

Prevalence of undiagnosed Depression among adult Type 2 diabetic patients attending Adan Primary Health Care Center in Kuwait

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Abstract

Aim

1. To determine the prevalence of undiagnosed depression among adult Type 2 diabetes in diabetic clinic in Adan Health Care Center in Kuwait.
2. To assess the importance of depressive symptoms for the management of glucose metabolism in the treatment of diabetes.
3. To determine if depression is associated with variables indicating risk for development of diabetes complication.

Keywords: Depression, Type 2 diabetes, BDI, PHQ-9

Introduction

Diabetes mellitus is a growing public health concern in Kuwait parallel with the worldwide diabetes pandemic (1, 2, 3, 4, 5, 6) due to abnormal glucose metabolism. It is the most common metabolic and endocrine disorder. According to World Health Organization (WHO)-2011 there were 346 million diabetic patients worldwide. This number will be doubled in 2030. (3).

Type2 DM is a chronic lifelong but treatable disease be caused by either insulin resistance or defective insulin secretion or by a combination of these processes. (7, 9, 10).

Likewise, depression is a major health problem with high prevalence worldwide. (8,9). It is a mood disorder in which the depressed person can feel. Worthless, guilt, loneliness, sadness, hopelessness, inefficiency, dissatisfaction, loss of energy and interest, low self-esteem, changes in appetite and sleep patterns are unable to feel joy and happiness. (3).

In fact, depression is expected to be the second leading cause of disability for all age groups by the year 2030. (8). It is also a modifiable risk factor the treatment of which could improve glycemic control and health outcomes in-patient with type 2 diabetes. (10).

Worldwide, the prevalence of mood and anxiety disorders is higher among persons living with diabetes compared to those without diabetes (4, 6, 10, and 18).

The increased risk of early mortality and a severe impact on quality of life and reduction in life expectancy has been found to be associated with both conditions at higher rates than either condition alone. (4, 10,11,12,13, 14).

Co-morbid depression among individuals with diabetes is associated with poor glycemic control via alteration in neurotransmitter functioning, hormonal deregulation, and disruption of diabetes self-management and with an increased prevalence of complications in Type 2 diabetes. (10, 11, 14)

Relationship between depression and diabetes is a self-perpetuating cycle resulting in adverse long-term glycemic control further worsening the risk of developing long-term complications/end-organ damage, increased hospitalization, and even mortality. (4).

Type 2 diabetes is a chronic illness that requires continuing medical care, education, and diligent patient self-management to prevent acute complications and to reduce the risk of long-term complications. Depression is a modifiable risk factor the treatment of which could improve glycemic control and health outcomes in patients with type 2 diabetes. (10).

The IDF recommends the inclusion of a mental health specialist in the multidisciplinary team for diabetes and indicates the need for counseling the person with diabetes in the context of on going diabetes education and care. (28).

Methods

Study design, setting and duration:

This descriptive cross-sectional study was conducted over a period of one year in Kuwait in Adan Health Center by using a Beck Depression Inventory (BDI) questionnaire and the patient's Health Questionnaire-9(PHQ-9). The BDI questionnaire is self-administered taking 5-10 minutes to complete. Each item assessed certain specific areas of functioning (self-esteem, quality of life, mood, communication and social interaction, appetite and weight, trouble sleeping). The PHQ-9 questionnaire consists of nine questions about the criteria for diagnosing major and minor depression.

Expedited ethics approval was obtained from the Kuwait Standing Committee for Coordination of Health and Medical Research. All respondents provided informed consent.

Inclusion and exclusion criteria:

The inclusion criteria was all Type 2 DM who were followed up at the Diabetic clinic for more than 3 months (Kuwaiti and non- Kuwaiti patients), provided that they belonged to the 18-70 years age group and were able to fill in questionnaires by themselves.

The exclusion criteria was all patients younger than 18 years or older than 70 years, patients not able to fill out the questionnaire for any reason, individuals with diabetes other than Type 2 DM (Type 1 DM, Gestational DM, secondary diabetes among others) and mentally ill patients (any patients who were diagnosed as having any kind of depressive disorder, on antidepressant medication).

Data collection Tool:

The structured questionnaire consisted of questions that covered several areas:

- (1) The socio-demographic data like age, sex, nationality, occupation, education, marital status, income.
- (2) Life style factors like diet, physical activity, smoking status and alcohol consumption.
- (2) The disease characteristics like duration, pharmacological treatment of diabetes, complications and co-morbidity like hypertension, IHD, BA, hypothyroidism.
- (3) The metabolic control measured by HbA1c levels (%) for estimating glycemic control over the last 90-120 days. HbA1c level was categorized as: (good glycemic control <7%), (fair glycemic control 7-8%) and (>8% considered as poor glycemic control).

(4) Hypertension was determined in accordance with AACE and ADA guidelines recommended targets <130/80mmHg for patients with hypertension and diabetes.

(5) Dyslipidemia was determined in accordance with AACE guidelines:

-Total cholesterol: desirable<5.17, borderline high: 5.17-6.18, high >6.21.

-HDL cholesterol: good>1 in males and > 1.2 in females and bad<4 in males and females.

- LDL: optimal <2.6, near optimal 2.6-3.3 and borderline high 3.4.

- TG: normal <1.7, borderline high 1.8-2.2 and high 2.3-5.6.

(6) BMI was measured through dividing weight(kg) by squared height (m) and the range 18.5-24.9 was considered normal, 25-29.5 as overweight, and ≥ 30 as obese.

(6) The Beck Depression Inventory (BDI) questionnaire:

The Beck Depression Inventory (BDI), a 21 item-screening questionnaire comprising 13 cognitive and 8 somatic questions was used to assess motivational, cognitive and somatic symptoms of depression. Each item of the inventory scores ranging from 0-3 points indicated the severity of the Depressive symptoms (total scores >17 showing moderate to severe depressive symptoms).

