

Prevalence of Depression among Diabetic Patients in Makkah

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ABSTRACT

Background: Diabetes mellitus (DM) is a major health problem that is associated with psychological, as well as physical, complications particularly depression. Depression is well-known to be prevalent among diabetic patients and to be associated with poor glycemic control, poor adherence to medication, increased diabetic complication and higher risk of mortality. **Objectives:** The purpose of the study is to determine the prevalence rate of depression among diabetic patients in primary health care units and diabetic centers at Makkah city – Saudi Arabia, and to explore the associated factors that co-exist with depression among diabetic patients.

Methods: This was a descriptive cross-sectional study conducted on 382 diabetic patients (both type I and II) recruited from diabetic centers at Al-Noor hospital, Hera'a hospital, and East of Al-aziziah hospital in Makkah, KSA. Data were collected via a self-administered questionnaire including demographic variables and the Arabic translation of Patient health questionnaire the Tunisian version (PHQ-9). The data collected were analyzed using SAS 9.4. **Results:** After data analysis of the 382 participants 43.19% were males and 56.81% were females, with a mean age of 50.28±11.43 years. The prevalence of depression was 20.68%, with 12.83%, 7.07%, and 0.79% having moderate, moderately severe, and severe depression, respectively. Hypertension, duration of hypertension, number of co-morbidities, and high education level were significantly associated with depression ($p=0.0111$, 0.0029 , 0.0491 , and 0.0158 , respectively). The odd's ratio of number of co-morbidities was 1.565 ($p=0.0039$). **Conclusions:** Depression and suicidality are prevalent among diabetic patients in Makkah. When diabetes co-exists with hypertension and/or other comorbid illnesses the prevalent doubles. Hypertension, increased number of associated co-morbidities, and high educational level are significantly associated with depression in diabetic patients.

Keywords: Depression, prevalence, diabetes, KSA, Makkah.

INTRODUCTION

Diabetes is the most common chronic metabolic disease and one of the most common causes of psychological as well as behavioral changes^[1]. The prevalence of diabetes is progressively increasing in developing as well as developed countries. Researchers have reported a significant association between depression and diabetes. Depression in diabetic patients is often associated with poor glycemic control, poor adherence to medication, increased diabetic complication, and higher risk of mortality^[2].

Diabetes and depression are thought to be bidirectional. Patients with diabetes have high incidence of depression with poor glycemic control and low inflammatory reaction being accused of depression development, and depression worsening diabetic control^[3]. The aim of this study was to estimate the prevalence of depression among diabetic patients in Makkah city of Saudi Arabia. The main objectives of the study were to determine the prevalence rate of depression among diabetic patients in primary health care units and diabetic centers at Makkah city – Saudi Arabia, and to explore the associated factors that co-exists with depression among diabetic patients.

PATIENTS AND METHODS

Subjects and study design

This was a quantitative research model aimed at collecting numerical data from human Participants (diabetic patients) in Makkah, and the data was transformed to available and usable statistics. The project was carried out in 10 months and commenced in 30 December 2016. The study was carried out in Makkah city Saudi Arabia. It was a descriptive cross-sectional study of patients recruited from diabetic centers and primary health care facilities in the city. The hospitals the study was conducted in were the diabetic center of Al Noor Hospital, the diabetic center of Hera 'a hospital and East of Alaziziah outpatient clinic.

The study included 382 diabetic patients both types (Type I DM & Type II DM) attending diabetic centers and the primary health cares. Those included were both males and females aged from 18 to 64 years old who accepted to join the research and given both oral as well as written consents. Those who were excluded were participants below the age of 18, patients with gestational diabetes, patients with any endocrinopathies, patient recently diagnosed with depression or treated for depression and patients with long-term corticosteroid use.

The study was done after approval of ethical board of Umm Al-Qura university.

Sample size determination and sampling technique

Sample size was determined using the formula: $n = [DEFF * Np(1-p)] / [(d^2/Z^2(1-\alpha/2) * (N-1) + p*(1-p))]$, where $p=0.5$ to catch the largest variation in the sample from the population N which represented the total census of the selected hospitals. Random sampling was used to sample the study subjects.

