Depression in Diabetes—The Hidden Bane

Annals of Neurosciences
30(3) 163–168, 2023

DOI: 10.1177/09727531221144112
journals.sagepub.com/home/aon
Sage

Arun Shirali[1], Yeshoda M[1], Priyanka Arun Shirali[2] and Sarah[1]

Abstract

Background: In India, a number of diabetes patients are rising, around 41 million Indians are suffering from diabetes. The depressed mood of an individual restricts the performance of that individual—socially, financially, and health-wise.
Purpose: Patients with diabetes having depression have shown worst diabetes outcomes in contrast to those suffering from type II diabetes mellitus (T2DM) only, perhaps due to neglect at retaining a specific dietary regimen to control blood sugar levels, and/or not complying with regular exercise, consistent lifestyle, and treatment course. Our study aimed to analyze the presence of undiagnosed depression among adult diabetes patients and correlate complications and duration of T2DM with depression.
Methods: This cross-sectional observational study was conducted on diabetes cases visiting Out Patient Department (OPD) at Tertiary Care Hospital in South India. After obtaining ethics committee clearance, known diabetes adult patients on regular treatment fulfilling selection criteria, and willing to join in the study were randomly selected. Participants were interviewed, clinically examined and data pertaining to sociodemographic characteristics, comorbid conditions, clinical parameters etc., were collected. Depression was judged using the Hamilton Depression Rating Scale (HDRS17) questionnaire. The association of depression with glycemic control, duration, and comorbidities associated with T2DM was studied.
Results: Of 224 T2DM patients studied, the average age was 58 years, with a Male-to-Female ratio 2:1. In total, 49 (22%) had undiagnosed depression, and 175 (78%) were not having clinically obvious depression. In our study, depression was significantly associated with older age, occurrence of complications like retinopathy, neuropathy, nephropathy, and heart disease, and duration of diabetes ($p < .005$).
Conclusion: Almost a fifth of diabetes individuals had undiagnosed depression. Proper diagnosis of depression among T2DM patients and intervention at right time can change the prognosis for patients, preventing further morbidities.

Keywords

Anxiety, Blood sugar, Diabetes related comorbidities, Duration of diabetes

Received 14 September 2022; **accepted** 14 November 2022

Introduction

"Diabetes mellitus" (DM) consists of a set of disorders characterized by hyperglycemia (high blood glucose levels), ensuing due to an insufficient action of hormone insulin on peripheral tissues in the human body or from an absolute deficiency of insulin secretion.[1] World Health Organization (WHO) stated that by 2030, diabetes will rank seventh as a cause of death[2] and Indians are especially prone to type II diabetes mellitus (T2DM) on account of physiological, social, and societal variables. In India, a number of diabetes patients are rising, and around 41 million Indians are suffering from diabetes.[3] It is projected that about 69.9 million will be suffering from T2DM, in India by end of 2025.[4] Approximately 340 million human beings worldwide go through depression at any given moment. Depression symptoms lead to a significant burden of disease from morbidity, mortality

[1]Department of General Medicine, Kasturba Medical College, Mangalore, Manipal Academy of Higher Education, Manipal, Karnataka, India
[2]Department of Physiology, Kasturba Medical College, Mangalore, Manipal Academy of Higher Education, Manipal, Karnataka, India
Corresponding author:
Priyanka Arun Shirali, Department of Physiology, Kasturba Medical College, Mangalore, Manipal Academy of Higher Education, Manipal, Karnataka 575001, India.
E-mail: priyanka.as@manipal.edu

(increases risk of suicide attempts) and affect quality-adjusted life expectancy (QALE), attributable to depression.[5,6]

T2DM associated with depression has shown worse diabetes outcomes[6,7] in contrast with patients with diabetes alone, due to neglect at retaining a specific dietary regimen to control blood sugar levels, and/or not complying with regular exercise, consistent lifestyle, and treatment course.[8,9] This results in more incidences of uncontrolled hyperglycemia, ensuing a series of related complications leading to augmented hospital care cases and expenditures. This, in turn, increases the number of disabilities, comorbidities, and mortalities.[10] Timely intervention of depressed diabetes patients can improve their glycemic control from 41% to 58%, avoid comorbidities and help them live productively longer and happier.[11–13] In India, with increasing T2DM incidence, it is imperative to find diabetes patients who are depressed and not being treated to curb its impairments. We conducted this study with the aim to assess for undiagnosed depression among adult diabetic patients and to find an association between complications and the duration of diabetes with depression.

