Prevalence of depression and Predictors of glycemic control among Type 2 Diabetes Mellitus patients at family medicine clinic, Suez Canal University Hospital Egypt

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Abstract

Objective: To assess the prevalence of depression and predictors of glycemic control among type 2 diabetes mellitus patients at a family medicine clinic Suez Canal university hospital.

Method: A cross-sectional study was conducted in 2018. Patients with type 2 diabetes mellitus (300 participants) were selected by systematic random sampling technique and assessed for depression using Patient Health Questionnaire 9 (PHQ 9). The relationship between depression, glycemic control, and its predictors was studied using Univariate analysis. Multivariable analysis was used to evaluate the combined effect of several factors associated with glycemic control among type 2 diabetes mellitus patients after adjusting for confounding variables.

Results: The prevalence of depression among type 2 diabetic outpatients was 69.0%; three-quarters of the studied population had poor glycemic control (74.3%), and the predictors for glycemic control were depression, the presence of other comorbidities and diabetic complications.

Conclusion: Prevalence of depression among type 2 diabetic was very high and was a predictor for glycemic control. So screening, and management of depression among diabetic patients and more effort by multidisciplinary health care team for patients with diabetes is recommended to achieve good glycemic control are recommended.

Key words: depression, diabetes mellitus, glycemic control, complications

Introduction

"Prevalence of diabetes mellitus is one of the real rising health problems of the 21st century and constantly rising. As indicated by the International Diabetes Federation 2017, approximately 425 million adults (20-79 years) were living with diabetes; by 2045 this will rise to 629 million. The proportion of people with type 2 diabetes is increasing in most countries. 79% of adults with diabetes were living in low- and middle-income countries" (1). Depression is a noteworthy contributor to the disease burden around the world. Depression is a serious and common disease with a lifetime prevalence extending from around 11% in low-income countries to 15% in high-income countries (2).

Diabetes and depression are recorded as the fourth and eighth reason for disability adjusted life years respectively and the cost, morbidity, and mortality from diabetes is expanded when it is associated with depression (3,4). Depression was defined by the American Psychiatric Association Diagnostic and Statistical Manual of Mental Disorders (DSM-5) as a mood disorder that brings together various symptoms that change the functionality of the individual. Depression includes disturbance of cognition, behaviors, and emotions. Depression could be defined as a first episode, chronic and recurrent; severity could be from mild, moderate or severe, with or without psychotic features (5). People with diabetes mellitus when contrasted to individuals without diabetes have a 2–4 fold greater risk of depression (6-9). Higher glycated haemoglobin (HbA1c), diabetic complications and mortality were conveyed among diabetic patients with depression (10,11).

Prevalence of depression among diabetic patients differs from one country to another and was 77.6%, 52.1%,48%,47%, 23%,21,13.6% in the UK, Allied Hospital Faisalabad, Mexico, JJM Medical college in Karnataka, North India, Leiden University and Qatar respectfully (12-18).

Depressed diabetic patients are more likely to have poor compliance with medication, self-care and lifestyle modification which lead to a poor clinical outcome (19).The literature demonstrates that active screening, case finding and management of depression among diabetic patients can enhance metabolic control and clinical outcome which will lessen the expense of patient management (20).

Prevalence of depression among diabetic patients in prior studies might be affected by the study location, studied population and methodology used, so it is hard to assess the future medical care needs based on burden of depression in the general diabetic population.

This study aimed to assess the prevalence of depression and predictors of glycemic control among type 2 diabetes mellitus patients at a family medicine clinic, Suez Canal University Hospital.

Methodology

A cross-sectional study was conducted from April to July 2018. All adult type 2 diabetes outpatients who were on follow-up treatment in a family medicine clinic (age ≥ 18) were invited to participate in the study. However, severely ill patients, patients with gestational/ type 1 DM; those who had a prior diagnosis of depression; psychological diseases, age <18years old, not capable of independent communication and patients who refused to participate in the study were excluded.