Data collection and analysis

Data collection was carried out by both a confrontational approach and from the patients' files. The study was done using a validated self-reported depression tool, the Arabic translation of Patient health questionnaire the Tunisian version was used (PHQ-9)^[4]. The PHQ-9 is a nine-questions questionnaire used to screen for depression, to assess its severity, and to detect major depression. For diagnosing major depression, the PHQ-9 shows high sensitivity (73%) and a very high specificity (98%) when based on structured psychiatric interviews^[5]. The prevalence of depression measured by the cut of score ≥ 10 which is the most widely used to indicate positive cases of depression^[6].

PHQ-9 score ranges from (0-27), each symptom of the nine questions can be scored from 0 to 3, where 0 refers to (Not at all), 1 refers to (several days per week), 2 refers to (more than half of the days), and 3 refers to (nearly every day). The cut-off score used for assessment is ≥ 10 . Patients who scored 10-14, 15-19 and ≥ 20 , were considered to have moderate, moderately severe, and severe depression, respectively^[7]. The resulted scores were then analyzed and correlated with the demographic data of the participants to determine the variables significantly correlated with the depression among the recruited sample. Suicidality of the patients was also measured and the participants were categorized into suicidal-free & suicidal groups based on their answers of the PHQ-9 tool, where scoring 0 indicated 'no suicidal ideation', whilst scoring either 1,2, or 3 indicated positive suicidal ideation.

SAS 9.4 was used to analyze the gathered data. Fisher's exact test was used for analysis of categorical variables, whilst Kruskal Wallis non-parametric test was used for continuous variables. A logistic module was computed to calculate the odds ratios of the covariates predicting depression cases.

RESULTS

Demographic data

A total of 382 participants were recruited to this study, 165 (43.19%) of them were male and 217

(56.81%) were females. The mean age of all participants was 50.28 +/- 11.43 years.

Depression prevalence and severity

The prevalence of depression was 20.68% (n=79), with a mean PHQ-9 score of 6.09 +/- 4.83. Patients who scored < 10 on PHQ-9 were considered depression-free 79.32% (n=303). The prevalence of depression symptoms among the recruited sample is demonstrated in table 1. As regards the severity of depression, 12.83% (n=49) fulfilled were categorized as moderate depression, with a PHQ-9 score between 10–14, 7.07% (n=27) had moderately severe depression, with a PHQ 9 score between 15–19, and 0.79% (n=3) had severe depression with scores ranging from 20–27. Those details are depicted in table 2.

Demographic and clinical variables in correlation with depression

Sixteen demographic variables obtained from patients were studied in correlation with depression. They were compared between patients who were found to have depression and those who were depression-free to determine the significantly correlated variables (table 3). Variables that showed significant association with depression were number of other medical conditions, hypertension, hypertension duration & educational level. The mean number of other medical conditions the studied participants had was 2.29 ± 1.29 . This was significantly correlated with depression ($p=0.0158$), as the number of medical conditions tended to be slightly higher among depressed patients (2.72 ± 1.80) than non-depressed ones (2.17 ± 1.10). As regard hypertension, it was found that 173(45.29%) of the recruited sample had depression, and it was significantly higher among depressed patients (58.23%) with a p-value of 0.0111. The mean duration of hypertension was 4.04 ± 6.8 years, and the duration was significantly higher in depressed patients (6.32 ± 8.66) than non-depressed patients (4.12 ± 2.79) ($p=0.0029$). Educational level was also significantly different among depressed patients in comparison to non-depressed patients, with figures showing that those who reached a university degree had the highest rates of depression amongst the studied sample ($p\text{-value} = 0.0491$).

A logistic regression module (table 4) was then built to predict the occurrence of depression in correlation with the demographic and clinical variables. The results of regression analysis showed that the only significant variable was the number of associated medical conditions ($p\text{-value} = 0.0039$) with an odd's ratios of 1.56. Of note, the participants with higher education 2.84 times more prone to get

depressed compared to high school graduates. However, the difference between the two groups was not statistically significant (p -value=0.2899).