Methods

Study Population

We conducted the study on adult patients with T2DM coming for regular follow-up/routine health checks at a tertiary care hospital in South India. With the anticipated level of depression among diabetes-seeking health care in tertiary level hospitals in India as 30%, considering 95% confidence interval, bearing in mind 7% precision and adding 20% nonresponse error, a total sample size of 224 was considered for this study.[13,14] The study was conducted for 2 years from March 2016 to March 2018 on a total of 224 subjects. In this time-bound study, patients were selected randomly. The selection was based on inclusion criteria as known case of T2DM diagnosed for more than 6 months and on regular treatment.

Data Collection

Patients who had been diagnosed with any mental/psychiatric ailments or had been consuming psychiatric medications/drugs for enhancement of sleep or mood alterations were excluded from this study. Others not included were pregnant women, any acute severe illness, history of hospital admission in past 3 months, recent surgery, trauma or burns, or any tragic event in the family in the last 6 months (road traffic accident, loss of job, unemployment, divorce, death of a family member, any chronic dependent patient), hypothyroidism which could cause transient dysthymia. This descriptive study was conducted on diabetes patients >18 years of age. Patients consenting for the study were examined, and sociodemographic and clinical details were recorded using a self-structured questionnaire. Glycemic control was evaluated based on HbA1c (nondiabetic reference range of 4.1%–6.0%) through laboratory enzymatic method.[14] To assign glycemic control level, the HbA1c values were stratified as:

<7% = well-controlled blood sugar levels
>7% = poorly controlled blood sugar levels.

Subsequently, patients were administered an open-end questionnaire, and the presence of depression was evaluated using the Hamilton M, a rating scale for depression (HDRS). Original scale consists 17 features (HDRS17) related to symptoms of depression as felt by patient in the last week. Each question has five possible answers valued from 0 to 4, 0 = "no problem" and 4 = "a serious problem," with score of 0–7 as being normal, 8–16 suffering from mild depression, 17–23 having moderate depression, and a score of >24 suggestive of severe depression.[15–17]

Data Analysis

Data collected was organized and statistically analyzed using SPSS IBM for Windows version 16.0, Armonk, New York. Relationship of duration of diabetes and comorbidities with glycemic control was studied. The chi-square and Fischer's test were used to test the association between variables. The odds ratio (OR) was measured to find an association between diabetes and comorbidities. The severity of depression was associated with the duration and complications of diabetes. For all analyses, purpose P-value $\leq .05$ was considered to be statistically significant.

Ethical Considerations

The study was conducted after obtaining Institutional Ethical Committee Clearance. Patients were given information about the study and written informed consent was taken from those willing to participate. The anonymity of participants was safeguarded by not linking any patient identifying details to the study data.

Results

After considering inclusion and exclusion criteria, 224 patients were interviewed in our observational study, clinically examined, and data pertaining to various demographic characteristics, and comorbidities were collected. Table 1 enlists the demographic distribution of studied patients.

The mean age of patients was 58 years (32 to 82 years), with 2:1 as the Male-to-Female ratio. Of 147 male diabetics, 30 (20%) were found to be depressed, while among 77 females, 19 (25%) were found to be depressed. The majority of the patients with underlying depression belonged

Table 1. Demographic Details of Study Participants.