(7) The PHQ-9 questionnaire:

The PHQ-9 questionnaire was considered according to the following algorithms: a severity score of 0-3 was assigned to each item, (0=2- days, 2=7-11 days and 3=12-14 days) yielding a total score between 0 and 24 points. A PHQ score ≥ 10 has been recommended as a cutoff point for depression.

Data Analysis:

Statistical analysis was carried out using a Statistical Package for Social Sciences SPSS version 17). Frequencies were utilized for categorical variables; mean and standard deviation was obtained for continuous variables. Data were expressed as "mean" (standard deviation; SD) and percentage (%) where appropriate. All tests used a significance level of p value < 0.05.

Results

There were 200 participants (92 males, and 108 females) with type 2 DM. 22 patients were omitted because of the lack of investigations required. (11.5%) of the total participants were depressed with (9.5%) experiencing mild depression and (1.1%), a small proportion, moderate depression and no one had severe depression. The variables such as advancing age, income, LDL, and TG were found as a major determinant of depression in our study.

Participants in the study ranged in age from 21 to above 60 with a mean age (\pm standard deviation) of $4.1+1.01$ years. (54%) of them were females and (46%) were males with a mean gender $1.54+0.49$. (71%) of them were Kuwaiti and (29%) were non-Kuwaiti with a mean

nationality $1.29+0.45$. The majority of them were married (76%) and the rest were single, divorced or widowed (24%) with a mean marital status $2.1+0.69$. (40.4%) of them were working and (59.5%) were not working with a mean occupation $1.59+0.49$. (28%) of them had high school level of education, (20%) had Bachelor education, (0.5%) had Master education, (1%) had Doctorate education and the remaining (50%) had other level of education with a mean level of education $3.24+1.81$. The majority of the participants had income below 1000 K.D (48%), while the minority had income above 3000 K.D (2%) and the remaining of the participants refused to respond (12%) with a mean income of $2+1.31$.

The prevalence of depression varied with the duration of DM diagnosis in years with depression rates higher in those with less than 5 years of diabetes duration, with a decrease in prevalence as the duration increased. Up to 5 years duration, Mild depression occurs in (5%), moderate depression occurs in (1%). In 5-10 years duration, Mild depression occurs in (0.5%) and moderate depression occurs in (0.5%). In more than 10 Y duration mild depression occurs in (4%) and moderate depression occurs in (0.5%) with a mean of $2.1+0.87$.

The prevalence of depression also varied with the management of diabetes. (6%) had mild depression and (1%) had moderate depression for patients on OHA. (1.5%) had mild depression only for patients who had Injectable treatment and (2%) had mild depression and (1%) had moderate depression for patients who had Injectable treatment with a mean of $1.83+0.95$.

Regarding smoking and alcohol, (17.5%) of the participants who were smokers, (1.5%) of them had mild depression and (0.5%) had moderate depression with a mean of $1.82+0.38$. (1.5%) of the participants who were consuming alcohol had no depression with a mean of $1.98+0.12$.

Regarding the participants with complication of diabetes (14.5%) of those with diabetic retinopathy had (0.5%) mild depression and (0.5%) had moderate depression, while (6%) of participants who had diabetic neuropathy, (1%) had mild depression and (0.5%) had moderate depression and those who had diabetic nephropathy (1%) had no depression with a mean of $1.34+0.78$.

Among participants with associated co-morbid conditions, depression was shown to be present in some co-morbid conditions. Hypertensive participants had (6%) mild depression and (1%) moderate depression. Osteoarthritic participants had (1%) mild depression only with a mean of $3.29+2.54$. Dyslipidemia participants had (1.5%) mild depression and (0.5%) moderate depression.

Among the participants who had elevated systolic BP, (2.5%) had mild depression and (0.5%) had moderate depression. Those who had stage 1 systolic BP, (3%) had mild depression and (1%) had moderate depression. and those who had stage 2 systolic BP, (3%) had mild depression and (0.5%) had moderate depression with

a mean of 1.34 ± 1.5 . On the other hand, the participants who had elevated diastolic BP, (0.5%) had (6%) mild depression and (0.5%) had moderate depression. Those who had stage 1&2 diastolic BP, (1%) had mild depression and (0.5%) had moderate depression with a mean of 1.2 ± 0.59 .

Among participants who were compliant to the diet had (4%) mild depression only, but those who were not compliant to the diet had 11(5.5%) had mild depression and (2%) moderate depression with a mean of 1.69 ± 0.46 .

On the other hand, the participants who were compliant with physical activity had (4.5%) mild depression only, but those who were not compliant to physical activity had (5%) mild depression and (2%) moderate depression with a mean of 1.69 ± 0.46 .

Among 14% of participants who had BMI < 25, (1%) had mild depression and (0.5%) had moderate depression. Among 41.5% BMI 25-29.9, (6.5%) had mild depression and (0.5%) had moderate depression. and among 44.5% BMI ≥ 30 , (2%) had mild depression and (1%) had moderate depression with a mean of 2.3 ± 0.70 .

Among the entire sample of patients uncontrolled those who had- HbA1 more than ≥ 7 had (3.5%) mild depression and (1%) had moderate depression. While HbA1 <7 had (6%) mild depression and (1%) moderate depression with a mean 1.6 ± 0.48 .

The distribution and severity of depression was significantly higher for Age of participants ($p=0.006$), income ($p=0.006$), LDL ($p=0.00$) and TG ($p=0.065$). Several demographic and disease-related variables emerged as significant independent predictors of depression as gender ($p= 0.223$), nationality ($p= 0.947$), occupation ($p=0.477$), mental status ($p=0.144$), level of education ($p=0.986$), smoking($p=0.907$), alcohol ($p=0.820$), systolic BP ($p=0.950$), diastolic BP ($p=0.274$), HbA1c ($p=0.872$), total cholesterol ($p=0.221$), HDL for females ($p=0.553$), HDL for males ($p= 0.526$), the methods of controlling DM ($p=0.238$), complication ($p=0.476$), co-morbidity ($p=0.432$), diet ($p=0.224$), physical activity ($p=0.118$), BMI ($p=0.138$) and duration of DM ($p=0.179$).

