowo University Teaching Hospitals Complex

Samuel Anu OLOWOOKERE

Obafemi Awolowo University Teaching Hospitals Complex

Ibrahim Sebutu BELLO

Obafemi Awolowo University Teaching Hospitals Complex

Aanuoluwapo Omobolanle OLAJUBU

Obafemi Awolowo University

Chukwuemeka Joseph NWOYE

Obafemi Awolowo University Teaching Hospitals Complex

Oludayo Adeyemi OLOSUNDE

Seventh Day Adventist Hospital

Research Article

Keywords: Depression, Diabetes, Comorbidity, Glycaemic control, Quality of life, Family Medicine, Nigeria

Posted Date: March 26th, 2026

DOI: https://doi.org/10.21203/rs.3.rs-8933571/v1

License: This work is licensed under a Creative Commons Attribution 4.0 International License.
Read Full License

Additional Declarations: No competing interests reported.

Abstract

BACKGROUND

Depression commonly coexists with diabetes and contributes to poor health outcomes, yet many affected patients are managed in primary care, where this mental health condition is frequently under-recognized. In Nigeria and much of sub-Saharan Africa, available evidence largely comes from specialist clinics, highlighting the need for better characterization of depression among diabetic patients in primary care settings. The study aimed to determine the pattern of depression comorbidity among type 2 diabetic patients and its relationship with glycaemic control and quality of life in a Nigerian primary care clinic.

METHODS

It was a cross-sectional study of 260 known diabetic patients recruited from the Family Medicine clinic of Obafemi Awolowo University Teaching Hospital Complex, Ile-Ife. The respondents completed a structured questionnaire which incorporated the Patient Health Questionnaire and the World Health Organization Quality of Life brief version. Univariate and multivariate analyses of the data were carried out.

RESULTS

A total of 260 diabetic patients participated, with a mean age of 57.4 ± 11.2 years; and most were female (62.7%). The prevalence of depression was 23.5%. Depression was significantly associated with not being married, lower monthly income, presence of comorbidities, poor medication adherence, poor glycaemic control, and physical inactivity ($p < 0.05$). Depressive symptom scores correlated negatively with overall quality of life ($r = -0.753$, $p < 0.001$). Hierarchical multiple linear regression showed that the addition of fasting blood glucose and quality of life scores significantly improved the prediction of depressive symptoms. Logistic regression identified low income (AOR = 6.861; $p < 0.001$), poor glycaemic control (AOR = 3.171; $p = 0.024$), and lower QOL scores (AOR = 0.866; $p < 0.001$) as independent predictors of depression.

CONCLUSION

Depression is common among patients with diabetes in the study setting, and was strongly associated with poor glycaemic control and reduced quality of life. It's recommended that primary care physicians consider routine mental health screening and integrated biopsychosocial care of these patients.

INTRODUCTION

Diabetes Mellitus (DM) is a group of metabolic disorders characterized by hyperglycaemia that results from a defect in the secretion and/or action of insulin.[1] There continues to be an increase in the burden of diabetes globally, including in the developing parts of the world. The global prevalence of diabetes has been estimated to be rise from 9.3% (463 million people) in 2019 to 10.9% (578) by 2030 and progressively to 10.9% (700 million) by 2045.[2] The African region is projected to have the greatest percentage increase of 143% in the burden of DM by 2045.[2, 3] In Nigeria, the pooled prevalence was 6.3%,[4] which is believed to be a gross under-estimation in view of the fact that over fifty percent of cases of diabetes are said to be undiagnosed.[5]

Chronic diseases, such as DM, are known to exert a significant impact on the psychological and emotional well-being of affected individuals.[6, 7] It is often difficult for many to accept that they have to take drugs invariably throughout their life. Patients with DM often have to adjust their aspirations, lifestyle, and sometimes employment. These psychosocial problems can eventually develop into depressive or other psychological disorders.[6] Many grieve about their predicament before adjusting to it. But others have protracted distress and may develop psychiatric disorders, most commonly depression and anxiety. However, the emotional dimensions of the condition and its impact on patients' quality of life are often overlooked when medical care is considered. Majority of the guidelines on diabetes care focus on the medical aspects of initial management without addressing the psychological needs of the patient.[6]

The odds of depression is higher among diabetics than among the normal population.[8] Depression not only often coexists with diabetes but also negatively affects treatment goals, engenders poor diabetes self-management (i.e., diet modification, physical activity, and adherence to medications), and an increased risk for poor glycaemic control, which contributes to increased risk for DM complications.[8, 9] Furthermore, co-morbid depression in diabetes is associated with reduced functioning and poorer QOL.[6, 8] This underscores the importance of an increased awareness and treatment of depressive symptoms within diabetes care, especially in the primary care setting.