Variables		Frequency *n*(%)	Depression Present	Depression Absent
Age (years)	31–40	13 (5.8)	0	13
	41–50	44 (19.6)	1	43
	51–60	70 (31.3)	17	53
	61–70	66 (29.5)	19	47
	Above 70	31 (13.8)	12	19
Gender	Females	77 (34.4)	19	58
	Males	147 (65.6)	30	117
Alcohol consumption	Yes	31 (13.8)	16	15
	No	193 (86.2)	33	160
Smoking	Yes	66 (29.5)	12	54
	No	158 (70.5)	37	125
Total		224 (100)	49	175

Table 2. Comorbidities among Study Patients.

Variable	Subgroup	Frequency *n*(%)
Depression	Present	49 (21.9)
	Absent	175 (78.1)
Glycemic status	<7%	195 (87)
	>7%	29 (12.9)
Retinopathy	Yes	33 (14.7)
	No	191 (85.3)
Nephropathy	Yes	41 (18.3)
	No	183 (81.7)
Neuropathy	Yes	14 (6.3)
	No	210 (93.8)
Hypertension	Yes	101 (45.1)
	No	123 (54.9)
Heart disorders	Yes	26 (11.6)
	No	198 (88.4)
Total		224 (100)

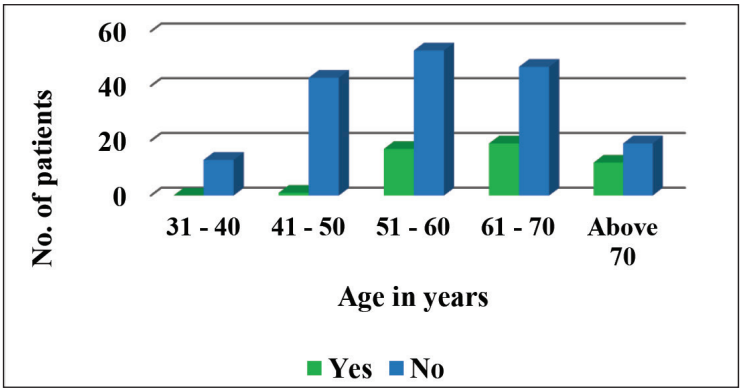

Figure 1. Association of Depression among Diabetes with Age.

to the age group of 51–60 (17) and 61 to 70 years (19) and those between 31 and 40 years (0) of age were not suffering from depression (*P*-value = .000).

As seen in Table 2, HbA1c of all patients was in the range of 6−15.8 with mean being (9.1 ± 1.8). In total, 195 (87%) had uncontrolled sugar levels of which 41 (21%) had depression (*P*-value = .425), although not statistically significant. In total, 45 (20.1%) patients had disease-related commonly occurring complications of which 31 (69%) had undiagnosed depression. In total, 179 (79.9%) diabetes study patients had no complications, of them, 18 (10%) had depression (*P*-value = .05).

As seen in Figure 1, diabetes patients suffering from depression were less in the younger and very old age groups.

Table 3. Distribution of Study Population Based on the Duration of Diabetes.

Duration of Diabetes in Years	*N*	*%n*	*%n*	*N'*	*%n'*	*%n*
0–5	3	6.1	2.1	142	81.1	97.9
6–10	21	42.9	43.8	27	15.4	56.3
11–15	15	30.6	78.9	4	2.3	21.1
>15	10	20.4	83.3	2	1.1	16.7
Total	49	100.0	21.9	175	100.0	78.1

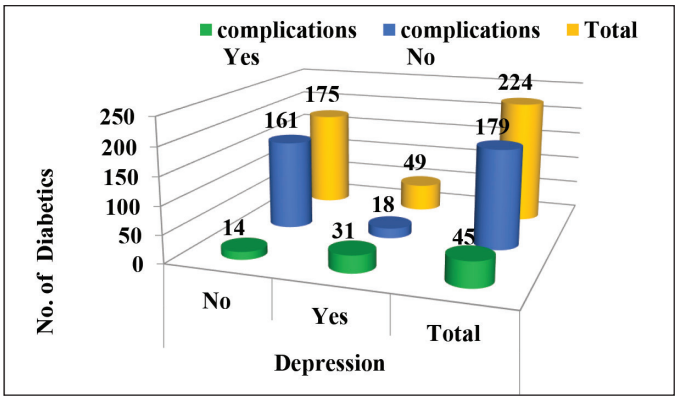

Figure 2. Association between Depression and Glycemic Control in Study Group.

