

Factors associated with depression among Type-2 Diabetic Patients in Nepal

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ABSTRACT

Background: The worldwide health scenario is undergoing a shift from infectious diseases to non-communicable ones, and diabetes is now the seventh major contributor to global mortality. Depression, anticipated to be the second-highest contributor to Disability Adjusted Life Years by 2020, presents a notable public health challenge. The probability of experiencing depression is elevated two to three times in individuals with diabetes, particularly those diagnosed with Type 2 diabetes.

Objectives: To assess the prevalence of depression and associated factors in Type 2 diabetic patients in Tribhuvan University Teaching Hospital.

Methods: An analytical cross-sectional study was conducted among 151 Type 2 diabetic patients visiting Tribhuvan University Teaching Hospital, Nepal. Patients were selected by systematic random sampling at an interval of every third diabetic patient attending the Out-Patient Department. Depression was assessed using the Beck Depression Inventory. Data was analyzed using STATA-14 where logistic regression was performed to ascertain associations (P value <0.05) of sociodemographic, behavioral and clinical characteristics with depression.

Results: The prevalence of depression among Type 2 diabetic patients was 28.5%. Among them, 15.2% had mild depression, 11.9% had moderate depression and 1.4% had severe depression. The odds of having depression was 1.24 times higher with 1 unit increase in HbA1C level (AOR=1.24, 95%CI:1.09-1.42, P-value=0.001), 4.62 times higher in patients having retinopathy as comorbidity (AOR=4.62, 95%CI:1.63-13.11, P-value=0.04) and 6.36 times higher in patients taking insulin for treatment (AOR=6.36, 95%CI:1.79-22.53, P-value=0.004) after adjusting for age, sex, occupation, marital status, ethnicity income and education.

Conclusion: The study revealed that more than a quarter of Type 2 diabetic patients in this sample experienced depression. Factors such as HbA1C, treatment by insulin and retinopathy as comorbidity were identified as significant contributors. These findings highlight the emerging problem of depression among diabetic patients, emphasizing the need for integrated mental health services in diabetes care.

Keywords: Type-2 Diabetes, Depression, Associated factors, Healthcare cost, Comorbidities

1. Introduction

The global health landscape is rapidly changing, with a shift from infectious diseases to non-communicable diseases. Diabetes affects 537 million people, projected to rise to 783 million by 2045 [1]. Additionally, depression, affects around 280 million individuals worldwide and is predicted to be the second-highest contributor to Disability Adjusted Life Years (DALYs) by 2020 [2]. In 2021, the total cases of diabetes in Nepal was 1.13 million [3]. Both diabetes and depression pose substantial challenges to public health globally.

Depression and diabetes have a bidirectional relationship, with major depressive disorder in individuals with diabetes stemming from a complex interplay of biological and psychosocial factors [4]. The likelihood of depression is two times higher in individuals with Type 2 diabetes [5]. Global studies consistently emphasize the strong correlation between depression and factors such as poor glycaemic control, comorbidities, and treatment intensity [6].

The burden of depression in diabetic patients is closely linked to complications like diabetic foot problems, cardiovascular disease, and eye complications [7]. Comorbid

depression is associated with increased healthcare costs, dietary restrictions, poor medication adherence, and functional impairment [8-10]. Smoking and obesity significantly elevate the likelihood of depression in individuals with diabetes, particularly Type 2 diabetes, contributing to the reduced quality of life [11].

Limited studies have been conducted on depression in diabetes even though incidence of type 2 diabetes has been increasing rapidly in Nepal. Depression often goes undiagnosed and untreated due to stigma on mental illness. Thus, this study assessed depression and associated factors in Type 2 diabetic patients at Tribhuvan University Teaching Hospital. Insights from this study can guide integrating mental health services into primary care, addressing emerging depression in individuals with diabetes. Recognizing links between lifestyle practices and risk of depression allows health officials to identify high-risk individuals, enhance prevention strategies, and expedite treatment, potentially improving patient self-care and mitigating long-term diabetes complications.

2. Methods

2.1 Study Area

The study was conducted within a period of one month from 5th of September to 5th of

October, 2018 in Department of Endocrinology, Tribhuvan University Teaching Hospital (TUTH), Nepal.

2.2 Study Design

This is a cross-sectional analytical study.