Primary care clinics are the first and often the only point of contact many diabetic patients have with the health system. Many of these patients are routinely managed by primary care physicians.[10, 11] Most of the studies on depression among diabetics in sub-Saharan Africa, in general, and Nigeria in particular have largely been done among diabetics attending specialist clinics.[9, 12–14] Depression is frequently under-recognized in primary care, despite being common among patients with chronic medical conditions.[15] This results in substantial missed opportunities for early identification and treatment in primary care settings. This under-recognition is influenced by factors such as somatic symptom presentations, limited consultation time, and insufficient mental health training among primary care clinicians, contributing to poor detection and delayed care.[15]

There is therefore the need for studies within the primary care setting on the burden of depression among these patients and the associated bio-demographic and lifestyle factors. Such information is

important for day-to-day clinical management towards improved health outcomes among the diabetic population in primary care. The findings may also strengthen the case for the implementation of appropriate policies, such as routine mental health screening of these patients. The study, therefore, aimed to determine the pattern of depression among DM patients attending a primary care clinic in southwest Nigeria. It also assessed the relationship of depression with glycaemic status and quality of life.

METHODS

Study design, setting, and population

The cross-sectional study was carried out among type 2 diabetic (T2DM) patients attending the General Outpatient Clinic (GOPC) of the Obafemi Awolowo University Teaching Hospital Complex (OAUTHC), Ile-Ife, Osun State, Nigeria. The GOPC, which is run by Family Physicians, provides primary and secondary care for people aged 16 years and above. An average of 1,500 to 2000 patients are seen each month at the clinic for a variety of acute and chronic conditions. The majority of the patients are managed and followed up at the GOPC, except for those with specific indications for referral to other specialty clinics. An average of 25 T2DM patients are seen at the clinic each week.

Sample size and sampling procedure

The sample size was determined using the formula for estimating a population proportion with a specified absolute precision. A sample size of 260 was calculated based on a previous prevalence of 19.4%[16], a confidence level of 95%, and an absolute precision of 5%, with the addition of 10% for potential non-response.

The study was conducted over a period of three months, during which about 300 T2DM patients constituted the available study population. Thus, all the T2DM patients who attended the clinic during the period were recruited if they met the inclusion criteria. This includes those who have been diagnosed and have been on treatment for at least 6 months. This was to ensure that they had understood and experienced the dynamics of the disease and its management, including its impact on their lives. Patients with cognitive impairment, acute illness, or any condition that impaired their ability to participate were excluded.

Data Collection and Study Measures

The collection of data was done with the use of a structured questionnaire (see supplementary file 1). After securing informed consent from the selected patients, the study questionnaire, which had been translated to Yoruba (the predominant local language) by the method of back-translation were administered. It consists of the following sections:

Socio-demographic data and medical history: such as respondents' age, sex, tribe, religion, marital status, occupation, and total monthly income. Others were: family history of diabetes, duration of years since diagnosis, and past medical history of co-existing medical conditions.

Lifestyle factors

These include the history of smoking, alcohol intake, and physical activity. With regard to smoking, respondents were classified into non-smokers, ex-smokers, and current smokers.[17] Concerning physical activity, an active respondent was defined as someone who regularly engaged in 30 or more minutes of moderately-intensive physical activities (e.g., brisk walking, carrying light loads, cycling at a regular pace, or doubles tennis) daily at least 5 times in a week, i.e. total of 150 minutes in a week in line with WHO recommendations. A respondent with a lower level of physical activity each week was categorized as inactive. Alcohol intake status was simply categorized as "yes" (i.e., currently taking alcohol) or "no" (not currently taking alcohol).

Medication Adherence

Questions were also asked about respondents' adherence to their diabetic medication(s). The degree of adherence was estimated using the following formula.[18]

$$\% \text{ Adherence in last 7days} = \frac{\text{\# expected doses} - \text{\# missed doses}}{\text{\# expected doses}} \times 100\%$$

High adherence was defined as greater than or equal to 80% adherence level, while a poorly adherent patient was an individual with less than 80% adherence level.[19]

Depressive Symptoms

The Patient Health Questionnaire (PHQ-9), a standardized and validated tool, was used to assess for depression.[15, 20] Response to each item was scored 0, 1, 2 or 3, based on a 4-point Likert scale to give a total score ranging from 0 to 27. In line with standard criteria, a total score of 5 and above indicated a positive screening for clinically significant depressive symptoms. Therefore, the respondents with scores of 5 and above were categorized as having depression, while those who scored between 0 and 4 were categorized as not depressed. All patients who had a positive screen for depression were given appropriate intervention.