Suicidality among participants

One tenth (10.21%) of the recruited sample was found to have suicidal ideation. A sub-analysis was done to suicidal patients in correlation with demographic and clinical variables. It was found that

the number of associated medical conditions was higher among suicidal patients (3.1 ± 2.27) than those who did not think of suicide (2.19 ± 1.1) (p -value = 0.0131). Additionally, the educational level was also found to be significantly associated with suicidality. Patients with elementary and mid-school educational levels (26.32%) had higher suicidal ideations than those with higher educational levels (p -value = 0.0391)

TABLES

Table 1. Prevalence of depression symptoms among the studied population

Variables	Frequency	Percent
Little interest or pleasure in doing things		
<i>Not Present</i>	207	54.19%
<i>Present</i>	175	45.81%
Feeling down, depressed or hopeless		
<i>Not Present</i>	172	45.03%
<i>Present</i>	210	54.97%
Trouble falling sleep, staying asleep or sleeping too much		
<i>Not Present</i>	175	45.81%
<i>Present</i>	207	54.19%
Feeling tired or having little energy		
<i>Not Present</i>	109	28.53%
<i>Present</i>	273	71.47%
Poor appetite or overeating		
<i>Not Present</i>	206	53.93%
<i>Present</i>	176	46.07%
Feeling bad about yourself or that you are a failure		
<i>Not Present</i>	252	65.97%
<i>Present</i>	130	34.03%
Trouble concentrating on thing, such as reading the news paper		
<i>Not Present</i>	224	58.64%
<i>Present</i>	158	41.36%
Moving or speaking so slowly that other people could have		
<i>Not Present</i>	270	70.68%
<i>Present</i>	112	29.32%
thoughts that you would be better off dead or of hurting your self		
<i>Not Present</i>	343	89.79%
<i>Present</i>	39	10.21%

Table 2: Severity score of depression among the studied sample

Score Simple	Frequency	Percent
No Depression	39	10.21%
Minimal Depression	128	33.51%
Mild Depression	136	35.60%
Moderate Depression	49	12.83%
Moderately Severe Depression	27	7.07%
Severe Depression	3	0.79%

Table 3: Correlation between demographic and clinical variables and depression among the studied group