Sample size for the study was determined using single population proportion formula, and systematic random sampling technique until sample reached 300 patients was used, as the total number of patients with appointments at the study time was 900, the calculated final sample size was 300, so that the individual type 2 diabetic outpatient was interviewed every κ th; that is, every 3rd patient was selected from the sampling frame developed by giving a number for all 900 patients in the registration book ascendingly. Meanwhile the sampling interval was 3; a number between 1 and 3 was selected randomly by lottery process and number 1 was drawn first to take as an initial patient for the interview.

Data collection was done by well-trained nurses using a questionnaire which included: socio-demographic characteristics (age, sex, education, occupation, marital status, and others). Health factors included the duration of diabetes; diabetes control, medications, and the presence of other co-morbidities. The instrument was adopted and translated to Arabic language and back to English and was tested for validity. Depression status of patients was ascertained at the time of recruitment by using Patient Health Questionnaire 9 (PHQ 9), where a total score of 0 indicates no depression, 1–4 indicates minimal depression; 5–9 signifies mild depression; 10–14 indicates moderate depression, a score of 15–19 signifies moderately severe depression and a score 20-27 signifies severe depression. It has been validated for use in primary care (21).

Operational definition: Duration of diabetes in years since diagnosis of diabetes was categorized as < 5, 5-10 and >10 years. Glycemic status was categorized as a good glycemic control if HbA1c was less than 7% and poor glycemic control if HbA1c >7% (22).

The last hemoglobin A1C results within last two months were obtained from the patient's medical record.

Data processing and analyses

Data were analyzed using SPSS version 20. Bivariate analysis was done to see the association of each independent variable with the outcome variable. Potential confounders' variables were entered into binary logistic regression model to identify the effect of each independent variable with the outcome variables.

Abbreviations:

HbA1c: glycated hemoglobin
DM: diabetes mellitus
KSA: Kingdom of Saudi Arabia
PHQ 9: Patient Health Questionnaire 9

A p-value of less than 0.05 was considered statistically significant, and adjusted odds ratio with 95% CI was calculated to determine the association.

Ethical considerations

Ethical clearance was obtained from the Research and Ethics Review from Suez Canal University, informed consent was obtained from each study participant, where they were informed about their rights to interrupt the interview at any time, and written informed consent was signed by participants before they were enrolled. Confidentiality was preserved at all levels of the study. DM patients who were found to have depression were managed.

Results

Socio-economic and demographic characteristics

A total of 300 participants were recruited for this study; 60.0% aged between 40-60 with a mean age of (42 ±17.11) years. More than half of the total recruits were females (68.3%), 77.7% were married, 38.7% illiterate, 85.0% unemployed and 5.0% were active smokers. Over half of the participants (55.4%) were diabetic for more than 10 years; (70.0%) had at least one diabetes-related complication, and three quarters (74.3%) had at least one additional chronic disease. More than two thirds (68.7%) were using insulin in addition to oral medications, almost three quarters (74.3%) had poor glycemic control and 69.0 % of them were depressed (Table 1).