Health-related quality of life

The World Health Organization Quality of Life brief version (WHOQOL-BREF) was used to assess respondents' health-related quality of life (QOL).[21] It consists of 26 items, which assessed 4 major

domains of health-related QOL, i.e., physical, psychological, social, and environmental. Each item was scored on a Likert scale from 1 to 5, with higher scores denoting a higher quality of life and a total obtainable score ranging from 26 to 130. The scores of items within each of the four domains were used to calculate the respective domain score, while the summation of all scores yielded the total quality of life (QOL) score.

Anthropometric and Clinical parameters

Each respondent also had their weight, height, blood pressure, and fasting blood sugar measured. A weighing scale (calibrated in kilograms) coupled with a stadiometer (calibrated in metres) manufactured by Hana, Japan, was used to measure the weight and height. The body mass index (BMI – defined as the weight in kilograms divided by the square of the height in meters) was calculated from the height and weight. The respondents were classified as either overweight or not based on their BMI. This was defined as BMI ≥ 25kg/m^2. An Accosson® Mercury sphygmomanometer was used to measure the blood pressure of the subjects. The blood pressure (BP) reading was taken in sitting position after the subject had been seated and well rested for about ten minutes. Two readings were taken at 5 minutes interval, and the average was recorded. A respondent was classified as hypertensive if he/she was a previously diagnosed hypertensive or had an average systolic BP of ≥ 140mmHg and/or diastolic BP reading of ≥ 90mmHg.[22]

Glycaemic status: this was determined by the fasting blood glucose (FBG). FBG was done with the use of a Caresens® glucometer (Model: GM505NA, Serial No: CN37G11273) with the appropriate test strips. For the purpose of this study, the level of glycaemic control was graded as follows: Good control (FBS ≤ 6 mmol/L), fair control (FBS of 6.1–6.9 mmol/L), and poor control (FBS of 7 mmol/L and above), an adaptation of the WHO diagnostic criteria.[23]

Data analysis

Data was analysed using the IBM SPSS® (version 24). Descriptive statistics were used to summarize the data. Respondents were classified into ‘depressed’ and not ‘depressed’ as described above. The socio-demographic and clinical variables associated with depression were identified using cross-tabulation and the Pearson chi-square test. The Pearson correlation was used to assess the relationship between the PHQ-9 scores and each of FBG and quality of life scores. Multivariate analysis, using hierarchical multiple linear regression, was used to further explore the effect of depressive symptoms (PHQ-9 scores) on the glycaemic status (FBG) and quality of life (WHOQOL-BREF scores), respectively, while controlling for potential confounders. Finally, all the variables that were significantly associated with depression (dichotomized into ‘depressed’ and not ‘depressed’) were entered into a multivariable binary logistic regression model to determine those that independently predicted the risk of depression. Significance level for all the analyses was set at $p < 0.05$

RESULTS

A total of 260 respondents were studied, with a mean age of 57.4 ± 11.2 years, and about one third (34.2%) were between age of 51 and 60 years. The majority were females (62.7%), married (80%), and Christians (75.4%), while 35.8% had a tertiary education. **(Table 1).**

Table 1
Socio-demographic characteristics of respondents (N = 260)

Variable	Frequency (n)	Percentage (%)
Age		
30–40	24	9.2
41–50	46	17.7
51–60	89	34.2
61–70	62	23.9
≥71	39	13.0
Religion		
Christianity	196	75.4
Islam	64	24.6
Marital Status		
Married	208	80.0
Separated/Divorced	9	3.5
Widowed	43	16.5
Level of Education		
None	75	28.8
Primary	44	16.9
Secondary	48	18.5
Tertiary	93	35.8
Occupation	53	20.4
Unemployed/Pensioners		
Farmer/Trader/Artisan	134	51.5
Civil/Public servants	57	21.9
Clergy	16	6.2
Sex		
Male	97	37.3
Female	163	62.7
Total income per month		

Variable	Frequency (n)	Percentage (%)
≤ #30,000 ($25)	76	29.2
> #30,000 ($25)	184	70.8

Prevalence and factors associated with Depression

A total of 61 out of the 260 respondents met the patient health questionnaire (PHQ-9) criteria for depression, giving a prevalence rate of 23.5% **[Figure 1]**.

Figure 1: Prevalence of depression among the diabetic patients

Association between depression and socio-demographic/clinical characteristics

As shown **on table 2**, the prevalence of depression was higher among those older than 60 years but this difference was not significant statistically. Similarly, there was a slightly higher prevalence of depression (23.9%) among the females compared with the males (22.7%) but was however not statistically significant. The variables that were significantly associated with depression include: marital status, total monthly income, presence of other co-morbid conditions, poor medication adherence, poor glycaemic control and physical inactivity.