	Variable	Statistics	Overall (n=382)	Depression Free (n=303)	Depression (n=79)	p-value
	Age	50.28 ±	11.43			
	18 - 29			27(8.91%)	7(8.86%)	0.9994
	30 - 39			19(6.27%)	4(5.06%)	
	40 - 49			59(19.47%)	16(20.25%)	
	50 - 59			121(39.93%)	32(40.51%)	
	60 - 64			77(25.41%)	20(25.32%)	
	Number of Medical Conditions	2.29 ±	1.29	2.17±1.10	2.72±1.80	0.0158**
	Diabetes Duration	10.91 ±	8.39	10.51±7.93	12.44±9.88	0.1792
	Hypertension Duration	4.04 ±	6.8	3.45±6.10	6.32±8.66	0.0029**
	Average PHQ-9 score	6.09 ±	4.83	4.12±2.79	13.65±3.29	0.001**
Depression	<i>No</i>	303	79.32%			
	<i>Yes</i>	79	20.68%			
Gender	<i>Male</i>	165	43.19%	138(45.54%)	27(34.18%)	0.0751
	<i>Female</i>	217	56.81%	165(54.46%)	52(65.82%)	
Nationality	<i>Saudi</i>	352	92.15%	282(93.07%)	70(88.61%)	0.2375
	<i>Non-Saudi</i>	30	7.85%	21(6.93%)	9(11.39%)	
Marital Status	<i>Single</i>	41	10.73%	33(10.89%)	8(10.13%)	1
	<i>Married</i>	316	82.72%	250(82.51%)	66(83.54%)	
	<i>Divorced</i>	14	3.66%	11(3.63%)	3(3.80%)	
	<i>Widow</i>	11	2.88%	9(2.97%)	2(2.53%)	
Education Level*	<i>Illiterate</i>	71	21.52%	50(19.31%)	21(29.58%)	0.0491*
	<i>Elementary</i>	59	17.88%	46(17.76%)	13(18.31%)	
	<i>Mid-School</i>	41	12.42%	28(10.81%)	13(18.31%)	
	<i>High School</i>	45	13.64%	37(14.29%)	8(11.27%)	
	<i>University</i>	107	32.42%	93(35.91%)	14(19.72%)	
	<i>High Education</i>	7	2.12%	5(1.93%)	2(2.82%)	
Diabetes Type	<i>Type I</i>	45	11.78%	37(12.21%)	8(10.13%)	0.6986
	<i>Type II</i>	337	88.22%	266(87.79%)	71(89.87%)	
Hypertension	<i>No</i>	209	54.71%	176(58.09%)	33(41.77%)	0.0111*
	<i>Yes</i>	173	45.29%	127(41.91%)	46(58.23%)	
Smoker	<i>No</i>	320	83.77%	253(83.50%)	67(84.81%)	0.8651
	<i>Yes</i>	62	16.23%	50(16.50%)	12(15.19%)	
Oral anti Hyperglycemic Drugs	<i>No</i>	180	47.12%	137(45.21%)	43(54.43%)	0.1643
	<i>Yes</i>	202	52.88%	166(54.79%)	36(45.57%)	
Insulin	<i>No</i>	302	79.06%	240(79.21%)	62(78.48%)	0.8775
	<i>Yes</i>	80	20.94%	63(20.79%)	17(21.52%)	
Both oral & Insulin	<i>No</i>	286	74.87%	232(76.57%)	54(68.35%)	0.1462
	<i>Yes</i>	96	25.13%	71(23.43%)	25(31.65%)	
Diet & Exercise	<i>No</i>	378	98.95%	300(99.01)	78(98.73%)	1
	<i>Yes</i>	4	1.05%	3(0.99)	1(1.27%)	

* Fishers exact test. ** Kruskal Wallis non-parametric test; Education Level has 52 missing observations

Table 4: Logistic module for depression among studied patients

Effect	Odds Ratio	Lower Confidence Interval	Upper Confidence Interval	p-value
Age	0.969	0.933	1.007	0.1080
Number of Medical Conditions	1.565	1.155	2.122	0.0039*
Gender (<i>Female vs. Male</i>)	1.891	0.904	3.958	0.0908
Marital Status (<i>Divorced vs. Single</i>)	0.943	0.168	5.293	0.9465
Marital Status (<i>Married vs. Single</i>)	1.368	0.389	4.811	0.6248
Marital Status (<i>Widow vs. Single</i>)	0.679	0.084	5.507	0.7167
Education Level (<i>Elementary vs. High School</i>)	1.263	0.444	3.591	0.6616
Education Level (<i>High Education vs. High School</i>)	2.840	0.411	19.628	0.2899
Education Level (<i>Illiterate vs. High School</i>)	1.747	0.636	4.801	0.2791
Education Level (<i>Mid School vs. High School</i>)	2.327	0.814	6.655	0.1152
Education Level (<i>University vs. High School</i>)	0.727	0.271	1.949	0.5265
Diabetes Type (<i>Type II vs. Type I</i>)	1.228	0.352	4.286	0.7477
Hypertension (<i>Yes vs. No</i>)	0.932	0.427	2.033	0.8592
Smoker (<i>Yes vs. No</i>)	0.935	0.393	2.221	0.8785

DISCUSSION

Many literature studies reported an association between diabetes and depression^[5,6], and both disorders were considered bidirectional^[3]. This research is the first study in Makkah to investigate the prevalence of depression in both diabetes types. Results from this research showed that the prevalence of depression among diabetic patients in Makkah city was 20.68%. Comparing with other studies, there was a research conducted in Jeddah city in Saudi Arabia, reported that the prevalence of depression was 34% in 2004^[8]. Another study from Jordan found that the depression prevalence among diabetic patients was 19.7%^[9]. Other prevalence reported in Nigeria, Pakistan, Uganda, and Urban India was 19.4%, 5.4%, 28%, and 34.8%, respectively^[10,13]. An Asian multi-racial population study reported a prevalence of 31.1%^[14]. These prevalence discrepancies might be due to many factors including differences in psychometric scales, study design, setting, level of country development, Social and cultural factors.