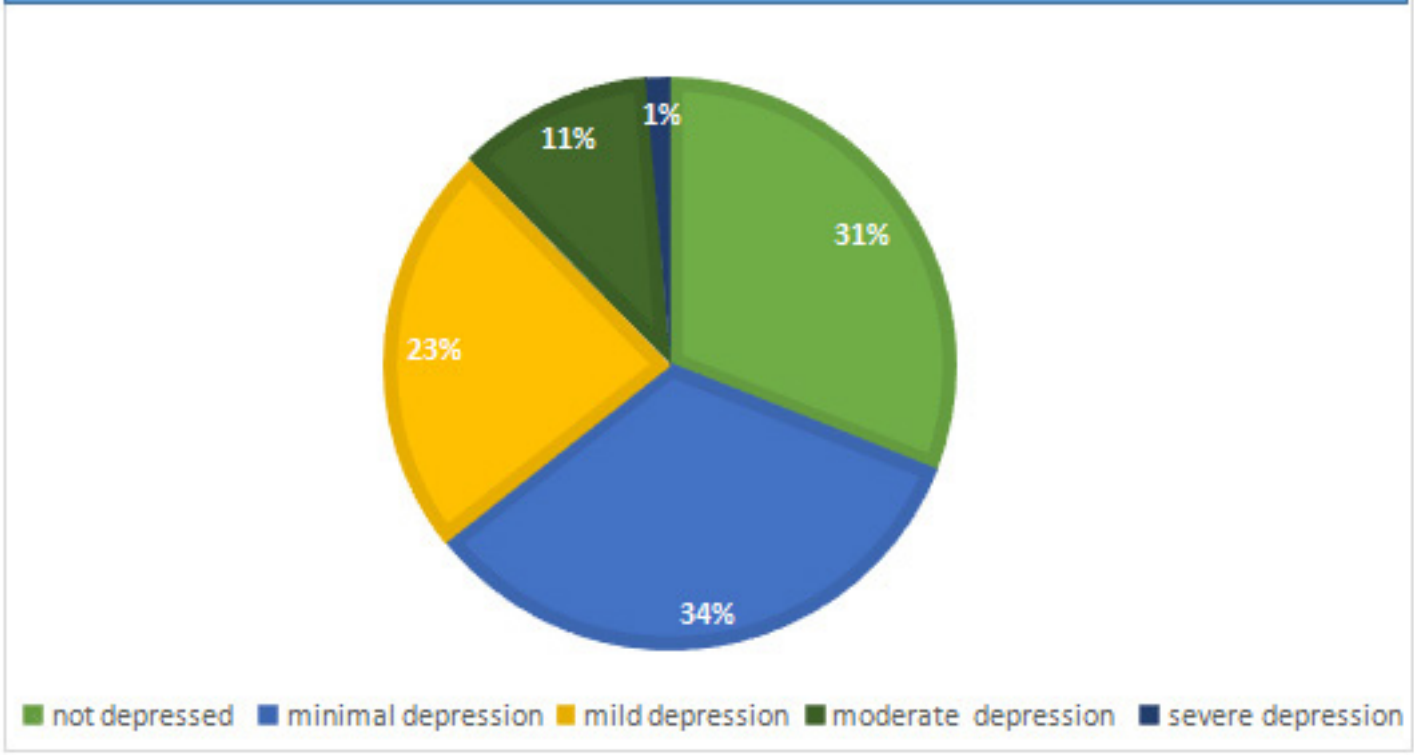
Table 1: Sociodemographic and clinical characteristics of type 2 diabetic patients at family medicine clinic Egypt (N = 300)

		N	%
Age Groups	18-39	49	16.3%
	40 -60	180	60%
	≥ 60	71	23.7%
	Mean age (42 ±17.11)		
Gender	Male	95	31.7%
	Female	205	68.3%
Marital Status	Single	17	5.7%
	Married	233	77.7%
	Widow	29	9.7%
	Divorced	21	7.0%
Educational Level	Illiterate	116	38.7%
	Primary	111	37.0%
	Secondary	63	21.0%
	University	10	3.3%
Employment	No	255	85.0%
	Yes	45	15.0%
Smoking	No	285	95.0%
	Yes	15	5.0%
DM Duration	< 5 y	76	25.3%
	5 -10	58	19.3%
	>10 -	166	55.4%
DM Complications	Yes	210	70.0%
	No	90	30.0%
Comorbidities	Yes	223	74.3%
	No	77	25.7%
DM Medications	Oral	94	31.3%
	Insulin &Oral	206	68.7%
Glycemic control	Hba1c <7	77	25.7%
	Hba1c >7	223	74.3%
Depression	Yes	207	69.0%
	No	93	31.0%

Prevalence of depression and its severity

From the total sample (300), ninety three did not report any depressive symptoms but two hundred and seven reported depressive symptoms; 33.3% (100) fulfilled the criteria for minimal depression, 23.3% (70) for mild depression, 11% (33) for moderate depression, and 1.3% (4) for moderately severe to severe depression (Figure 1). When a cut-off score of PHQ 9 ≥ 10 (mild, moderate to severe depression) was used, the prevalence was 35.7% (107). However, the prevalence of depression was 69 % (207) when a cut-off score of PHQ 9 ≥ 5 was used.