2.3 Sample size and sampling

Sample size determination for this study took into account the baseline prevalence of depression in diabetics, with reference to a similar study conducted in the same geographical area with a presumed prevalence (p) of 40.3% (13).

Utilizing the formula,

$$n = p(1-p)/e^2,$$

where Z represents the level of confidence measure (1.96 for a 95% confidence interval), p signifies the baseline prevalence, and e represents the margin of error (chosen as 8% of $p = 0.055$ for this study), the calculated sample size (n) was 144. Considering an assumed response rate of 90%, the final adjusted sample size for potential non-response was $n = 144/0.9 = 151$. Thus, 151 participants were recruited for the study.

Endocrinology department of TUTH was selected purposively. The number of diabetic

patients attending the OPD was verified through the OPD register.

Using systematic random sampling, every fourth patient with Type 2 diabetes visiting the doctor for follow-up was recruited until the desired sample size was achieved. Given an average of 40 diabetic patients attending follow-ups each day, the population size (patients visiting the TUTH endocrinology department) was estimated to be 4012. With a sample size of 151, the sampling interval (k) was calculated as $4012/151$, resulting in a value of 3. This process ensured a representative sample for the study.

All type 2 diabetic patients above 18 years of age visiting Department of Endocrinology, TUTH for follow up were included in the study. Patients with chronic medical illnesses before detection of diabetes, pregnant women, and patients with previous history psychiatric illnesses were excluded.

2.4 Data Collection

Beck Depression Inventory (BDI) was used to assess the depression among diabetic patients. This scale comprises of 21 items, each rated on a four-point scale. Each item, representing a depression symptom, is aggregated to yield a single score, ranging from 0 to 63. On the basis of obtained score,

the condition can be categorized as: i) normal (0-13), ii) mild (14-19), iii) moderate (20-28), and iv) severe (29-63). The BDI tool, utilized for over 35 years to identify and assess depression, demonstrated high sensitivity and specificity with an internal consistency of 0.9. With a well-established construct validity, a high coefficient alpha (0.80), and the ability to differentiate between depressed and non-depressed individuals, the BDI remains a highly reliable instrument across diverse populations.

A semi-structured, pre-tested questionnaire was administered by the interviewers to collect information on socio-demographic, clinical and behavioral characteristics. The questionnaire was prepared in English and translated into Nepali language.

Health care costs included the total direct cost of treatment, the medicine cost and doctor consultation fees. Counselling facilities were provided by the Department of Endocrinology where patients were counselled on diabetes, self-care, diet and living with diabetes.

2.5 Data Analysis

Data was entered in EpiData v3.1 and was exported to STATA-14 for analysis. Descriptive statistics were presented in

frequencies for categorical variables whereas means (standard deviations) were used for continuous variables. Depression was dichotomized (0-13) as having depression and (14-63 as having no depression). Logistic regression was applied to test whether the factors were significantly associated (p value <0.05) with depression.

2.6 Ethical Clearance

This study was approved by Institutional Review Board, Institute of Medicine, Tribhuvan University (IRC Ref No:181(6-11-E)). Participants were recruited on a voluntary basis after providing full information about the research and obtaining written informed consent. Confidentiality of responses was assured by not recording names on the questionnaire and by restricting access to the computer database to others. Codes were used to identify respondents instead of names.

3. Results

Table 1 shows the sociodemographic, behavioral, and clinical characteristics of participants. The study included 151 respondents with a balanced gender distribution (50.3% males, 49.7% females). Mean age of participants was 54 years (SD 11.4). Most were from nuclear families

(57.6%) and married (90.1%). In terms of ethnic groups, 51% were Brahmin/Chettri and majority of the patients were of Hindu religion (82.1%). Nearly half of the patients were homemakers (49%). About one-third had a family income below 20,000 Nepalese rupees (NRs.) per month. Education-wise, 30.5% had no formal education, 27.2% had completed primary level, 27.8% had completed secondary level, and 14.6% had completed SLC (School Leaving Certificate) and above.

Behavioral characteristics revealed that 35.1% of participants were classified as pre-obese, while 14.6% were obese. Tobacco consumption was low, with 82.8% reporting no use, 11.9% identifying as former users, and 5.3% as current users. Similarly, smoking prevalence was modest, with 61.6% of participants reporting never having smoked, 28.5% being former smokers, and 9.9% current smokers. In terms of alcohol consumption, the majority (58.9%) reported no history of alcohol intake, while 23.2%

were former drinkers, and 17.9% admitted to current alcohol use.