Depressive symptoms, glycaemic status and quality of life

The correlation between PHQ-9 scores and some quantitative variables is presented in table 3. There was a strong negative correlation between depressive symptom score and each of the physical ($r = 0.678$, $p < 0.001$), psychological ($r = 0.748$, $p < 0.001$), social ($r = 0.535$, $p < 0.001$), environmental ($r = 0.627$, $p < 0.001$) domains, as well as the total QOL scores ($r = 0.753$, $p < 0.001$). On the other hand, the depressive symptom score is positively correlated with the FBG ($r = 0.250$, $p < 0.001$) among the respondents.

Hierarchical linear regression analysis was conducted to examine the degree to which variance in PHQ-9 scores could be accounted for by FBG after controlling for the significant socio-demographic variables. A regression model for the PHQ-9 scores predicted by sex, age, marital status, income, co-morbidity, medication adherence, and physical activity (Model 1) was compared to a Model 2 with FBG values added. The result is summarized in **Table 4**. A significant change in R-squared (R^2 change = 0.18, $p = 0.011$) was found between Model 1 [$R^2 = 0.302$] and Model 2 [$R^2 = 0.319$]. The inclusion of FBG value in the regression model significantly increased the variance accounted for in PHQ-9 scores.

Similarly, hierarchical regression analysis showed that QOL scores accounted for a significant variation in PHQ-9 scores after adjusting for the significant socio-demographic variables. Model 3 (addition of

QOL scores to the first model) produced an increase of about 30% in the variance accounted for by the regression model. (R^2 change = 0.288, $p < 0.001$).

Predictors of depression among the respondents

The variables that were significantly associated with depression from the earlier analyses were all entered into a logistic regression model with dichotomized depression status (yes or no) as the dependent variable (Table 5). Out of all these variables, the ones that maintained their significance as predictors of depression were low income (< 60,000 Naira), poor glycaemic control, and QOL scores. The respondents with lower income were almost seven times more likely to be depressed. (p < 0.000; OR = 6.861; CI = 3.405 – 13.825). Similarly, those with poor glycaemic control were thrice more likely to have depression (p = 0.024, OR = 3.171, CI = 1.161 – 8.661). Also, the risk of having depression was associated with lower QOL scores.

Discussion

This study determined the prevalence of depression among the adult type 2 diabetic population in a family practice setting and its relationship with glycaemic control and quality of life.

The study showed that 23.5% of the diabetic patients had depression. Previous studies from within and outside the country had reported varying figures depending largely on the screening instrument used, demographic mix of the respondents, and socio-cultural setting. Our finding is higher than 11.3% prevalence found in a study in Jos, Nigeria,[24] but much lower than the figures ranging between 30% and 50% reported by many previous authors.[8, 9, 12, 13, 25] These differences are most likely due to the aforementioned reasons. A meta-analysis of studies on depression among diabetics in Africa reported a pooled prevalence of 40%.[12] It is, however, comparable to findings by Abate et al in their study, which also used the PHQ-9 for screening for depressive symptoms among diabetic patients.[26]

Age has been identified as a risk factor for depression in the general population and among diabetics.[26-28] However, this study did not find any significant relationship between depression and age of the patients, even though the prevalence of depression was higher among the older patients, but it did not reach statistical significance. This finding could probably be due to the fact that more than 70% of the respondents were older than 50 years and are thus over-represented in the sample. This is in consonance with that of some studies in Nigeria and Ghana, which did not find any significant association between age and the diagnosis of depression in diabetes.[9, 29]

In this study, there was no statistically significant relationship between depression and respondents' gender, in contrast to what had been reported severally among the general population and among diabetic patients.[9, 26, 30, 31] Although the prevalence was higher among female subjects, this did not reach statistical significance. This finding aligns with some earlier reports.[25, 29]

With regard to marital status, depression was significantly associated with the non-married group among the subjects in this study. The highest prevalence was found among the separated or divorced group. This was similar to the finding by Akpalu et al., who reported that, compared to unmarried participants, currently married participants had a lower risk prevalence of depression.[9] According to Agbir et al., this suggests that some relative protection is offered by being married and could be potentially explained by the fact that married people are more likely to have a confidant with whom they can share their concerns and psychological distress and who can give them needed emotional support when in a stressful situation.[16] Such support may not be available to subjects who are single, divorced, or widowed.