1. The association between Depression and social demographics:

Gender: The prevalence of depression varied with the difference in gender of the diabetic patient. Among 108 female participants (6.5 %) of them had mild depression and (0.5%) had moderate depression, while of the (46%) male patients, (0.03 %) of them had mild depression and (1.5%) had moderate depression. These results were not statistically significant ($p= 0.223$) and there is no correlation between depression and gender ($r=0.011$) as shown in Table 1.

Table 1: The association between Depression and gender:

Variable	No depression (0-9) No (%)	Mild Depression (10-18) Yes (%)	Moderate depression (19-29) Yes (%)	Severe Depression (30-63) Yes (%)	Total	Mean	SD	P value
Gender								
Male	83(41.5%)	6(3%)	3(1.5%)	-	92(46%)	1.54	0.499	0.223
Female	94(47%)	13(6.5%)	1(0.5%)	-	108(54%)			

Age: The prevalence of depression was not present in 21-29 age groups of the study participants. Of those aged between 30-39 Y, (2.5%) had mild depression whereas those aged between 40-49 years, (1.5%) had mild depression and (1.5%) had moderate depression. Of those aged between 50-59 years, (1.5%) had mild depression and lastly those whose age group was above 60, (4%) had mild depression and (0.5%) had moderate depression.

The analysis revealed that there was statistical significance ($p=0.006$) between depression and the age of the patients and there is a weak correlation between depression and age ($r= 0.165$) as shown in Table 2.

Table 2: The association between Depression and age:

Variable	No depression (0-9) No (%)	Mild Depression (10-18) Yes (%)	Moderate depression (19-29) Yes (%)	Severe Depression (30-63) Yes (%)	Total	Mean	SD	P value
Age in Years						4.16	1.019	0.006
-21-29Y	2(1%)	0	0	-	2(1%)			
-30-39Y	10(5%)	5(2.5%)	0	-	15(7.5%)			
-40-49Y	27(13.5%)	3(1.5%)	3(1.5%)	-	33(16.5%)			
-50-59Y	46(23%)	3(1.5%)	0	-	49(24.5%)			
-≥ 60	92(46%)	8(4%)	1(0.5%)	-	101(50%)			

Nationality: Depression was shown to be present in Kuwaiti and non- Kuwaiti Nationality. Among (71%) Kuwaiti participants (7%) had mild depression and (1.5%) had moderate depression and among non- Kuwaiti nationality (2.5%) had mild depression and (0.5%) had moderate depression. The analysis revealed that there was no statistical significance between depression and the nationality of the participants ($p=0.947$) and there is no correlation between depression and nationality ($r=0.023$) as shown in Table 3.

Table 3: The association between Depression and nationality:

Variable	No depression (0-9) No (%)	Mild Depression (10-18) Yes (%)	Moderate depression (19-29) Yes (%)	Severe Depression (30-63) Yes (%)	Total	Mean	SD	P value
Age in Years						4.16	1.019	0.006
-21-29Y	2(1%)	0	0	-	2(1%)			
-30-39Y	10(5%)	5(2.5%)	0	-	15(7.5%)			
-40-49Y	27(13.5%)	3(1.5%)	3(1.5%)	-	33(16.5%)			
-50-59Y	46(23%)	3(1.5%)	0	-	49(24.5%)			
-≥ 60	92(46%)	8(4%)	1(0.5%)	-	101(50%)			

Total income: The prevalence of depression was not present for participants whose income is between 2000-3000 K.D. Of those with income less than 1000 K.D, (4%) had mild depression and (0.5%) had moderate depression. Of those with income between 1000-2000 K.D, (2.5%) had mild depression and (0.5%) had moderate depression. Of those with income above 3000, (0.5%) had moderate depression. The participants who refused to respond had (3%) mild depression and (0.5%) depression.

These results were statistically significant ($p=0.006$) between depression and the income of the diabetic patients and there is a weak correlation between depression and income ($r=0.173$) as shown in Table 4.

Table 4: The association between Depression and total income:

Variable	No depression (0-9) No (%)	Mild Depression (10-18) Yes (%)	Moderate depression (19-29) Yes (%)	Severe Depression (30-63) Yes (%)	Total	Mean	SD	P value
Income						2.000	1.314	0.006
-≤ 1000 K.D	87(43.5%)	8(4%)	1(0.5%)	-	96(48%)			
-1000-2000 K.D	54(27%)	5(2.5%)	1(0.5%)	-	60(30%)			
-2000-3000 K.D	16(8%)	0	0	-	16(8%)			
-≥ 3000 K.D	3(1.5%)	0	1(0.5%)	-	4(2%)			
-Refused to respond	17(8.5%)	6(3%)	1(0.5%)	-	24(12%)			

Occupation: The prevalence of depression was present for the occupied participants as (5%) had mild depression and (1%) had moderate depression while the non-occupied participants had (4.5%) mild depression and (1%) moderate depression. The results showed a statistical non-significance between occupation and depression ($p=0.477$) and there is no correlation between them ($r=0.079$) as shown in Table 5.

Table 5: The association between Depression and occupation:

Variable	No depression (0-9) No (%)	Mild Depression (10-18) Yes (%)	Moderate depression (19-29) Yes (%)	Severe Depression (30-63) Yes (%)	Total	Mean	SD	P value
Occupation						1.59	0.492	0.477
-Working	69(34.5%)	10(5%)	2(1%)	-	81(40.4%)			
-Not working	108(54%)	9(4.5%)	2(1%)	-	119(59.5%)			

Marital status: The prevalence of mild depression was present in single status (1.5%) while married status had (8%) mild depression and (15%) moderate depression, widow and divorced status had both (0.5%) moderate depression only. The results showed a statistical non significance between marital status and depression ($p=0.174$) and there is no correlation between them ($r=0.039$) as shown in Table 6.