In terms of clinical characteristics, almost half of the participants had been diagnosed with diabetes for less than 5 years (54.3%), while 20.5% had a duration of 5-10 years, and 25.2% had been diagnosed for over 10 years. Most participants (90.1%) were undergoing medical treatment, primarily through oral medication (93.4%) and insulin therapy (19.9%). More than a quarter (31.8%) reported a family history of diabetes, while nearly half (49%) had not attended counseling sessions. Comorbidities were prevalent over half of the participants (55%), including conditions such as diabetic retinopathy (45.8%), neuropathy (20.5%), nephropathy (19.3%), and cardiovascular diseases (16.9%). Financially, the majority (75.5%) spent less than NRs. 5,000 on diabetes treatment, while 14.6% spent between NRs. 5,000-10,000, and 9.9% spent over NRs. 10,000 every month.

Table 1: Socio-demographic, behavioral and clinical characteristics of the respondents (n=151)

Characteristics (n=151)	Number (n)	Percentage (%)
Age (years)		
Less than 40	23	15.2
40-60	86	57.0
60 and above	42	27.8
Mean ± SD	54.38 ± 11.42	
Sex		
Male	76	50.3
Female	75	49.7

Characteristics (n=151)	Number (n)	Percentage (%)
Marital status		
Married	136	90.1
Unmarried	15	9.9
Family type		
Nuclear	64	42.4
Joint	87	57.6
Ethnicity		
Brahmin/ Chhetri	77	51.0
Janajati	58	38.4
Dalit	8	5.3
Others	8	5.3
Religion		
Hindu	124	82.1
Buddhist	18	11.9
Christian	6	4.0
Others	3	2.0
Occupation		
Housewife	49	32.5
Business	24	15.9
Service	23	15.2
Retired	22	14.6
Agriculture	20	13.2
No income	9	6.0
Others	4	2.6
Monthly family income (NRs)		
Less than 20000	54	36.0
20000-40000	44	29.3
40000-60000	33	22.0
60000 and above	19	12.7
Educational status		
No formal education	46	30.5
Primary (1-5)	41	27.2
Secondary (6-9)	42	27.8
SLC and above	22	14.5
Behavioural Characteristics		
BMI		
Normal (18.5-24.9)	72	50.3
Pre-obesity (25-29.9)	53	35.1
Obesity (29.9and above)	22	14.6
Tobacco consumption		
Never	125	82.8
Former	18	11.9
Current	8	5.3
Smoking		
Never	93	61.6
Former	43	28.5
Current	15	9.9
Drinking alcohol		
Never	89	58.9
Former	35	23.2
Current	27	17.9
Clinical Characteristics		
Duration of diabetes (years) (median-5)		
Less than 5 years	82	54.3

Characteristics (n=151)	Number (n)	Percentage (%)
5 to 10 years	31	20.5
10 years and above	38	25.2
Mean (\pm SD)	2.16 \pm 0.81	
Medical treatment at present		
Yes	136	90.1
No	15	9.9
Duration of medication (years) (n=136)		
Less than 5 years	75	55.1
5-10 years	29	21.3
10 years and above	32	23.5
Counselling on diabetes		
Yes	77	51.0
No	74	49.0
Monthly total cost for diabetes treatment (NRs)		
Less than 5000	114	75.5
5000-10000	22	14.6
10000 and above	15	9.9
Family history of diabetes		
Yes	48	31.8
No	103	68.2
Comorbidity associated with diabetes		
Yes	83	55.0
No	68	45.0
Types of comorbidities(n=83)		
Retinopathy	37	45.8
Neuropathy	17	20.5
Nephropathy	16	19.3
Cardiovascular diseases	13	16.9
Type of treatment at present		
Medicine	127	84.1
Insulin	24	15.9

