

Research Article

The Effect of Diabetes Mellitus on the Presentation of Depression in a Primary Care Population

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Keywords

• Diabetes; Depression; Comorbid depression; Integrated mental health care; PHC; Saudi Arabia

Abstract

Background: Depression is a common disorder with more than 300 million people worldwide. The comorbidity of depression and diabetes has a high prevalence rate. Collaborative care in diabetes should include screening for depression and patients with depression should be screened for diabetes for better patients care outcome.

Objective: To identify the effect of diabetes mellitus on the depression presentations in the primary-care centers.

Method: A case-control study was conducted at 11 PHC centers during April-May, 2017. Out of 185 patients who fulfill the study criteria, 74 who had depression with co-morbid with diabetes formed the *Case-sample*, 111 depressed patients not co-morbid formed the *Control sample*.

PHQ-9 used as the diagnostic tool for depression. The satisfaction level and patients' file were assessed and explored the diagnosed and missed cases by the PHC doctors. Data were analyzed using SPSS version 20. Odds ratios (OR) demonstrated with their 95% confidence intervals (CI) and P-value ≤ 0.05 .

Results: Comorbid depression and diabetes have a significantly high mean of TG and HbA1c. Physical activity and sleep pattern were better among comorbid cases. At the same time, they were unsatisfied with their care in the PHC centers. Most of the depressant patients were missed by their PHC doctors (74%), that worse when the patients had comorbid with diabetes (85%) with significantly different (p-value=0.005).

Conclusion: In diabetic patients, depression is mostly missed by the PHC physicians. Therefore, depression should be predicted in diabetic patients particularly, uncontrolled diabetes, unsatisfied patients. Integrated depression management in diabetic care is necessary to improve clinical outcomes and reduce the burden of illness

INTRODUCTION

Depression is a common disorder, more than 300 million people worldwide are suffering from depression, according to the World Health Organization [1]. Depression has a negative economic impact on governments, employers, and households. It causes a drop in the worldwide productivity, costing the global economy more than \$1 trillion, and annual death rate of 800,000 worldwide [1].

Co-morbid depression and diabetes have a high prevalence rate [2]. Depression in diabetic patients increases the risk of developing diabetic complications, disability, and early mortality. A meta-analysis study was done by de Groot (2001) to test the strength and consistency of the relationship between depression, and diabetes complications showed a significant association between depression and a variety of diabetes complications; diabetic retinopathy, nephropathy, neuropathy, macrovascular complications, and sexual dysfunction [3].

However, Diabetes is considered as one of the risk factors for depression particularly among those who are using insulin compared with noninsulin medications [4,5]. The mortality risk in diabetic patients increased in the presence of depression or anxiety, and highest for depression [6].

There is evidence that shows that depression and type 2 diabetes may share the same biological markers and risk factors such as overactivation of innate immunity leading to a cytokine-mediated inflammatory response, and potentially through dysregulation of the hypothalamic-pituitary-adrenal axis [7]. Eventually, understanding of shared origins of depression and diabetes could offer the potential to treat and improve outcomes of both disorders simultaneously, which are targets for primary prevention of type 2 diabetes [7]. Other reports show that depression and diabetes mellitus occur together, approximately twice as frequently as occurring alone [8], and have a bi-directional association [9,10].

Chen et al. (2013), indicated an association for depression predicting the onset of diabetes [9]. The combination of both disorders worsens the outcome of either condition. This association also worsens the quality of life, worsens self-management, increases the incidence of complications, and life expectancy [11], and the costs of treatment increase significantly [12].

Consequently, depressive episodes with diabetes are more likely to be persistent and relapse more. In contrast, depressive symptoms usually last 8–12 weeks when occurs alone [4]. The development of two or more diabetes complications showing the strongest association with depression [3,13]. Thus, the evidence recommends the need to have an effective diagnosis and management of depression in diabetic patients [14].

The evidence from the literature suggests that health promotion in people with diabetes should include screening for depression and vice versa [15]. In this study, I will explore the effects of diabetes mellitus on depressive symptoms in a population of people attending primary care clinics in Saudi Arabia.