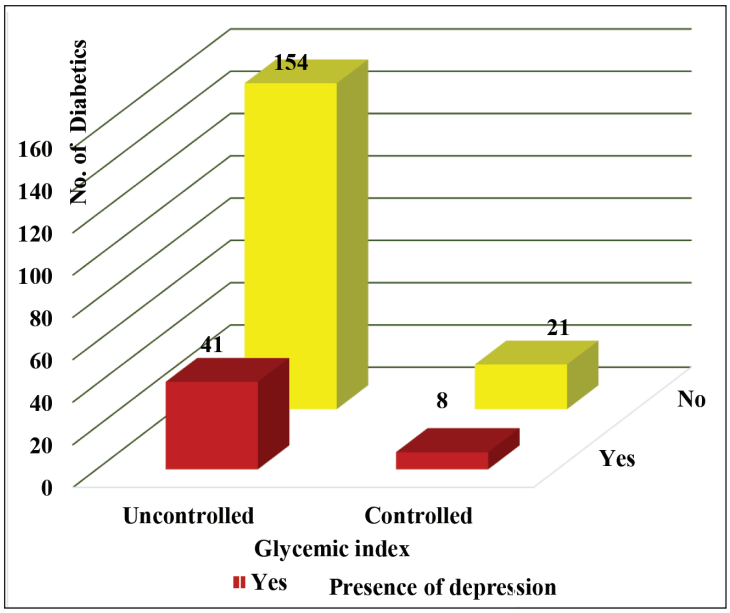

Figure 3. Association between Existence of Comorbidities and Depression in the Study Group.

The number of depressed patients with uncontrolled diabetes based on glycemic index was 41 compared to 8 diabetes patients who were depressed but had good glycemic control, as seen in Figure 2 and Figure 3.

Our study showed, of the 49 depressed diabetes patients 31 had other complications, whereas only 14 diabetes patients of the 175 were neither depressed nor had other complications.

Patients were categorized into four groups based on a period of suffering from diabetes as—less than 5 years, 6−10 years, 11−15 years, and greater than 15 years to discover any direct association between diabetes duration and depression. In total, 145 (65%) had duration <5 years of which 3 (2%) were having undetected depression. Of 48 diabetes individuals of 6 to 10 years of duration, 21 (44%) were in depression. In category of 11−15 years' suffering from diabetes, 15 (79%) had depression. Last category >15 years of duration of diabetes, 10 (83%) were having depression (*P*-value = .000) (Table 3).

Discussion

Authors of this cross-sectional study assessed known diabetes adult patients for the presence of undiagnosed depression and correlated with complications and duration of T2DM. The primary outcome was evaluation of prevalence of the undiagnosed depression in adult diabetes. The secondary outcome was to measure for any association between uncontrolled diabetes, diabetic complications, and duration of diabetes with depression. The presence of depressive symptoms was assessed using HDRS17. The HbA1c level of less than 7% was categorized as good glycemic control. Both micro- and macro-vascular complications were evaluated including nephropathy, neuropathy, retinopathy, and ischemic heart disease. Controls were not considered as the aim of this study assessed duration and complications of diabetes with depression.

We found almost one-fifth, 22% of total studied patients, had undiagnosed depression, Table 1. Other studies conducted in India showed a prevalence range from 8.5 % to 32.5 %[13,14,18] and in the USA, the prevalence of depression ranged between 2% and 28%[19] corroborating with our study. Thus, many diabetes individuals tend to show mood changes. This can be attributed to compulsion in medication as well as change and/or decrease in dietary habits. Since food alleviates one's mood; curtailment of the same to control disease can depress the patient.

The study in Western Kenya showed a positive association between diabetes females and depression (20.4% female vs 16.2% male),[20] a positive gender association in similar lines with our study data. This can be because females in south India will be responsible for cooking, and yet they cannot enjoy what they cook. We did not evaluate depressed females based on their work nature or hormones. A larger sample size study can be planned to assess the effect of work/profession, and their hormonal levels on depressed diabetes females.