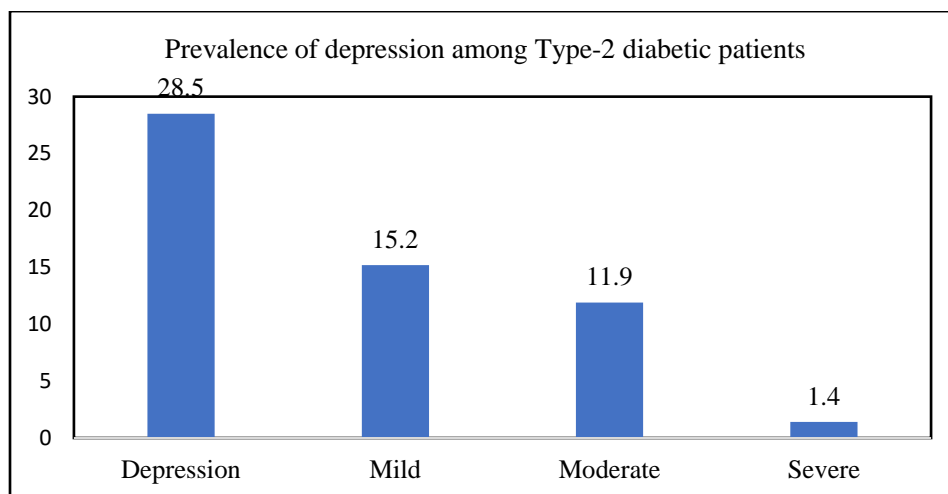


Figure 1: Status of depression in type 2 diabetic patients

Figure 1 shows the status of depression among type 2 diabetic patients. The overall prevalence of depression in diabetic patients was 28.5%; among them, 15.2% had mild depression, 11.9% had moderate depression and 1.4% had severe depression.

Table 2 shows the association between socio-demographic characteristics and depression among type 2 diabetic patients. The socio-demographic variables (sex, age, marital

status, family type, ethnicity, religion, monthly family income and educational status) were found to have no significant association with depression among type 2 diabetic patients. However, in comparison to homemakers, type-2 diabetic patients involved in agriculture had 0.14 times lower odds of having depression (95%CI:0.02-0.78, P-value=0.02).

Table 2: Association between socio-demographic factors and depression among Type 2 DM patients (n=151)

Factors	Depression		OR	95% CI	P-Value
	Frequency	Percentage			
Age	N/A	N/A	1.22	0.71-2.13	0.46
Sex					0.34
Male	19	25.00		Ref	
Female	24	32.00	1.41	0.69-2.87	
Marital Status					
Unmarried	2	13.33		Ref	
Married	41	30.15	2.81	0.61-12.99	0.18
Family Type					
Nuclear	17	26.56		Ref	
Joint	26	29.89	1.17	0.57-2.42	0.65
Ethnicity					
Others	4	25.00		Ref	
Brahmin/Chettri	22	28.57	1.2	0.34-4.12	0.77
Janjati	17	29.31	1.24	0.35-4.41	0.73
Religion					
Non-Hindus	8	29.63		Ref	
Hindus	35	28.23	0.93	0.37-2.32	0.88
Occupation					
Home makers	8	40.00		Ref	
Service	6	25.00	0.5	0.13-1.8	0.29
Business	16	32.65	0.72	0.24-2.13	0.56
Agriculture	2	8.70	0.14	0.02-0.78	0.02*
Others	11	31.43	0.68	0.21-2.15	0.52
Income (NRs)					
<20000	17	31.48		Ref	
20000-40000	8	29.63	0.91	0.33-2.51	0.86
40000-60000	13	30.95	0.97	0.41-2.32	0.95
60000 and above	4	14.81	0.37	0.11-1.26	0.11
Educational Status					
No formal education	14	30.43		Ref	
Primary	12	36.36	1.31	0.51-3.36	0.58
Secondary and above	17	23.61	0.71	0.31-1.62	0.41

*OR= Odds Ratio, 95% CI= 95% Confidence Interval, N/A= Not applicable

Table 3 shows the association of behavioural characteristics with depression among type 2 diabetic patients using logistic regression. The behavioural variables (BMI, smoking

habit, tobacco consumption, alcohol consumption) were found to have no significant association with depression among type 2 diabetic patients.