Table 6: The association between Depression and marital status:

Variable	No depression (0-9) No (%)	Mild Depression (10-18) Yes (%)	Moderate depression (19-29) Yes (%)	Severe Depression (30-63) Yes (%)	Total	Mean	SD	P value
Marital status						2.190	0.690	0.174
-Single	11(5.5%)	3(1.5%)	0	-	14(7%)			
-Married	134(67%)	16(8%)	2(1%)	-	152(76%)			
-Widow	15(7.5%)	0	1(0.5%)	-	16(8%)			
-Divorced	17(8.5%)	0	1(0.5%)	-	18(9%)			

Level of Education: The prevalence of depression varied with the level of education. Of the 28% high school level of education, (3%) had mild depression and (1%) had moderate depression. Of the 20% Bachelor level of education, (2%) had mild depression and (0.5%) had moderate depression. Of the 0.5% Master level of education, (2%) had only mild depression. Others at 50% such as illiterate or diploma education had (4.5%) mild depression and (0.5%) had moderate depression. The results were statistically not significant ($p=0.986$) and there is no correlation between depression and level of education ($r=0.074$) as shown in Table 7.

Table 7: The association between Depression and level of education:

Variable	No depression (0-9) No (%)	Mild Depression (10-18) Yes (%)	Moderate depression (19-29) Yes (%)	Severe Depression (30-63) Yes (%)	Total	Mean	SD	P value
Level of Education						3.24	1.814	0.986
-High school	48(24%)	6(3%)	2(1%)	-	56(28%)			
-Bachelor degree	36(18%)	4(2%)	1(0.5%)	-	41(20%)			
-Master degree	1(0.5%)	4(2%)	0	-	1(0.5%)			
-Doctorate	2(1%)	0	0	-	2(1%)			
-Others	90(45%)	9(4.5%)	1(0.5%)	-	100(50%)			

Smoking status: (17.5%) of the participants were smokers among who (1.5%) had mild depression and (0.5%) had moderate depression. The results were statistically not significant ($p=0.907$) and there is no correlation between depression and smoking status ($r=0.009$) as shown in Table 8.

Table 8: The association between Depression and smoking status:

Variable	No depression (0-9) No (%)	Mild Depression (10-18) Yes (%)	Moderate depression (19-29) Yes (%)	Severe Depression (30-63) Yes (%)	Total	Mean	SD	P value
Smoking status						1.825	0.380	0.907
-Yes	31(15.5%)	3(1.5%)	1(0.5%)	-	35(17.5%)			
-No	146(73%)	16(8%)	3(1.5%)	-	165(82.5%)			

Alcohol consumption: (1.5%) of participants who were consuming alcohol had no depression. The results were statistically not significant ($p=0.820$) and there is no correlation between depression and alcohol consumption ($r=0.042$) as shown in Table 9.

Table 9: The association between Depression and alcohol consumption:

Variable	No depression (0-9) No (%)	Mild Depression (10-18) Yes (%)	Moderate depression (19-29) Yes (%)	Severe Depression (30-63) Yes (%)	Total	Mean	SD	P value
Alcohol consumption						1.985	0.121	0.820
-Yes	3(1.5%)	-	-	-	3(1.5%)			
-No	174(87%)	19(9.5%)	4(2%)	-	197(98.5%)			

2. The association between complications of Diabetes and depression:

The total number of participants who had no complications was (78.5%) with (8%) who had mild depression and (15%) moderate depression. While those participants who had diabetic retinopathy (14.5%) had (0.5%) mild depression and (0.5%) moderate depression. (6%) who had diabetic neuropathy had (1%) mild depression and (0.5%) moderate depression. Those who had diabetic nephropathy (1%) had no depression.

The results were statistically significant ($p=0.437$) and there is no correlation between depression and complication of type 2 DM ($r=0.092$) as shown in Table 10.

Table 10: The association between Depression and complication of diabetes:

Variable	No depression (0-9) No (%)	Mild Depression (10-18) Yes (%)	Moderate depression (19-29) Yes (%)	Severe Depression (30-63) Yes (%)	Total	Mean	SD	P value
Complication						1.345	0.780	0.476
-Nil	139(69.5%)	16(8%)	2(15%)	-	175(78.5%)			
-Retinopathy	27(13.5%)	1(0.5%)	1(0.5%)	-	29(14.5%)			
-Nephropathy	2(1%)	0	0	-	2(1%)			
-Neuropathy	9(4.5%)	2(1%)	1(0.5%)	-	12(6%)			
-Skin ulcer	0	0	0	-	0			
-AMI	0	0	0	-	0			

3. The association between the co-morbid conditions of Diabetes and depression: Depression was shown to be present in some co-morbid conditions associated with type 2 DM. Among (65%) hypertensive participants, (6%) had mild depression and (1%) had moderate depression. Among (18.5%) of dyslipidemia participants, (1.5%) had mild depression and (0.5%) had moderate depression. Among (1.5%) osteoarthritic participants, (1%) had mild depression only. The results were statistically significant ($p=0.432$) and there is no correlation between depression and co-morbid conditions of type 2 DM ($r=0.026$) as shown in Table 11.