The significant positive correlation was noted between diabetes complications and depression in a study conducted in North India. It showed diabetes complications strongly influenced disease outcomes. This study enforced both micro- and macro-vascular complications were associated with a higher prevalence of depression particularly neuropathy, nephropathy, and diabetes foot disease.[19] A positive correlation between retinopathy and increased prevalence of depression was noted in a study in Iran, in keeping with the findings of our study.[18] Based on the findings of our study, the presence of complications were associated with the existence of depression, which has also previously been observed in another similar study.[21] A probable reason for this could be mood changes due to ongoing diabetes, accompanied by newer complications.

Duration of diabetes showed a strong positive correlation with depression (Figure 1), implying that diabetes patients with greater durations of their illness were more likely to be depressed. Duration of diabetes was related to diabetes-related distress and has been noticed in a study done in a northwestern country in Europe in 2015.[21,22] Similarly, in another study authors observed duration of diabetes was significantly associated with elevated depression scores. A possible explanation maybe that prolong illness increases chances of developing disease-related complications. Also, a chronic disease escalates chances of disease-related health care costs. All these factors, cumulatively increase the mental stress in a patient, making him/ her more prone to develop depression.[23] Older individuals confront numerous difficulties such as increased health problems, isolation, and disabilities, making them more likely to develop depression.[24]

The strength of our study is precision in the diagnosis of diabetes, the type of study group selected, and the thorough assessment of various diabetes-related parameters and complications contributing to depression.

Conclusion

Up to 20% of diabetes patients have undiagnosed depression. Hence it is imperative to screen for depression in this cohort of patients. Further, their counselling can help to overcome or avoid depression. This can help prevent the deterioration of the patient's health status. Complications and duration of diabetes are both strongly associated with the occurrence of depression. Prevention and appropriate treatment of complications may help to decrease the burden of depression in diabetes patients.

Recommendations

The role of the management of depression in better glycemic control needs to be studied in a larger sample size. Screening and management of depression in diabetes can be incorporated into regular follow-up/routine health check-ups at hospitals. In a

resource-limited setting, a questionnaire-based screening tool will be easy to administer which can be done in primary care settings—once diabetes is diagnosed, these patients may benefit from referral for psychiatric/psychologic evaluation. These measures will prompt early identification and management of depression, and help in reducing the comorbid burden of the disease.

Authors' Contribution

The manuscript has been read and approved by all the authors, the requirements for authorship for all the authors in this document have been met, and that each author believes that the manuscript represents honest work.

Statement of Ethics

Institutional Ethics committee clearance was procured before initiating the study.

Declaration of Conflicting Interests

The authors declared no potential conflicts of interest with respect to the research, authorship, and/or publication of this article.

Funding

The authors received no financial support for the research, authorship, and/or publication of this article.