Study Rationale

PHC/Family doctors need to predict the symptoms of depression among diabetic patients for early diagnosis and management. Hopefully, the better outcomes of both depression and diabetes mellitus care. This was supported by recommended by Guo et al. (2015), that working on minimizing depressive symptoms may enhance depression and diabetes adaptation concerning metabolic control and quality of life [16].

Aim

To identify the effect of diabetes mellitus on the depression presentations in the primary-care centers.

METHODS

Study setting

This case-control study was conducted at the PHC centers (11 centers) in Al-Khobar city, Saudi Arabia.

Sampling procedure

Out of the 388 patients invited to participate in this study during April-May, 2017, 368 patients completed the questionnaire with respond rate of (95%). Out of them, 185 patients who fulfill the study criteria; who had depression only or depression comorbid with diabetes were included in the study. Only 74 patients who had depression with co-morbid with diabetes, and formed the *Case-sample*. The rest 111 depressed patients not co-morbid with diabetes formed the *Control sample*.

Depression Assessment

Patient Health Questionnaire-9 (PHQ-9) used as the diagnostic tool for depression [17]. It was modified from PHQ-8 and has been used in several hundred studies to assess both mentally and physically ill patients, including studies with patients with diabetes [18]. PHQ-9 score ≥ 5 was considered as positive for depression.

Satisfaction Assessment

The satisfaction level among depressive patients was assessed by a direct question about their satisfaction regarding the care which providing to them in the PHC center for their condition. The patients' perception was assessed by a 5-scaled question; 1 is the lowest level, and 5 is the highest satisfaction level.

Missed cases by PHC doctors

The studied patients' file was reviewed to define the depressant patients who were diagnosed by their PHC doctors, and those who not diagnosed before. Those who were not diagnosed and only discovered by the screening tool were considered as missed cases.

Data collection

Data collection was a two-stage process:

Stage one: A self-administered questionnaire was completed by participants to gather socio-demographic information, information about the chronic disease and lifestyle.

All participating patients were asked to complete a PHQ-9 an Arabic version. There two trained persons for interpretation and filling the questionnaires for illiterate patients.

Stage Two: The patient medical records/files review for all patients who filled the questionnaire to obtain information about weight, height, BP, lab tests profile, complications, and treatments.

Statistical analysis

Data were entered and analyzed using SPSS version 20. Data were presented as Mean \pm SD for quantitative data, and number (N) and percentage (%) for qualitative data. Student t-test, Chi-square test, biserial correlation were used when appropriate. Odds ratios (OR) demonstrated with their 95% confidence intervals (CI) and P-value, considered significant at p-value ≤ 0.05 .

Ethic issue

Administrative permission, as well as Institutional Review Board approvals, and Informed consent obtained from all participants.

RESULTS

From 388 questionnaires were distributed, 368 were completed and retained with a response rate of 94.8%, females formed 51.4% (n=189). Out of them, 185 patients filled the study criteria, depression only or depression comorbid with diabetes. The case-sample was 74 patients who had depression with co-morbid with diabetes, and 111 depressed patients not co-morbid with diabetes.

Socio-demographic characteristics of the studied sample

The distribution of the studied sample according to socio-demographic characteristics demonstrated that there is no significant difference between the case and control samples. The mean age (\pm standard deviation) of the studied sample was 44.7

years \pm 11.6. More than half of the participants (68.6%), were female. The majority of the studies sample were married (75.7%). Sixty percent (60%) of the participants had their own house.

Regarding the education level among the studied sample, 15.1% was illiterate, 30.3% and 27% were of primary and secondary education respectively, while 27.6% had university and postgraduate education.

Table 1 shows no difference between depressive cases with and without diabetes mellitus according to the weight and blood pressure, cholesterol, and vitamin serum D level. But, the depressive comorbid patients had a significant difference in their diastolic reading, and LDL level was less than depression without diabetes. That could be related to diabetic control management i.e. diet and lifestyle modification.

Table 2 demonstrates that the physical activity and sleep pattern is a better significantly difference among depression comorbid with diabetic comparing without, p-value= 0.009, <0.0001, respectively. Other habits such diet control, weight change, smoking, and alcohol intake have no significant difference.

Table 3 demonstrates that the satisfaction level among depressive patients without co- morbid diabetes mellitus is significantly high as compared with depressive patients when they have a comorbid with diabetes, the Odds Ratio=0.268 (CI=0.097-0.742).