Table 11: The association between Depression and DM with other Co-morbid disease:

Variable	No depression (0-9) No (%)	Mild Depression (10-18) Yes (%)	Moderate depression (19-29) Yes (%)	Severe Depression (30-63) Yes (%)	Total	Mean	SD	P value
Co-morbid conditions						3.290	2.549	0.432
-Nil	16(8%)	2(1%)	1(0.5%)	-	19(9.5%)			
-Diagnosis of hypertension	116(58%)	12(6%)	2(1%)	-	130(65%)			
-Diagnosis of CVD	3(1.5%)	0	0	-	3(1.5%)			
-Diagnosis of CVA/TIA	1(0.5%)	0	0	-	1(0.5%)			
-Diagnosis of PVD	0	0	0	-	0			
-Diagnosis Thyroid	6	0	0	-	6(3%)			
-Diagnosis of COPD	1(0.5%)	0	0	-	1(0.5%)			
-Diagnosis of dyslipidemia	33(16.5%)	3(1.5%)	1(0.5%)	-	37(18.5%)			
-Diagnosis of osteoarthritis	1(0.5%)	2(1%)	0	-	3(1.5%)			

4. The association between compliance of the participants to diet and physical activity and depression:

Diet: The participants who were compliant to the diet had (4%) mild depression only but those who were not compliant to the diet had (5.5%) mild depression and (2%) moderate depression. The results showed statistical non-significance between diet and depression ($p=0.224$) and there is no correlation between depression and diet ($r= 0.006$) as shown in Table 12.

Table 12: The association between Depression and compliance to diet:

Variable	No depression (0-9) No (%)	Mild Depression (10-18) Yes (%)	Moderate depression (19-29) Yes (%)	Severe Depression (30-63) Yes (%)	Total	Mean	SD	P value
Diet						1.695	0.461	0.224
-Yes	53(26.5%)	8(4%)	0	-	61(30.5%)			
-No	124(62%)	11(5.5%)	4(2%)	-	139(69.5%)			

Physical activity: The participants who were compliant to physical activity had (4.5%) mild depression only but those who were not compliant to physical activity had (5%) mild depression and (2%) moderate depression. The results showed no statistical significance between physical activity and depression ($p=0.118$) and there is no correlation between depression and physical activity ($r= 0.017$) as shown in Table 13

Table 13: The association between Depression and compliance to physical activity:

Variable	No depression (0-9) No (%)	Mild Depression (10-18) Yes (%)	Moderate depression (19-29) Yes (%)	Severe Depression (30-63) Yes (%)	Total	Mean	SD	P value
Physical activity						1.690	0.463	0.118
-Yes	53 (26.5%)	9(4.5%)	0	-	62(31%)			
-No	124(62%)	10(5%)	4(2%)	-	138(69%)			

5.The association between the BMI and depression:

Of the participants who had BMI < 25, (1%) had mild depression and (0.5%) had moderate depression. Those who had BMI 25-29.9, (6.5%) had mild depression and (0.5%) had moderate depression. and those who had BMI ≥ 30, (2%) had mild depression and (1%) had moderate depression.

The results showed statistically non- significance between BMI and depression (p=0.138) and there is no correlation between depression and BMI (r= 0.017) as shown in Table 14.

Table 14: The association between Depression and the BMI:

Variable	No depression (0-9) No (%)	Mild Depression (10-18) Yes (%)	Moderate depression (19-29) Yes (%)	Severe Depression (30-63) Yes (%)	Total	Mean	SD	P value
BMI						2.305	0.703	0.138
< 25	25(12.5%)	2(1%)	1(0.5%)	-	28(14%)			
-25-29.9	69(34.5%)	13(6.5%)	1(0.5%)	-	83(41.5%)			
≥ 30	83(41.5%)	4(2%)	2(1%)	-	89(44.5%)			

6.The association between systolic BP levels and depression:

The participants who had elevated systolic BP had (2.5%) mild depression and (0.5%) had moderate depression. Those who had Stage 1 Systolic BP, (3%) had mild depression and (1%) had moderate depression and those who had Stage 2 Systolic BP, (3%) had mild depression and (0.5%) had moderate depression. The results showed statistical non-significance between systolic BP and depression (p=0.950) and there is no correlation between depression and systolic BP (r= 0.023) as shown in Table 15.

Table 15: The association between Depression and systolic BP:

Variable	No depression (0-9) No (%)	Mild Depression (10-18) Yes (%)	Moderate depression (19-29) Yes (%)	Severe Depression (30-63) Yes (%)	Total	Mean	SD	P value
Systolic Blood pressure						1.349	1.550	0.950
1-Normal	18(9%)	2(1%)	0	-	20(10%)			
2-Elevated	50(25%)	5(2.5%)	1(0.5%)	-	56(28%)			
3-High BP (hypertension stage 1)	45(22.5%)	6(3%)	2(1%)	-	53(26.5%)			
4-High BP (hypertension stage 2)	64(32%)	6(3%)	1(0.5%)	-	71(35.5%)			

7. The association between diastolic BP levels and depression:

The participants who had elevated diastolic BP (2.5%) had mild depression and (0.5%) had moderate depression. Those who had stage 1&2 diastolic BP, 2(1%) had mild depression and 1(0.5%) had moderate depression.

The results showed statistical non-significance between diastolic BP and depression ($p=0.274$) and there is no correlation between depression and diastolic BP ($r=0.027$) as shown in Table 16.

Table 16: The association between Depression and diastolic BP

Variable	No depression (0-9) No (%)	Mild Depression (10-18) Yes (%)	Moderate depression (19-29) Yes (%)	Severe Depression (30-63) Yes (%)	Total	Mean	SD	P value
Diastolic Blood pressure						81.2	7.590	0.274
1-Normal	55(27.5%)	5(2.5%)	2(1%)	-	62(31%)			
2-Elevated	100(50%)	12(6%)	1(0.5%)	-	113(56.5%)			
3-High BP (hypertension stage 1 & stage 2)	24(12%)	2(1%)	1(0.5%)	-	27(13.5%)			

8. The association between the HbA1c levels and depression:

While there was no significance and correlation between HbA1c and depression ($p=0.872$). Uncontrolled HbA1 more than ≥ 7 had (3.5%) mild depression and (1%) had moderate depression. While HbA1 <7 had (6%) mild depression and (1%) moderate depression. The results showed no correlation between depression and HbA1 ($r=0.023$) as shown in Table 17.