ORCID iD

Priyanka Arun Shirali https://orcid.org/0000-0001-5076-8016

References

1. Musselman DL, Betan E, Larsen H, et al. Relationship of depression to diabetes types 1 and 2: Epidemiology, biology, and treatment. *Biol Psychiatry* 2003; 54(3): 317–329.
2. Mathers CD, Loncar D. Projections of global mortality and burden of disease from 2002 to 2030. *PLoS Med* 2006; 3(11): 2011–2030.
3. Joshi SR, Parikh RM. India—Diabetes capital of the world: Now heading towards hypertension. *J Assoc Physicians India* 2007; 55: 323–324.
4. King H, Aubert RE, Herman WH. Global burden of diabetes, 1995-2025: Prevalence, numerical estimates, and projections. *Diabetes Care* 1998; 21(9): 1414–1431.
5. Greden JF. Physical symptoms of depression: Unmet needs. *J Clin Psychiatry* 2003; 64(Suppl 7): 5–11. http://www.ncbi.nlm.nih.gov/pubmed/12755646
6. Jia H, Zack MM, Thompson WW, et al. Impact of depression on quality-adjusted life expectancy (QALE) directly as well as indirectly through suicide. *Soc Psychiatry Psychiatr Epidemiol* 2015; 50(6): 939–949. https://doi.org/10.1007/s00127-015-1019-0
7. Lustman PJ, Anderson RJ, Freedland KE, et al. Depression and poor glycemic control: A meta-analytic review of the literature. *Diabetes Care* 2000; 23(7): 934–942.
8. De Groot M, Anderson R, Freedland KE, et al. Association of depression and diabetes complications: A meta-analysis. *Psychosom Med* 2001; 63(4): 619–630.
9. Lin EHB, Katon W, Von Korff M, et al. Relationship of depression and diabetes self-care, medication adherence, and preventive care. *Diabetes Care* 2004; 27(9): 2154–2160.
10. Eraker SA, Kirscht JP, Becker MH. Understanding and improving patient compliance. *Ann Intern Med* 1984; 100(2): 258–268. https://doi.org/10.7326/0003-4819-100-2-258
11. Katon WJ, Rutter C, Simon G, et al. The association of comorbid depression with mortality in patients with type diabetes. *Diabetes Care* 2005; 28(11): 2668–2672.
12. Lustman PJ, Freedland KE, Griffith LS, et al. Fluoxetine for depression in diabetes: A randomized double-blind placebo-controlled trial. *Diabetes Care* 2000; 23(5): 618–623.
13. Aminu AS, Chandrasekaran V, Nair S. Depression among patients with diabetes: A community-based study in South India. *J Med Sci* 2017; 37: 237–244.
14. Chaudhry R, Mishra P, Mishra J, et al. Psychiatric morbidity among diabetic patients: A hospital-based study. *Ind Psychiatry J* 2010; 19(1): 47–49. http://www.industrialpsychiatry.org/text.asp?2010/19/1/47/77637
15. Hamilton M. Development of a rating scale for primary depressive illness. *Br J Soc Clin Psychol* 1967; 6(4): 278–296.
16. Zimmerman M, Martinez JH, Young D, et al. Severity classification on the Hamilton Depression Rating Scale. *J Affect Disord* 2013; 150(2): 384–388. https://doi.org/10.1016/j.jad.2013.04.028
17. Williams JB. A structured interview guide for the Hamilton Depression Rating Scale. *Arch Gen Psychiatry* 1988; 45(8): 742–747.
18. Raval A, Dhanaraj E, Bhansali A, et al. Prevalence and determinants of depression in type 2 diabetes patients in a tertiary care centre. *Indian J Med Res* 2010; 132: 195–200.
19. Li C, Ford ES, Strine TW, et al. Prevalence of depression among U.S. adults with diabetes: Findings from the 2006 behavioral risk factor surveillance system. *Diabetes Care* 2008; 31(1): 105–107.
20. Nyaberi Z, Oyieke J, Chege M, et al. Correlates of undiagnosed depression among diabetic patients on follow-up at a regional referral hospital in Western Kenya. *Glob J Interdiscip Soc Sci* 2014; 3(6): 24–30.
21. Kasteleyn MJ, de Vries L, van Puffelen AL, et al. Diabetes-related distress over the course of illness: Results from the Diacourse study. *Diabet Med* 2015; 32(12): 1617–1624.
22. Juozulynas A, Mikaliūkštienė A, Žagminas K, et al. Prevalence and determinants of anxiety and depression symptoms in patients with type 2 diabetes in Lithuania. *Med Sci Monit* 2014; 20: 182–190. https://doi.org/10.12659/MSM.890019
23. Khuwaja AK, Lalani S, Dhanani R, et al. Anxiety and depression among outpatients with type 2 diabetes: A multicentre study of prevalence and associated factors. *Diabetol Metab Syndr* 2010; 2: 72. https://doi.org/10.1186/1758-5996-2-72
24. De la Roca-Chiapas JM, Hernández-González M, Candelario M, et al. Association between depression and higher glucose levels in middle-aged Mexican patients with diabetes. *Rev Invest Clín* 2013; 65: 209–213.