This study found a significant association between total monthly income and depression. There was a higher prevalence among those who earned less than the national minimum wage, used as cut off. The economic burden associated with diabetic care and self-management may indeed be a major psycho-stressor for these patients, especially among those with low income, which limits their capacity to cope with the cost of their care. This association has been severally reported by previous authors.[25, 32, 33] There was also a significant association between depression and low levels of physical activity. This is in agreement with findings of earlier studies done in Nigeria and Saudi Arabia. [25, 29]

With reference to medication adherence among the respondents, there was a significant relationship with depression. The prevalence of depression was higher among those who were non-adherent. It has been shown that depressed diabetic patients tend to have a higher risk of discontinuing their medications and paying little effort to their daily management activities.[9, 25, 34, 35] Management guidelines for diabetes mellitus emphasise the importance of medication adherence, physical activity, and blood glucose monitoring. In view of the role of treatment adherence in the achievement of glycaemic control, this finding may be a contributory factor to the relationship between depression in diabetes and poor glycaemic control, as demonstrated in this study.

Depression was significantly associated with the level of glycaemic control among the respondents, as poor glycaemic control was not only associated with depression in univariate analysis, but it also predicted depression after being subjected to regression analyses. This is consistent with the findings of a previous systematic review.[36] The mechanisms that mediate this association are possibly multifactorial and bidirectional. As mentioned earlier, depression is known to negatively affect adherence to several aspects of diabetes management practices and regimens. Furthermore, major depression is known to be characterized by an increased release of counter-regulatory hormones such as glucocorticoids, growth hormone, catecholamines, and glucagon, which can cause the achievement of good glycaemic control more difficult.

After controlling for the potentially confounding sociodemographic and clinical factors, including physical inactivity and medication adherence, our findings showed that poor glycaemic control remained independently related to depression. On the flip side, it is also possible that when a diabetic patient has been having difficulty in achieving good control for whatever reason, that becomes a trigger for feeling

depressed. In other words, the poor glycaemic control may predate and indeed be a risk factor for depression.[37]

In terms of the quality of life of the respondents, the depressed patients had a significantly poorer quality of life on all the domains and the global score. A recent case-control study also showed that depressive symptoms in individuals with diabetes are associated with a worse quality of life.[38] The presence of depression may precede and precipitate a decrease in quality of life; a reversed causality cannot also be ruled out.[38] It is important to note that depression and quality of life are both known to be influenced by a number of variables, including age, sex, marital status, income, and education.[39, 40] These and many others may thus confound the relationship between quality of life and depression. However, this relationship was sustained in our analyses after adjusting for some of these factors. These findings underscore the need for paying adequate attention to the psychological aspect of diabetes management.

Limitation

A major limitation of this study is its cross-sectional nature, which limits the interpretation of the findings with regard to causality between the associated factors and the presence of depressive symptoms among the diabetic patients. The evaluation of the potential contribution of diabetes to depression is further constrained by the lack of non-diabetic controls in this study. There is a need for more robust longitudinal studies that will examine causal interactions between depression and diabetes in this environment. Such studies should also have a large sample and ideally be multi-centred or population-based to enhance the probability of generalising the findings. Furthermore, the effects of other potential confounders, such as diabetes complications and other life events, on the respondents' quality of life and their contribution to the onset of depression were not evaluated or controlled for. The study nevertheless makes an important contribution to drawing attention to the burden of depression among diabetic patients being managed in the study setting.

Conclusion

This study has demonstrated that there is a substantial prevalence of depression among diabetic patients in the study setting. Significant predictors of depression among diabetics in the study include low monthly income, poor glycaemic control, and poor quality of life. Evaluations of depression should be incorporated into the care plan of patients with diabetes, especially by primary care physicians who are the frontline care providers to many of these patients. Patients with the afore-mentioned characteristics associated depression, in particular those with low income, poor glycaemic control, and poor quality of life, should receive special attention. This will enable early diagnosis and treatment which has the potential of a positive effect on their treatment compliance and glycaemic control.

Abbreviations

BMI – Body Mass Index

BP – Blood Pressure

DM – Diabetes Mellitus

FBG – Fasting Blood Glucose

GOPC – General Outpatient Clinic

HRQOL – Health-Related Quality of Life

OAUTHC – Obafemi Awolowo University Teaching Hospital Complex

PHQ-9 – Patient Health Questionnaire (9-item version)

QOL – Quality of Life

T2DM – Type 2 Diabetes Mellitus

WHOQOL-Bref – World Health Organization Quality of Life (brief version)

Declarations

Ethics approval and consent to participate: Ethical clearance was obtained for the study from the ethics and research committee of the OAUTHC (ERC 2014/05/10). The study was conducted in accordance with the ethical standards and principles outlined in the Declaration of Helsinki. The nature of the study was explained to each prospective participant, and written informed consent was obtained.

Consent for publication: not applicable

Availability of data and materials: All data generated or analysed during this study are available from the corresponding author on reasonable request.

Declaration of Conflicting Interests: The Authors declare that there is no conflict of interest.

Funding: Not applicable.