Most of the depressant patients (74%) in our sample were missed by their PHC doctors especially when the patients had comorbid with diabetes (85%). This is reflecting how the comorbid with diabetes affected worse the doctors' ability to discover the depression in PHC centers, as illustrated in Table 4.

The patients with depression and comorbid with diabetes scored a significantly higher for the sleep disturbance, feeling tired, loss of concentration, and prefer to die as compared with

depressive patients only, p-value= (0.035), (0.018), (0.005), (0.006) respectively.

DISCUSSION

This study is the first study, up to known to the author, studied the effect of diabetes mellitus on the depression presentation in Saudi Arabia.

The socio-demographic characteristics testing supports the accuracy of the case and selective control process. Where there is no significant difference between the cases and the control candidates, and the relation between depression alone and presented with comorbid with diabetes not affected by their age, gender, marital status, education level, occupation, income, and BMI, it goes consistency with Eaton et al. (1996) findings [19].

Table 1 shows no difference between depressive cases with and without diabetes mellitus according to the weight and blood pressure, cholesterol, and vitamin serum D level. But, the comorbid depressive patients with diabetes have a significant difference in their diastolic reading, and LDL levels were less than depression without diabetes. That could be related to diabetic control management, i.e., diet and lifestyle modification. However, in our sample the diabetic patients' comorbid with depression have a significantly high mean of TG and HbA1c which indicates an uncontrolled DM related to the presence of depression. This finding is supported by other studies which showed a strong linear relationship as scored high on the PHQ-9 had higher HbA1c [20,21]. As approved by Bot et al., (2013), that, a higher HbA1c level indicated more with comorbid diabetes coexisted with depression [22]. This finding supports the needs for the integrating treatment of both disorders by PHC doctors for better patient care, which supported by the Bogner et al. (2012), and the Hermanns et al. (2013), findings [23,24].

Table 2, both physical activity and sleep pattern are better among diabetic comorbid with depression comparing. In contrary, sleep disturbance which significant associated with predicting diabetes, which is concomitant with others studies finding [22,25]. However, other habits such diet control, weight change, smoking, and alcohol intake didn't demonstrate an effect. In general as cited in different studies, depressive patients are more likely to be less active, unhealthy diets, which may contribute to the increased risk of developing type 2 diabetes [26,27]. The health education receiving in the diabetic clinic follow-up could help in improving the physical activity among diabetic comorbid with depression comparing without combined. Add to that; sleep pattern is better among comorbid could frequent visit to the diabetic clinic plays a role as a supportive therapy or consequent effect of physical activity improvement. These behaviors should be considered in the diabetic clinic education hopefully, would contribute to the depression management, which was emphasized on applying the collaborative care for diabetic patients with depression by Huang et al. [28].

Table 3 demonstrates that comorbid depression and diabetes were significantly unsatisfied for their care in the PHC centers. We keep in mind in this study most of the depressive patients not

Table 1: Comparison between depressive cases with and without diabetes mellitus according to the basic physical and laboratory findings, (PHQ-9 score \geq 5).

	Depression comorbid with DM (N=74)	Depression without DM (N=111)	P-value
	Mean \pm SD	Mean \pm SD	
Weight	80.76 \pm 16.9	78.84 \pm 19.5	0.489
Height	158.07 \pm 15.7	160.03 \pm 12.8	0.355
BMI	31.44 \pm 6.8	30.64 \pm 9.7	0.541
SBP	125.84 \pm 14.9	122.5 \pm 17.8	0.186
DBP	72.97 \pm 8.0	77.15 \pm 11.4	0.007
FBG	168.5 \pm 67.9	93.82 \pm 13.0	<0.0001
HBA1c	8.65 \pm 2.1	6.42 \pm 5.2	<0.001
TG	164.85 \pm 98.3	124.9 \pm 44.2	<0.0001
Total cholesterol	186.51 \pm 38.2	188.43 \pm 35.1	0.724
LDL	105.69 \pm 32.7	114.77 \pm 33.6	0.07
HDL	46.71 \pm 15.4	48.56 \pm 10.9	0.341
Vitamin D	17.87 \pm 4.2	20.08 \pm 10.3	0.082

Table 2: Effect of DM on depressive patients' socio-characters, (PHQ-9 score ≥ 5).