Table 17: The association between Depression and the HbA1c

Variable	No depression (0-9) No (%)	Mild Depression (10-18) Yes (%)	Moderate depression (19-29) Yes (%)	Severe Depression (30-63) Yes (%)	Total	Mean	SD	P value
HbA1C						1.625	0.485	0.872
≥ 7	66(33%)	7(3.5%)	2(1%)	-	75(37.5%)			
<7	111(55.5%)	12(6%)	2(1%)	-	125(62.5%)			

9. The association between the total cholesterol and depression :

The prevalence of depression varied with the level of the total cholesterol. Of the (81%) of patients who had normal total cholesterol, (7.5%) had mild depression and (0.5%) had moderate depression. Of the (9%) who had Borderline high total cholesterol, (1%) had mild depression and (0.5%) had moderate depression. Of the (10%) who had High total cholesterol, (1%) had mild depression and (1%) had moderate depression. These results are non-statistically significant ($p=0.221$) and there is a weak correlation between depression and high total cholesterol ($r=0.187$) as shown in Table 18.

Table 18: The association between Depression and the Total cholesterol:

Variable	No depression (0-9) No (%)	Mild Depression (10-18) Yes (%)	Moderate depression (19-29) Yes (%)	Severe Depression (30-63) Yes (%)	Total	Mean	SD	P value
Illness profile of the Total cholesterol						4.515	1.255	0.221
<5.17 Normal	146(73%)	15(7.5%)	1(0.5%)	-	162(81%)			
5.17-6.18	15(7.5%)	2(1%)	1(0.5%)	-	18(9%)			
Borderline high	16(8%)	2(1%)	2(1%)	-	20(10%)			
>6.2 High								

10. The association between HDL cholesterol and depression in women:

The prevalence of depression varied with the level of HDL cholesterol in women. Of the (37%) of patients who had good HDL cholesterol, (4%) had mild depression and (1.5%) had moderate depression. Of the (63%) who had bad HDL, (5.5%) had mild depression and (0.5%) had moderate depression. These results are statistically non-significant ($p=0.553$) and there is no correlation between depression and high HDL in women ($r=0.028$) as shown in Table 19.

Table 19: The association between Depression and HDL in women:

Variable	No depression (0-9) No (%)	Mild Depression (10-18) Yes (%)	Moderate depression (19-29) Yes (%)	Severe Depression (30-63) Yes (%)	Total	Mean	SD	P value
HDL in women						0.744	0.729	0.553
>1.2 good	63(31.5%)	8(4%)	3(1.5%)	-	74(37%)			
<4 bad	114(57%)	11(5.5%)	1(0.5%)	-	126(63%)			

11. The association between HDL cholesterol and depression in men:

The prevalence of depression varied with the level of HDL in men. Of the (59%) of patients who had good HDL cholesterol, (1.5%) had mild depression and (1%) had moderate depression. Of the (41%) who had bad HDL, (8%) had mild depression and (2%) had moderate depression. These results are statistically non-significant ($p=0.526$) and there is no correlation between depression and high HDL in men ($r=0.003$) as shown in Table 20.

Table 20: The association between Depression and the HDL in men:

Variable	No depression (0-9) No (%)	Mild Depression (10-18) Yes (%)	Moderate depression (19-29) Yes (%)	Severe Depression (30-63) Yes (%)	Total	Mean	SD	P value
HDL in men						0.549	0.637	0.526
>1 good	113(56.5%)	3(1.5%)	2(1%)	-	118(59%)			
<4 bad	64(32%)	16(8%)	2(1%)	-	82(41%)			

12. The association between the LDL cholesterol and depression

The prevalence of depression varied with the level of the LDL cholesterol. Of the (19.5%) of patients who had optimal LDL, (4%) had mild depression and (0.5%) had moderate depression. Of the (23%) of patients who had near optimal LDL, (4%) had mild depression and (0.5%) had moderate depression. Of the (57.5%) who had Borderline high LDL, (1.5%) had mild depression and (1%) had moderate depression. These results are highly statistically significant ($p=0.000$) and there is a weak correlation between depression and high LDL ($r= 0.197$) as shown in Table 21.

Table21: The association between Depression and the LDL:

Variable	No depression (0-9) No (%)	Mild Depression (10-18) Yes (%)	Moderate depression (19-29) Yes (%)	Severe Depression (30-63) Yes (%)	Total	Mean	SD	P value
LDL						2.447	1.037	0.000
<2.6 optimal	30(15%)	8(4%)	1(0.5%)	-	39(19.5%)			
2.6-3.3 Near optimal	37(18.5%)	8(4%)	1(0.5%)	-	46(23%)			
>3.4 Borderline high	110(55%)	3(1.5%)	2(1%)	-	115(57.5%)			

13. The association between TG and depression in women:

The prevalence of depression varied with the level of TG. Of the (33.5%) of patients who had $TG<1.7$, (5.5%) had mild depression and (1.5%) had moderate depression. Of the (42.5%) who had borderline highTG, (1%) had mild depression and nobody had moderate depression. Of the (18.5%) who had High TG, (3%) had mild depression and (0.5%) had moderate depression. These results are statistically significant ($p=0.065$) and there is a very weak correlation between depression and high TG ($r=0.036$) as shown in Table 22.

Table 22: The association between Depression and the TG:

Variable	No depression (0-9) No (%)	Mild Depression (10-18) Yes (%)	Moderate depression (19-29) Yes (%)	Severe Depression (30-63) Yes (%)	Total	Mean	SD	P value
TG						1.791	1.735	0.065
<1.7 Normal	53(26.5%)	11(5.5%)	3(1.5%)	-	67(33.5%)			
1.8-2.2 borderline high	83(41.5%)	2(1%)	0	-	85(42.5%)			
2.3-5.6 High	30(15%)	6(3%)	1(0.5%)	-	37(18.5%)			

14. The association between the management of DM and the prevalence of depression:

The prevalence of depression varied with the management of diabetes. Of the (55.5%) of patients on OHA, (6%) had mild depression and (1%) had moderate depression. Of the (6%) who had Injectable treatment (1.5%) had mild depression and nobody had moderate depression. Of the participants on OHA and Injectable (38.5%), (2%) had mild depression and (1%) had moderate depression. These results are statistically non-significant ($p=0.238$) and there is a weak correlation between depression and management of diabetes ($r=0.107$) as shown in Table 23.