As regards the severity of depression, about 13% of the studied participants had moderate depression, 7.07% had moderately severe depression, and less than 1% had severe depression. Depression was significantly correlated with diabetes and hypertension, and the duration of hypertension was also significantly associated. In

agreement with our results, studies have revealed that depression had been highly prevalent among hypertensive patients^[15]. Thus, when both diabetes and hypertension are combined, the risk and chance of developing depression is high.

The number of other co-morbid illnesses that co-existed with diabetes was significantly higher in those having depression. Statistically, by building a logistic regression module to predict the occurrence of depression, it was found that there was a significant correlation between the presence of other co-morbidities with diabetes and depression, thus, the more the number of associated medical illnesses the diabetic patient had, the higher risk to develop depression. Similar researchers found that the number of co-morbid illnesses was a significant risk factor for depression^[16,17]. Educational level also affected the development of depression. It was depicted that participants who had a high university degree education were more vulnerable to depression than patients who were less educated ($p=0.0491$). There is a similarity of the results of our research and other researches that showed a significant correlation between educational level and depression in diabetic patients^[18,19], whereas, others stated non-significant association^[20].

Depressed diabetic patients are at high risk for developing diabetic complications such as hyperglycemia, and coronary heart disease^[2]. Low

adherence to medications and subsequently less diabetic control and high morbidity and mortality are commonly encountered^[3]. Therefore, accurate assessment of depression in diabetic populations is important and the treatment of depression in those patients may improve diabetes management.

One tenth of the studied patients had suicidal ideation and the suicide was significantly correlated to the low educational levels and the co-existence of other medical conditions. In agreement with these results, previous reports from the literature indicated that high education attainment lead to decreased suicide rate^[21]. This in contrast to the prevalence of depression which was significantly higher among patients with a university-degree level of education. This might be attributed to the fact that highly educated individuals often have good socioeconomic status, satisfying employment, and high income which would reduce risk of suicide^[22].

Being life-threatening emergencies, it is essential to consider suicidal ideas and suicidal attempts among diabetic patients. Suicidal ideation and suicidal attempts are more frequent among diabetic patients when compared to general population. In one study, it was reported that depression was the most common psychiatric disorder encountered among patients who attempted suicide^[23]. Furthermore, various observational studies reported that the prevalence of suicidal ideation among diabetic patients was 15.0% in type 1 DM and 9.4% in type 2DM in Canada, 24.2% in Korea, 11.0% in Netherlands, 9.2% in USA, and 13.1% in Brazil^[24-27]. A prospective cohort study conducted on 1908 diabetic patients in Norway reported that, during the eight-year follow up period of those patients, 20 of the studied patients died, with 8 (40%) out of them due to suicide^[28]. Another cohort study, conducted on 3090 diabetic patients in UK, showed that 0.55% of the total deaths was due to suicide^[29]. Assessment of suicidality is essential when screening for depression as it can potentially reduce fatal outcome.

Limitations of the study: Whereas this study is the first study to estimate the prevalence of depression among diabetic patients in Makkah, and the response rate was excellent, the use of PHQ-9 psychiatric scale is not the gold standard scale to assess depression.

CONCLUSION

Depression and suicidality are prevalent among diabetic patients in Makkah. When diabetes co-exists with hypertension and/or other comorbid illnesses the prevalent doubles. Hypertension, increased number of associated co-morbidities, and

high educational level was significantly associated with depression in diabetic patients. Screening for depression, and subsequently its early diagnosis, is essential in the comprehensive management of diabetic patients for improving the outcome and reducing the mortality.

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