Authors' contributions: TOO, SAO, AOO, OAO, and ISB contributed to the conception, literature review, and writing the protocol for the study. TOO, CJN, and OAO were involved in the data collection, analysis, and interpretation. TOO, AOO, OAO, and CJN contributed to writing the manuscript, while SAO and ISB provided general supervision. All authors approved the final manuscript.

Acknowledgements: Not applicable

References

1. Punthakee Z, Goldenberg R, Katz P. Definition, classification and diagnosis of diabetes, prediabetes and metabolic syndrome. Canadian journal of diabetes. 2018;42:S10–S5.
2. Saeedi P, Petersohn I, Salpea P, Malanda B, Karuranga S, Unwin N, et al. Global and regional diabetes prevalence estimates for 2019 and projections for 2030 and 2045: Results from the International Diabetes Federation Diabetes Atlas, 9th edition. Diabetes Research and Clinical Practice. 2019;157:107843.
3. Motala AA, Mbanya JC, Ramaiya K, Pirie FJ, Ekoru K. Type 2 diabetes mellitus in sub-Saharan Africa: challenges and opportunities. Nature Reviews Endocrinology. 2022;18(4):219–29.
4. Tambuwal UM, Ahmad SA, Bello SK, Hayatu U, Zainab ZM, Sadiq MA, et al. The Prevalence and Risk Factors of Diabetes Mellitus in Nigeria: A Two-Decade Scoping Review Across Six Geopolitical Zones. 2025.
5. Zerihun E, Abera F, Kune G, Girma F, Tesgera M, Robi M. Undiagnosed status and associated factors of diabetes mellitus among adults living in eastern Ethiopia: Unmasking a silent killer of prevalence of diabetes mellitus. Clinical Epidemiology and Global Health. 2024;25:101483.
6. Jena B, Kalra S, Yeravdekar R. Emotional and psychological needs of people with diabetes. Indian Journal of Endocrinology and Metabolism. 2018;22(5):696.
7. Kreider KE. Diabetes Distress or Major Depressive Disorder? A Practical Approach to Diagnosing and Treating Psychological Comorbidities of Diabetes. Diabetes Therapy. 2017;8(1):1–7.
8. Darwish L, Beroncal E, Sison MV, Swardfager W. Depression in people with type 2 diabetes: current perspectives. Diabetes, Metabolic Syndrome and Obesity: Targets and Therapy. 2018;Volume 11:333–43.
9. Akpalu J, Yorke E, Ainuson-Quampah J, Balogun W, Yeboah K. Depression and glycaemic control among type 2 diabetes patients: a cross-sectional study in a tertiary healthcare facility in Ghana. BMC Psychiatry. 2018;18(1).
10. Ugwu E, Young E, Nkpozi M. Diabetes care knowledge and practice among primary care physicians in Southeast Nigeria: a cross-sectional study. BMC Family Practice. 2020;21(1).
11. Zoberi KA, Salas J, Morgan CN, Scherrer JF. Comparison of family medicine and general internal medicine on diabetes management. Missouri medicine. 2017;114(3):187.
12. Ogunsakin RE, Olugbara OO, Moyo S, Israel C. Meta-analysis of studies on depression prevalence among diabetes mellitus patients in Africa. Heliyon. 2021;7(5):e07085.
13. Ofori SN, Adiukwu FN. Screening for Depressive Symptoms among Patients Attending Specialist Medical Outpatient Clinics in a Tertiary Hospital in Southern Nigeria. Psychiatry Journal. 2018;2018:1–6.
14. Mohammed H, Sheikh T, Bello F, Abubakar-Abdullateef A, Suleiman H, Kakangi A. ORIGINAL: Depression and Anxiety Disorders among Persons with Type 2 Diabetes Mellitus in a Tertiary

Hospital in Zaria, Nigeria: West Afr J Med. 2024 September; 41 (9): 937-943 PMID: 39862408. West Africa Journal of Medicine. 2024;41(9):937–43.