Table 23: The association between Depression and the treatment of DM:

Variable	No depression (0-9) No (%)	Mild Depression (10-18) Yes (%)	Moderate depression (19-29) Yes (%)	Severe Depression (30-63) Yes (%)	Total	Mean	SD	P value
Treatment of DM	97(48.5%)	12(6%)	2(1%)	-	111(55.5%)	1.830	0.956	0.238
-OHA	7(3.5%)	3(1.5%)	0	-	12(6%)			
-Injectable	71(35.5%)	4(2%)	2(1%)	-	77(38.5%)			
-OHA and Injectable								

15. The association between duration of diabetes and depression:

The prevalence of depression varied with the duration of DM diagnosis in years. Mild depression (5%) and moderate depression (1%) happen in up to 5 year duration. Mild depression (0.5%) and moderate depression (0.5%) happen in 5-10 Y duration. Mild depression (4%) and moderate depression (0.5%) happen in more than 10 Y duration. These results showed a statistical non-significance ($p=0.179$) and that there is no correlation between depression and the duration from the time of diagnosis with diabetes was made ($r= 0.107$) as shown in Table 24.

Table 24: The association between Depression and the duration of DM:

Variable	No depression (0-9) No (%)	Mild Depression (10-18) Yes (%)	Moderate depression (19-29) Yes (%)	Severe Depression (30-63) Yes (%)	Total	Mean	SD	P value
Duration of DM diagnosis in years	53(26.5%)	10(5%)	2(1%)	-	65(32.5%)	2.125	0.873	0.179
-Up to 5 Y	43(21.5%)	1(0.5%)	1(0.5%)	-	45(22.5%)			
- 5-10 Y	81(40.5%)	8(4%)	1(0.5%)	-	90(45%)			
->10 Y								

16. The prevalence of depression:

It was found that 11.5% of the type 2 diabetic patients have depression. Of these, (9.5%) had mild depression as they scored 10-18 on the BDI while (2%) had moderate as they scored 19-29 on the BDI. None of the study participants had severe depression as shown in Table 25.

Table 25: The prevalence of depression:

Variable	Frequency (%)	Mean	SD	P value
Without depression (0-9)	177(88.5%)	1.135	0.396	0.434
Mild depression (10-18)	19(9.5%)			
Moderate depression (19-29)	4(2%)			
Severe depression (30-63)	-			

Discussion

Our study showed that depression, particularly in a mild to moderate to form, is much more common among those with diabetes than those without disease. This aligns with several previous studies suggesting increased depressive symptoms in type 2 diabetes including Prerna B(4), Mohammed S (33), Shazia P (34), Vivek S (35), Aatir H (38), Amit R (44), Mohan P (46), Bader Q, and Hala M (52).

Our study showed a higher percentage of significant association between depression in diabetes and **age** ($p:0.006$). Those above 60 years age group (4.5%) suffered most for mild to moderate depression, similar to other studies including Kiran Niraula (5) Feba Elizabeth (12), Donia K (32), Vivek S (35), Bagher L (36), Shivwani D(37), Amit R(44), Mohan P(46), and Aysha Q(51). Physical and psychological causes in the elderly like retirement, isolation, fear of death and physical inability increase the prevalence of depression in diabetic patients. On the other hand, age was not found to be significantly associated with depression including Akash R (49).

Regarding the **gender** our study showed that depression is more among females (54%) than males (46%), similar to other studies including Ebaa Al-Ozairi (1), saeedeh Alsadat(3), Aminul Hasan (9), Puneet K.C(11), G.K.Vankar(14), Hulya Parildar (21), Namrata C (30), Shamsaei F(31), Vivek S(35), Aatir H(38), Hira M(39), Norouzi Z(40), Abdul Rehman A(45), Mohan P(46), Akash R (49), Shafiepour MR (50), Bader Q, and Hala M.(52). However this reflects the higher prevalence of depression in women in the general population due to different stresses like family, socioeconomic and workplace factors. Other studies findings showed that depression is more prevalent in males as compared to females including Shivwani D (37).

Regarding the nationality, **Kuwaiti** nationality had (8.5%) mild to moderate depression in comparison to (3%) non- Kuwaiti, which is different from another study done previously in Kuwait, including that of Ebaa Al-Ozairi (1).

Depression was seen more frequently in patients who had no formal **education** as mild and moderate depression happens in 4% of high school education, 2.5% in Bachelor, 2% Master and 55 others like Diploma. This finding is consistent with Another study including that of G.K.Vankar(14), Hulya Parildar (21), and Akash R (49). The highest rate of depression occurs if there is lack of knowledge about the illness. On the other hand, the association of diabetes and depression was independent of an individual's education in other studies including Mohammed S (33).

Duration of diabetes is another important factor. In our study, there were no significant relationship between depression and disease duration, similar to other study including Saeedeh Alsadat(3), Rasmieh M.Al Amer(18), Donia K(32), Amira S(41), Aysha Q(51). As long disease

duration had no positive correlation with depression, despite that diabetes complication increases with illness duration that affect increased depression risk, but Prerna Bahety(4), Aminul Hasan (9), G.K.Vankar(14), Vivek S(35) reported a significant relationship between depression and disease duration. This suggests that the initial adjustment to diabetes may be more emotionally challenging, while long-term patients may develop better coping mechanisms.