Table 3: Association between behavioral characteristics and depression among type 2 diabetic patients (n=151)

Factors	Depression		OR	95% CI	P-Value
	Frequency	Percentage			
BMI					
Normal (18.5-24.9)	25	32.89	Ref		
Pre-obesity (25-29.9)	10	18.87	0.47	0.2-1.09	0.08
Obesity (29.9 and above)	8	36.36	1.16	0.43-3.13	0.76
Smoking					
No	38	27.94	Ref		
Yes	5	33.33	1.28	0.41-4.01	0.66
Alcohol consumption					
No	35	28.23	Ref		
Yes	8	29.63	1.07	0.42-2.67	0.88
Tobacco consumption					
No	41	28.67	Ref		
Yes	2	25.00	0.82	0.16-4.27	0.82

*OR= Odds Ratio, 95% CI= 95% Confidence Interval

Table 4 shows the bivariate analysis of association of clinical characteristics and depression among type 2 diabetic patients using logistic regression. A significant association was found between depression and HbA1c level, treatment by insulin and retinopathy. The odds of having depression was 1.18 times higher with 1 unit increase in HbA1c level (95%CI:1.06-1.33, P-value=0.003). The odds of having depression was 2.96 times higher in patients taking insulin as compared to those who were not taking insulin for treatment (95%CI:1.23-

7.11, P-value=0.015). The odds of having depression was 3.5 times higher in patients having retinopathy as comorbidity as compared to those who didn't have retinopathy (95%CI:1.35-9.02, P-value=0.01). However, no significant association was found between depression and other clinical variables (duration of diabetes, treatment by medication, other comorbidities, counselling on diabetes, family history of diabetes, and monthly cost of treatment).

Table 4: Association between clinical characteristics and depression among type 2 diabetic patients

Factors	Depression		OR	95% CI	P-Value
	Frequency	Percentage			
Duration of diabetes	N/A	N/A	1.009	0.9-1.04	0.5
HbA1c	N/A	N/A	1.18	1.06-1.33	0.003*

Factors	Depression		OR	95% CI	P-Value
	Frequency	Percentage			
Treatment of diabetes					
Medicine					
No	13	55.56	Ref		
Yes	34	26.77	0.29	0.07-1.15	0.07
Insulin					
No	30	23.85	Ref		
Yes	12	48.15	2.96	1.23-7.11	0.015*
Co morbidity related to diabetes					
No	14	20.59	Ref		
Yes	29	34.94	2.07	0.98-4.34	0.054
Type of comorbidities					
Cardiovascular diseases					
No	23	34.20	Ref		
Yes	6	42.86	1.43	0.44-4.62	0.54
Retinopathy					
No	25	22.22	Ref		
Yes	19	50.00	3.5	1.35-9.02	0.01*
Neuropathy					
No	24	39.36	Ref		
Yes	5	29.41	0.72	0.22-2.32	0.59
Nephropathy					
No	22	32.94	Ref		
Yes	7	43.75	1.59	0.52-4.83	0.41
Family History					
No	30	29.13	Ref		
Yes	13	27.08	0.90	0.42-1.94	0.79
Counselling on diabetes					
No	23	31.08	Ref		
Yes	20	25.97	0.77	0.38-1.57	0.48
Monthly total cost for diabetes treatment (NRs)					
<5000	29	25.44	Ref		
5000-10000	8	34.48	1.54	0.64-3.69	0.33
10000 and above	8	50.00	2.93	0.68-12.47	0.14

*OR= Odds Ratio, 95% CI= 95% Confidence Interval

Table 5 shows multivariable analysis of socio-demographic and clinical variables with depression among type 2 diabetic patients. In multivariate analyses, clinical variables were found to be significantly associated with depression after adjusting for age, sex, occupation, marital status, ethnicity income and education. The odds of having depression was 1.24 times higher with 1 unit

increase in HbA1c level after adjusting for age, sex, occupation, marital status, ethnicity income and education. (95%CI:1.09-1.42, P-value=0.001). The odds of having depression was 4.62 times higher in patients taking insulin for treatment as compared to those who were not taking insulin after adjusting for age, sex, occupation, marital status, ethnicity income and education.

(95%CI:1.63-13.11, P-value=0.04). The odds of having depression was 6.36 times higher in patients having retinopathy as comorbidity as compared to those who did not have

retinopathy after adjusting for age, sex, occupation, marital status, ethnicity income and education. (95%CI:1.79-22.53, P-value=0.004).