Lifestyle	Depression comorbid with DM n (%)	Depression without DM n (%)	Odds Ratio	P-value
Diet control:				
- Yes	52(70.3)	79(71.2)	0.957	0.895
- No	22(29.7)	32(28.8)		
Physical activity:				
- Yes	60(81.1)	70(63.1)	2.5	0.009
- No	14(18.9)	41(36.9)		
Sleep difficulties:				
- Yes	40(54.1)	90(81.1)	0.275	<0.0001
- No	34(45.9)	21(18.9)		
Weight change:				
- Yes	43(58.1)	64(57.7)	1.02	0.952
- No	31(41.9)	47(42.3)		
Smoking:				
- Yes	20(27.0)	21(18.9)	1.587	0.193
- No	54(73.0)	90(81.1)		
Alcohol:				
- No	73(98.6)	109(98.2)	0.747	0.812
- Past History	1(1.4)	2(1.8)		

Table 3: Satisfaction level among depressive patients co-morbid with DM and not comorbid, (PHQ-9 score ≥ 5)

	DM (N=74) n (%)	No DM (N=111) n (%)	Odds Ratio	P-value
Satisfaction:				
- Yes	61 (82.4)	105 (94.6)	0.268	0.008
No	13 (17.6)	6 (5.4)		

aware of their diagnosis, only discovered by screening. Therefore, this finding could be related to the load of the morbidity and the commitments to the regular follow-up which, could affect adversely on the patients psychologically. It is supported by Guo et al. (2015), findings that, increase depressive symptoms was associated with less patients' satisfaction [16]. Biochemistry of both depression and diabetes could have a role, increase the cortisone, and alter the catecholamines, and serotonin levels [29,30].

Table 4 Most of the depressant patients among the participants were missed by their PHC doctors, that worse when the patients had comorbid with diabetes. It is reflecting how the comorbid with diabetes worse the doctors' ability to discover the depression in PHC centers. Such finding was cited in WHO/Wonca Report (2008) [31], a there high rate of missed cases of minor mental health such as depression in PHC settings, as goes with Lawrence et al. (2002), and Frayne et al. (2005), findings [32,33].

As cited by Silverstein et al. (2015), such findings highlight the need for regular depression screening and appropriate management for patients, particularly among chronic physical disorders [34]. Add to that, PHC doctors should be efficiently trained for mental health care considering the patient's presentations in the PHC settings, not a psychiatric disorder only, for improving both emotional and metabolic statues [35].

The patients with depression and comorbid with diabetes scored a significantly higher for the sleep disturbance, feeling tired, loss of concentration, and prefer to die as compared with depressive patients only, it consistent with other studies findings [36-38]. In contrary, sleep disturbance which significant associated with predicting depression and diabetes which, cited by other authours [22,25,39].

We could conclude from this study integrated depression management in diabetic care is necessary to improve clinical outcomes and reduce the burden of illness, as found by other studies [23,24,40].

CONCLUSION

This study demonstrates that the comorbid depression and diabetes have a significantly high mean of TG and HbA1c. Physical activity and sleep pattern were better among comorbid cases. However, the satisfaction level is higher among depressive patients alone.

In diabetic patients, depression is mostly missed by the PHC physicians. Therefore, depression should be predicted in diabetic patients particularly, uncontrolled diabetes, unsatisfied patients, and sleep disturbance. The health education in the diabetic clinic could help in improving the physical activity and sleep disturbance. Therefore, integrated depression management in diabetic care is necessary to improve the clinical outcomes and reduce the burden of illness [41].

LIMITATION

This is a case control study with all the limitation of a case control study and does not prove causation. In addition the limited time and resources I had to complete this study may have resulted in limiting the sample size and the population base I have used. However it is still sufficient for me to generalise the findings to other population samples in Saudi Arabia'

Table 4: Comparison between diagnosed and missed depressive patients by PHC doctors related to the presence of diabetes mellitus, (PHQ-9 score ≥ 5).

Depression	Total n (%)	DM n (%)	No DM n (%)	Odds Ratio	P-value
- Diagnosed by PHC Doctors	48 (26)	11(15)	37(33)	0.349	0.005
- Missed by PHC doctors	137 (74)	63(85)	74(67)		

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