Figure 1: Prevalence of depression and it's severity among type 2 diabetic patients at family medicine clinic Egypt (N = 300)



Factors associated with depression among type 2 diabetes mellitus patients

Relationship between depression and participants' characteristics showed that depression was more common in the 40 – 60 age group (61.4%); the majority were married females (78.3% and 68.1%) respectively, with more than five years duration of diabetes, use of oral medications with insulin and the presence of diabetes complications (54.6%, 68.1% and 70.0%) respectively. All of these factors were not statistically significant. Depression among poorly controlled diabetic patients (80.7%) was statistically significant ($p < 0.001$) (Table 2).

Table 2: Relationship of depression with sociodemographic and clinical characteristics of type 2 diabetic patients at Family Medicine clinic Egypt (N=300)

		Depression				χ^2	p - value
		No		Yes			
		N	%	N	%		
Age	18-39	16	17.2%	33	15.9%	1.240	0.764a
	40 -60	53	57.0%	127	61.4%		
	≥ 60	24	25.8%	47	22.7%		
Gender	Male	29	31.2%	66	31.9%	0.015	0.904
	Female	64	68.8%	141	68.1%		
Marital Status	Single	4	4.3%	13	6.3%	1.133	0.769
	Married	71	76.3%	162	78.3%		
	Widow	10	10.8%	19	9.2%		
	Divorced	8	8.6%	13	6.3%		
Educational Level	Illiterate	34	36.6%	82	39.6%	2.512	0.473
	Primary	40	43.0%	71	34.3%		
	Secondary	17	18.3%	46	22.2%		
	University	2	2.2%	8	3.9%		
Employment	Yes	13	14.0%	32	15.5%	0.110	0.740
	No	80	86.0%	175	84.5%		
Smoking	Yes	3	3.2%	12	5.8%	0.893	0.407a
	No	90	96.8%	195	94.2%		
DM Duration	< 5	40	43	94	45.5%	0.396	0.941
	5 -10	20	21.5%	43	20.8%		
	> 10	33	35.5%	70	33.8%		
DM complications	Yes	65	69.9%	145	70.0%	0.001	0.978
	No	28	30.1%	62	30.0%		
DM Medications	Oral	28	30.1%	66	31.9%	0.531	0.767
	Oral& Insulin	65	69.9%	141	68.1%		
DM Control (HbA1c)	Controlled	37	39.8%	40	19.3%	0.001	0.000
	Uncontrolled	56	66.2%	167	80.7%		

* Statistically significant at $p<0.05$

a Fisher's Exact Test

Factors associated with glycemic control among type 2 diabetes mellitus patients

Diabetes Mellitus was notably poorly controlled amongst (40-60) age group who were females, illiterates with Diabetes Mellitus of more than (>5 years), with an additional chronic complication of diabetes mellitus, the presence of chronic diseases and depression were statistically significant with diabetes mellitus control ($p < 0.005$). While gender, occupational status of the participants and diabetic control did not have a statistically significant relation (Table 3).

Table 3: Relation between DM Control with sociodemographic and clinical characteristics of type 2 diabetic patients at family medicine clinic Egypt (N = 300)