Table 5: Multivariable analysis showing association between sociodemographic, behavioral and clinical characteristics and depression in type 2diabetic patients

Factors	Depression		OR	95% CI	P-Value	AOR	95% CI	P-Value
	n	%						
Occupation								
Homemakers	8	40.00	Ref			Ref		
Service	6	25.00	0.5	0.13-1.8	0.29	0.58	0.14-2.32	0.44
Business	16	32.65	0.72	0.24-2.13	0.56	0.63	0.16-2.41	0.51
Agriculture	2	8.70	0.14	0.02-0.78	0.02*	0.17	0.02-1.11	0.06
Others	11	31.43	0.68	0.21-2.15	0.52	1.01	0.25-4.01	0.98
HbA1c level	N/A	N/A	1.18	1.06-1.33	0.003	1.24	1.09-1.42	0.001*
Treatment of diabetes								
Insulin								
No	30	23.85	Ref			Ref		
Yes	12	48.15	2.96	1.23-7.11	0.015	4.62	1.63-13.11	0.04*
Type of comorbidities								
Retinopathy								
No	25	22.22	Ref			Ref		
Yes	19	50.00	3.5	1.35-9.02	0.01	6.36	1.79-22.53	0.004*

*Adjusted for age, sex, occupation, marital status, ethnicity income and education. OR= Odds Ratio, AOR= Adjusted Odds Ratio, 95% CI= 95% Confidence Interval, n= number of samples, N/A= Not applicable

4. Discussion

Around 28.5% of the adults with diabetes were found to have depression; among them, 15.2% had mild depression, 11.9% had moderate depression and 1.4% had severe depression. A study conducted in Bangladesh found the prevalence of depression among diabetic patients to be 37.2% [7]. Similar studies done in Nepal reported slightly higher prevalence of depression (40.6% and 54.1%) among diabetic patients [12, 13]. The prevalence of depression in our study was found to be slightly lower than in these studies. Differences in the findings may be

due to the different settings, different sample sizes and sampling method used to assess depression. However, the prevalence is consistent to a study done in TUTH where the prevalence of depression among person with diabetes (29.11%) [14].

Depression in relation to socio demographic factors:

In this study, the socio demographic variables such as sex, age, ethnicity, family type, religion, occupation were not significantly associated with depression. These findings were supported by a previous studies done in Nepal [12, 13]. However, another study

conducted on diabetes and depression by Durga. Et. al showed that marital status and educational level were found to be significantly associated with depression among diabetics as opposed to our study [13]. On the other hand, monthly family income was found to have no significant association with depression in our study as opposed to a similar study conducted in Nepal [12].

Depression in relation to behavioural factors:

This study did not show any association with the behavioural factors such as BMI, smoking, alcohol and tobacco which was consistent with a similar study done in Nepal [12]. However, a population-based mail survey done in Washington shows that smoking and obesity were associated with depression among diabetic patients [11]. The findings might have differed due to the difference in study type and settings.

Depression in relation to clinical factors:

The present study found that depression was associated with people having retinopathy as co-morbidity which was consistent with findings from prospective cohort studies conducted in the US and India [15, 16]. Depression was associated with HbA1c level and insulin treatment which was similar to

findings from similar study conducted in Nepal [12]. Similarly, duration of diabetes was found to have no significant association, this finding is parallel with other studies done in Nepal [12, 13]. Family history of diabetes had no significant association with depression among diabetic patients in this study whereas a study done by Niraula et al showed significant association with family history [12]. This might be in contrary to this study due to different settings, different sample sizes, and different sampling method. There are some limitations to the study; one of them is the inability to involve a larger number of patients due to time constraint. The results of this study are also limited because the recruited study participants were the patients visiting only one hospital in Kathmandu Valley, hence, the findings may not be generalizable to the entire population. Despite all the limitations, the magnitude and associated factors identified by this study can be of great help to prevent and control depression in diabetic patients.

5. Conclusion

This study revealed that a quarter of type 2 diabetic patients attending follow-up appointments at TUTH's diabetic OPD exhibited depression. Among them, 15.2% showed mild symptoms, 11.9% had moderate symptoms, and 1.4% had severe symptoms.

These symptoms correlated with diabetes-related factors such as HbA1c levels, insulin treatment, and comorbidities like retinopathy. Prevalence of depression in this sample underscores depression as a growing issue among diabetic patients. It emphasizes the importance of integrating mental health services into primary care and routinely assessing hidden depression in all diabetes care settings.

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