15. Amoran OE, Ogunsemi OO, Lasebikan VO. Assessment of mental disorders using the patient health questionnaire as a general screening tool in western Nigeria: A community-based study. Journal of Neurosciences in Rural Practice. 2012;03(01):06–11.
16. Agbir TM, Audu MD, Adebowale TO, Goar SG. Depression among medical outpatients with diabetes: A cross-sectional study at Jos University Teaching Hospital, Jos, Nigeria. Annals of African Medicine. 2010;9(1):5.
17. Szwarcbard N, Villani M, Earnest A, Flack J, Andrikopoulos S, Wischer N, et al. The association of smoking status with glycemic control, metabolic profile and diabetic complications–results of the Australian National diabetes audit (ANDA). Journal of Diabetes and its Complications. 2020;34(9):107626.
18. Fatiregun AA, Olowookere SA, Akinyemi JO, Bamgboye AE, Osagbemi GK. Prevalence and determinants of nonadherence to highly active antiretroviral therapy among people living with HIV/AIDS in Ibadan, Nigeria. The Journal of Infection in Developing Countries. 2008;2(05).
19. Wood B. Medication adherence: the real problem when treating chronic conditions. US pharm. 2012;37(4):3–6.
20. Kroenke K, Spitzer RL, Williams JBW. The PHQ-9. Journal of General Internal Medicine. 2001;16(9):606–13.
21. Lim SS, Vos T, Flaxman AD, Danaei G, Shibuya K, Adair-Rohani H, et al. A comparative risk assessment of burden of disease and injury attributable to 67 risk factors and risk factor clusters in 21 regions, 1990–2010: a systematic analysis for the Global Burden of Disease Study 2010. The lancet. 2012;380(9859):2224–60.
22. Armstrong C. JNC 8 guidelines for the management of hypertension in adults. American family physician. 2014;90(7):503–4.
23. Orazumbekova B, Issanov A, Atageldiyeva K, Berkinbayev S, Junusbekova G, Danyarova L, et al. Prevalence of impaired fasting glucose and type 2 diabetes in Kazakhstan: findings from large study. Frontiers in Public Health. 2022;10:810153.
24. Edah JO, Goar SG, Odoh G, Lawal B, Dayom PS, Sunday ZF, et al. Undiagnosed depression among adults with diabetes mellitus in Jos. Nigerian Journal of Clinical Practice. 2020;23(10):1431.
25. Alhunayni NM, Mohamed AE, Hammad SM. Prevalence of Depression among Type-II Diabetic Patients Attending the Diabetic Clinic at Arar National Guard Primary Health Care Center, Saudi Arabia. Psychiatry Journal. 2020;2020:1–7.
26. Abate TW, Gedamu H. Psychosocial and clinical factors associated with depression among individuals with diabetes in Bahir Dar City Administrative, Northwest Ethiopia. Annals of General Psychiatry. 2020;19(1).
27. Luppa M, Pabst A, Löbner M, Mallon T, Brettschneider C, Hajek A, et al. Age-specific risk factors of depression among the oldest-old-evidence from the multicenter AgeCoDe-AgeQualiDe study.

Frontiers in psychiatry. 2024;15:1367225.
28. Fatima M, Wang Z, Din ZU, Juan L, Ke C, Xie P. Evidence based prevalence of diabetes related depression in Kohat, Pakistan: a cross-sectional study. BMC Public Health. 2025;25(1):1938.
29. Ilori HT, Ajetunmobi OA. Cross-Sectional Study of Impact of Social Support on Depression among Type 2 Diabetics in a Secondary Health Care Facility in Southwest Nigeria. Journal of Advances in Medicine and Medical Research. 2019:1–8.
30. Sun Y, Zhong Y, Sun W, Chu L, Long J, Fan XW. More prevalent and more severe: gender differences of depressive symptoms in Chinese adolescents. Frontiers in Public Health. 2023;11:1167234.
31. Salve HR, Jaiswal A, Rath R, Sagar R, Vishnubhatla S. Prevalence and gender difference in depression in primary health care in India: A systematic review and meta-analysis. Journal of Family Medicine and Primary Care. 2024;13(3):819–26.
32. Aksünger N, Janssens W, Pradhan M. Daily struggles, shifting moods: The short-term dynamics of income and depression. Tinbergen Institute Discussion Paper; 2025.
33. Guan N, Guariglia A, Moore P, Xu F, Al-Janabi H. Financial stress and depression in adults: A systematic review. PloS one. 2022;17(2):e0264041.
34. Lunghi C, Moisan J, Grégoire J-P, Guénette L. The Association between Depression and Medication Nonpersistence in New Users of Antidiabetic Drugs. Value in Health. 2017;20(6):728–35.
35. Young-Hyman D, de Groot M, Hill-Briggs F, Gonzalez JS, Hood K, Peyrot M. Psychosocial Care for People With Diabetes: A Position Statement of the American Diabetes Association. Diabetes Care. 2016;39(12):2126–40.
36. Naskar S, Victor R, Nath K. Depression in diabetes mellitus—A comprehensive systematic review of literature from an Indian perspective. Asian Journal of Psychiatry. 2017;27:85–100.
37. Alruwaili NS, Al-Kuraishy HM, Al-Gareeb AI, Albuhadily AK, Ragab AE, Alenazi AA, et al. Antidepressants and type 2 diabetes: highways to knowns and unknowns. Diabetology & Metabolic Syndrome. 2023;15(1):179.
38. Suleman Shareef M, Indira A, Guthi VR, Alex V, Aruna G, Katari K, et al. Depression And Quality of Life Among Type-2 Diabetes Mellitus Patients: A Case Control Study. National Journal of Community Medicine. 2022;13(05):319–26.
39. Alemu WG, Due C, Muir-Cochrane E, Mwanri L, Azale T, Ziersch A. Quality of life among people living with mental illness and predictors in Africa: a systematic review and meta-analysis. Quality of Life Research. 2024;33(5):1191–209.
40. Kasa AS, Lee S-C, Chang H-C. Prevalence and factors associated with depression among older adults in the case of a low-income country, Ethiopia: a systematic review and meta-analysis. BMC psychiatry. 2022;22(1):675.