		DM Control (HBA1C)				χ^2	p - value
		Controlled		Uncontrolled			
		N	%	N	%		
Age	18-39	21	27.3%	28	12.6%	11.057266 ª	0.009 *
	40 -60	43	55.8%	137	61.4%		
	≥ 60	13	16.9%	58	26.0%		
Gender	Male	28	36.4%	67	30.0%	1.056106	0.304
	Female	49	63.6%	156	70.0%		
Marital Status	Single	13	16.9%	4	1.8%	25.842414	0.000 *
	Married	50	64.9%	183	82.1%		
	Widow	7	9.1%	22	9.9%		
	Divorced	7	9.1%	14	6.3%		
Educational Level	Illiterate	20	26.0%	96	43.0%	8.518001	0.036 *
	Primary	31	40.3%	80	35.9%		
	Secondary	22	28.6%	41	18.4%		
	University	4	5.2%	6	2.7%		
Employment	Yes	13	16.9%	32	14.3%	0.288105	0.591
	No	64	83.1%	191	85.7%		
DM Duration	< 5 y	32	41.6%	44	19.7%	30.486	0.000*
	5 -10	33	42.9%	88	39.5%		
	> 10	12	15.6%	91	40.8%		
DM Complications	Yes	31	40.3%	179	80.3%	43.629	0.000*
	No	46	59.7%	44	19.7%		
DM Medications							
Oral		35	45.5%	59	26.5	10.107	0.006*
Insulin & oral		42	54.6%	164	73.5%		
Depression							
Yes		40	52.0%	167	74.9%	14.081	0.000*
No		37	48.0%	56	25.1%		

* Statistically significant at $p<0.05$

a Fisher's Exact Test

Multivariate analysis of factors associated with poor glycemic control

On a multivariable logistic regression analysis revealed that presence of diabetic complications (adjusted odds ratio (AOR) = 4.84, 95% CI 2.219–10.573, p = 0.00) , associated other comorbidities (adjusted odds ratio (AOR) = 2.780, 95% CI 1.585–4.876, p = 0.00) and depression (adjusted odds ratio (AOR) = 3.625, 95% CI 2.113–6.220, p = 0.00), were found to be independent predictors of glycemic control among type 2 diabetic patients (Table 4).

Table 4: Logistic regression analysis to determine the independent predictors of glycemic control among type 2 diabetic patients at family medicine clinic Egypt (N = 300)

	Coefficient	Wald	P-value	Adjusted Odds Ratio	95% Confidence Interval	
					Lower	Upper
Duration of DM (5-)	-0.475	1.147	0.284	0.622	0.261	1.484
Duration of DM (5-10-)	0.112	0.041	0.839	1.119	0.378	3.312
Duration of DM (>10)	0.799	2.435	0.119	2.224	0.815	6.067
DM Complications	1.578	15.690	**0.000***	4.844	2.219	10.573
Treatment (Insulin)	0.253	0.555	0.456	1.287	0.662	2.502
Treatment (Combined)	0.710	0.841	0.359	2.033	0.446	9.271
Comorbidities	1.022	12.712	**0.000***	2.780	1.585	4.876
Smoking	0.704	0.782	0.368	2.022	0.437	9.359
Depression	1.566	3.684	**0.000***	3.625	2.113	6.220

Statistically significant at p<0.05

Discussion

Diabetes and depression are highly prevalent conditions and have a significant impact on health outcomes. This study assessed the prevalence of depression and predictors of glycemic control among type 2 diabetes outpatients at family medicine clinic at Suez Canal university hospital Egypt. This study revealed that the prevalence of depression was 69%, which is considered less than the finding from a previous study in Egypt which reported that (74.4%) of type 2 diabetic patients have depression (23). However, few studies have found the prevalence of depression among patients with T2DM to be slightly more than 70% in Trivandrum, India, in US-based separate studies (24), and (80.0%) in UK (25). A lower prevalence rate was reported at 45.8% in KSA [26]. In the current study when we used the cut- off (PHQ-9 ≥ 10), prevalence of depression was 35.7%. This finding was higher than results reported from a cross-sectional study done in Bangladesh using the same cut-off value (PHQ-9 ≥ 10), where the prevalence was 16.5% (27).

On the other hand the current study findings were lower than that reported from a cross-sectional study conducted in Chandigarh, India; which conveyed that from 300 type 2 diabetic patients, 23% fulfilled the criteria for severe depression and 18% for moderate depression (28).