Regarding **marital status**, married persons (9%) showed higher depression than single non married (1.5%), widowed (0.5%) and divorced (0.5%) in our study. This finding is consistent with other studies including Hira M (39), Akash R (49) and is different from results of other studies like Aminul Hasan (9), and Shafiepour MR (50).

In our study, lower **income** was associated with greater depression which was different to results from other studies. Kiran Niraula (5) reported that high personal income was associated with greater depression. On the other hand the association of diabetes and depression was independent of an individual's income in other studies like Mohammed S (33).

In our study there is significant association between depression and **occupation** as depressed patients was found to be more among employed than those who were not employed similar to other studies including Bader Q, Hala M. (52) and different from other studies' findings including Catherine N (48), Akash R (49), and Shafiepour MR (50). This could be due to different work stresses.

Among the study population, 17.5% reported **smoking** in which 2% had mild and moderate depression consistent with the association between smoking and depression reported to other findings, Puneet K.C(11), and 1.5% reported using **alcohol** but no one had mild and moderate depression.

In our study **high blood pressure**, either systolic or diastolic, was associated with greater depression severity, similar to other findings, Kiran Niraula (5). Hypertension, particularly elevated systolic blood pressure, was linked to higher depression prevalence, emphasizing the role of managing cardiovascular health in reducing depressive symptoms.

Among the study population there is no significant relationship between depression and **compliance to dietary and physical activity pattern** as 30.5% on dietary pattern in which 4% had mild depression and 31% on daily physical activity in which 4.5% had mild depression only is different from previous studies including that of Bader Q, Hala M. (52) as the results revealed a significant association between exercise and depression, with the majority of patients with T2DM who did not exercise were more susceptible to depression than those who exercised. These findings highlight how socioeconomic challenges and poor diabetes management can worsen emotional well-being.

In this study there is no significant relationship between depression and **HbA1c control**, similar to other studies including saeedeh Alsadat(3), Zana Stankovic(8), Ashraf Shehatah(10), Puneet K.C(11), Rasmieh M(18) Hulya Parildar(21), Donia K(32), but Ebaa Al-Ozairi(1), Perna Bahety(4), Kiran Niraula (5), Aminul Hasan (9), Bagher L(36), and Chandana K (47) who reported significant relationship between depression and HbA1c control, as elevated HbA1c increased diabetic risk by impairing self-management in diabetic patients and exacerbating insulin resistance.

In our study an analysis of **BMI** showed no significant relationship between depression and BMI, similar to other studies including Feba Elizabeth (12), Abdul Rehman A (45). But other studies including that of Aminul Hasan (9), Sree Lekshmi (27), and Amit R (44). Overweight and obese participants had higher depression rates, reinforcing the connection between obesity and mental health issues in T2DM patients.

In our study an analysis of **HDL cholesterol** in male and female participants showed no significant relationship between depression and DM, similar to another study including Zana Stankovic (8). On the other hand, **LDL cholesterol** showed significant relationship between depression and DM in our study.

In our study patients with DM having no complication were found in (69.5%) of depression compared to patients with DM who had **complications** like retinopathy and neuropathy (2.5%). This finding is in agreement with other studies including saeedeh Alsadat(3), Zana Stankovic(8) G.K.Vankar(14), Shamsaei F (31), Amira S(41), and Amit R(44). Other studies including Bagher L(36), and Chandana K(47) showed association of depression with diabetic complications like cardiovascular symptoms, neuropathy and retinopathy. It is understandable that DM complications increased the frequency of depression and contribute to psychological distress. The more complications the person experiences, the greater the possibility that it is related to developing depressive symptoms.

On analysis of **prescription pattern for diabetes**, it was found that of participants who had mild and moderate depression, 1.5% of them were on injectable alone and 7% of them on OHA and 3% on combination of injectable with OHA. The OHA was associated with a higher frequency of depression which is different from previous studies Perna Bahety(4), Aminul Hasan(9) as insulin had higher frequency of depression. Further population-based studies are needed as our study being a cross-sectional one had a limited sample at one diabetic Center and further longitudinal studies are needed in the future to detect changes overtime.

Conclusion

This study reveals that individuals with Type 2DM are at a significantly higher risk of developing depressive symptoms compared to the general population. The presence of depression in diabetic patients has been associated with reduced adherence to treatment, inadequate self-care practices, and

diminished quality of life. Factors such as diabetes distress, lifestyle changes, social isolation, and concerns over long-term complications further contribute to the psychological burden experienced by these patients.

Psychological assessment in every diabetic patient is a must for better quality of life and prognosis.

Healthcare providers should incorporate mental health support into diabetes care, especially for those with additional risk factors.

Recommendations

1. Routine screening and early detection of depression in patients with Type 2DM should be implemented in diabetic clinics in PHC Centers as early identification of depressive symptoms can lead to early interventions and reducing diabetes complication and improving management outcomes through a multidisciplinary approach that addresses both physical and mental health. Collaborative care involving physicians, nurses, and diabetes educators can ensure comprehensive treatment plans.
2. Integrating lifestyle interventions such as structured exercise, dietary counseling, and Cognitive Behavioral Therapy (CBT) and programs that include lifestyle changes have shown positive effects on reducing depressive symptoms and improving glycemic control
3. Empowering patients with self-management skills and coping strategies that can improve adherence to diabetes care plans and reduce the impact of depression.
4. Train the physicians and nurses on using PHQ-9 for all diabetic patients attending the diabetic clinics.
5. Starting antidepressant use for patients with depressive symptoms with appropriate pharmacological treatments should be considered. However, the potential effects of antidepressants on blood glucose levels need to be monitored closely to avoid complications.
6. Encouraging family and community support can help reduce social isolation and provide emotional support for diabetic patients facing depression.
7. Our research recommendation for further studies is implementation of this study on a wider level. Further analysis of data is needed, as there are a number of issues that can be explored further like reviewing the correlation between the role of social and psychological support with the depressed Type 2 diabetic patients.

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