Table 2 to 5

Table 2 to 5 are available in the Supplementary Files section.

Figures

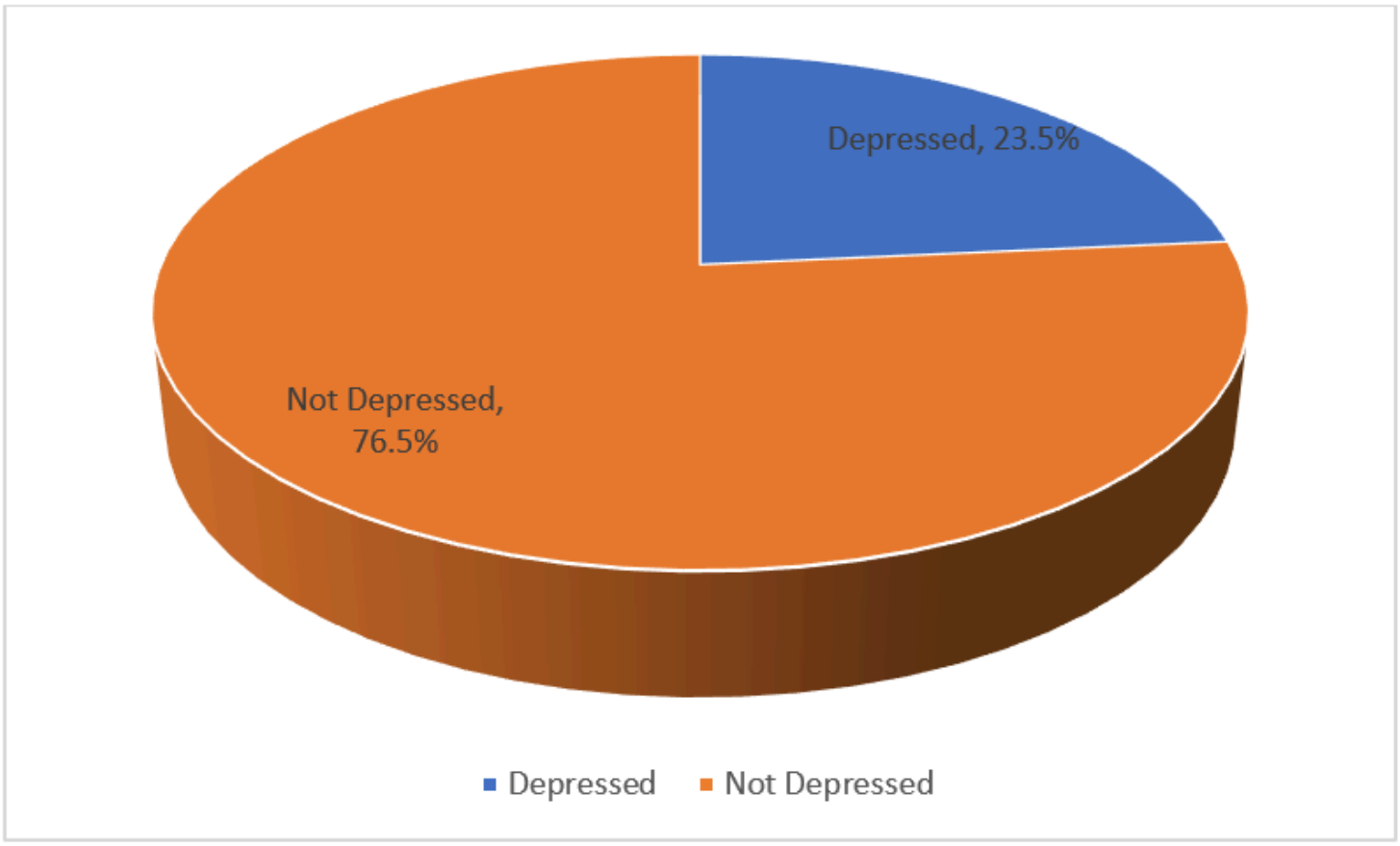


Figure 1

Prevalence of depression among the diabetic patients

Supplementary Files

This is a list of supplementary files associated with this preprint. Click to download.

- SupplementaryFile1Questionnaire.docx
- Table2To5.docx