The discrepancy of this prevalence might be explained by numerous factors including variation in methodology including characteristics of the studied population, study design, use of different psychometric scale, data collection tool, sample size, level of country development, culture and social factors. The high prevalence in the current study may be due to that more than half of them had more than 10 years duration of diabetes and most patients have diabetic complications (70%).

Factors affecting depression among diabetic patients:

The current study showed that there is an associated significant correlation between depression and glycemic control, despite the relationship between depression and HbA1c levels showing mixed results (29). The current

study finding is similar to results from a previous study that reported that presence of depression is associated with higher glycated haemoglobin (HbA1c) (30), whilst other studies found either no relationship between HbA1c levels and depression (31).

The current study didn't show a significant relationship between depression and being older; the same was noted from several other studies that reported no association between age and prevalence of depression among patients with T2DM, (32&33), whereas in contrast results from a study in Palestine revealed a significant association between age and depression in subjects with diabetes(34).

Although the literature suggests that patients diagnosed with diabetes and comorbid depression are generally common among females, this study did not find this, in contrast to results from a meta-analysis, (35) which showed that diabetes doubles the risk of depression and it is especially more among women.

Marital status wasn't significantly associated with depression in the current study. However, a study from Malaysia was concluded that the majority of depressed diabetic patients were married. (36), and, this was contradicted with findings from a study conducted at Johns Hopkins University in Baltimore and in Morocco showed that depression was more prevalent among unmarried diabetics. (37, 38).

There was no significant relationship between diabetes duration and depression in the current study, in contrast to findings from previous studies that showed a statistical relationship between diabetes diagnosed greater than five years and depression (18&39). This could be attributed to adaptation to the disease.

The current study showed that depression was higher among patients with complications and more among insulin users, but the relation wasn't statistically significant, in contrast to findings from a previous study which observed that patients with longer duration of diabetes, on insulin and having diabetic related complications were found as risk factors for developing depression among diabetic patients (40) .

Factors affecting glycemic control among diabetic patients:

The present study showed that almost three quarters (74.3%) of patients had poor glycemic control (Hba1c >7); similar findings were shown by previous studies (78.8%) in Kuwait, (78.6%) in India,(67.7%) in King Saudi Arabia and (65.0%) in Oman of T2DM patients had poor glycemic control (41-44).

Middle-aged patients (40-60 years old) had poorer glycemic control than others, as they represented the majority of the studied groups. This is consistent with a previous study which reported that most of the respondents who have b diagnosed diabetes mellitus were in the middle age group (45). Patient education played a significant role in achieving better glycemic control, which was reported from the current study. , Somehow this finding has been supported by other studies that conveyed that patients with higher education levels are more likely to have superior glycemic control (46).

This study revealed that patients with longer duration of diabetes and more complex treatment regimens, having diabetic complications and associated with other comorbidities were associated with poorer glycemic control and this is in agreement with findings from prior studies which reported that patients with longer duration of diabetes and more complex treatment regimens were associated with poorer glycemic control (47, 48).

Presence of diabetic complications, co morbidities and depression were found to be independent predictors of glycemic control among type 2 diabetes patients in the current study.

Conclusion and Recommendations

The prevalence of depression was high, 69 %, among Type 2 DM patients; diabetic complications, co morbidities, and depression were found to be independent predictors of poor glycemic control among type 2 diabetes patients in the current study, so it is highly recommended to screen and manage depression among type 2 diabetic patients with more effort from the Multidisciplinary health care team for the patients with diabetes to achieve good glycemic control.

Limitation of the study

This study was a cross-sectional study design, where causal relationship between diabetes and depression cannot be established. The sample size was relatively small which may limit generalization of the study findings to a larger population of type 2 diabetes patients.

This clinic provides care for diabetic patients referred from primary care health centers, so there is referral bias as family physicians usually referred those who were more challenging patients with multiple co morbidities, uncontrolled diabetes and diabetes complications.

Competing interests

The authors have no conflicts of interest to disclose.

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