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ORIGINAL RESEARCH

Depression and Associated Risk Factors Among Type 2 Diabetic Patients: A Cross Sectional Study on a Convenience Sample from the Diabetic Center, Khamis Mushait; Saudi Arabia

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Background: Studies had confirmed that diabetic patients have a greater risk for developing depression. Our objectives were to estimate the prevalence and predictors of depression among type 2 diabetic patients.

Methods: A cross-sectional study at the Diabetic Center, Armed Forces Hospital-Southern Region (AFHSR), Khamis Mushait was conducted in the period from March to June 2017. The study includes a convenience sample of type 2 diabetic patients. Self-administered questionnaires were utilized. It consists of personal characteristics, diabetes-related information's, and the Arabic version of the Patient Health Questionnaire (PHQ-9). Proper statistical analyses were done to assess the significance of the correlates with $p \leq 0.05$ considered significant.

Results: The study included 350 diabetic patients out of 410 with a response rate of 85.4%. Their age ranged between 28 and 100 years with a mean ±SD of 61.4±13 years. The prevalence of depression among them was 36.6%. Logistic regression revealed that patients older than 50 years were at lower risk for developing depression as compared to those aged between 28 and 40 years OR and 95% CI were 0.21 (0.08–0.57), 0.30 (0.12–0.78) and 0.33 (0.12–0.91) for patients in the age groups 51–60, 61–70 and > 70 years, respectively. Diabetic patients with thyroid dysfunction, neuropathy, those treated with insulin, and noncompliant patients were at double risk for developing depression compared to their counterparts (OR = 2.26, 95% CI = 1.20–4.27, p = 0.012); (OR = 2.35, 95% CI = 1.22–4.53, p = 0.011); (OR = 1.92, 95% CI = 1.08–3.40, p = 0.026); (AOR = 2.14, 95% CI = 1.01–4.53, p = 0.047) respectively.

Conclusion: Almost one third of type 2 diabetic patients were depressed. Younger patients, having comorbid thyroid disorders or neuropathy, those treated with insulin and noncompliant patients were at higher risk for developing depression. Proper screening and treatment of depression is a crucial part of the health care management of diabetic people.

Keywords: depression, diabetes, risk factors

Introduction

Major depression lifetime prevalence in adults is found to be 7–12% in males and 20–25% in females.[1] Diabetes affects more than 220 million patients worldwide, and it's expected to be more than double by the year 2030: approximately 90% of diabetes is type 2 (DM2).[2] In Saudi Arabia, the tremendous rush in socioeconomic growth has affected people's lifestyle leading to a high prevalence of diabetes mellitus.[3] Diabetes requires long-term medical care to manage it and to limit the development of its complications.[4]

Studies had confirmed that diabetic populations have a greater risk for developing depression.[5] It has been documented that 10–30% of diabetic patients suffer from major depressive disorder or sub-threshold depression.[6,7]

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Diabetics are at a 24% increased risk of developing depression.[8] The factors associated with high prevalence of depression among diabetic patients include poor quality of life, higher health care costs, impaired self-care, higher diabetes complications, and increased mortality rates.[9–11] There is a marked under-treatment of depression among diabetes patients. However effective treatments are available, estimates had found that fewer than 50% of depressed patients with diabetes have been identified.[12,13] Depressed diabetic patients are less likely to manage their self-care regimens.[14,15] Their glycosylated hemoglobin (HbA_{1c}) levels are higher.[16] The number and severity of complications and mortality rates are higher as well.[17] On the other hand, diabetes and its complications may lead to poorer depression outcomes.[18] American Diabetes Association guidelines (2010) recommended screening for depression among all type 2 diabetic patients.[19]

Most of the studies which assessed depression among diabetic patients in Arab countries were cross sectional in nature and mostly done on clinical samples,[20–32] but none of them had studied the population from southern region Saudi Arabia which is typically rural or suburban areas while the people aggregate in common tribes and consanguinity is common. The tools that had been used to asses depression were mostly patient rated questionnaires like (BDI-II) which revealed depression prevalence rates ranged from 22%[20] to 62.5%,[25] Patient health questionnaire (PHQ-9) (48.7%),[21] PHQ-2 (45.8%),[26] Center of Epidemiological Studies – Depression Scale (CES-D) (49.6%),[23] and depression anxiety and stress scale 21 (DASS-21) (33.8%).[22] However, studies that used clinical interviews identified depression in 20%[30] and 16% of diabetic patients.[31]

A large meta-analysis in 2001 identified some interesting differences in the prevalence of depression among diabetic patients as it was higher in females (28%) than in males (18%), in clinical (32%) than in community (20%) samples, and when it was recognized by using patient rated tools (31%) than by standardized diagnostic interviews (11%).[33]

The heterogeneity of the studies has resulted in mixed findings in terms of prevalence, correlates and risk factors of depression among diabetic population. However some studies have been conducted in Arab countries, no studies have been conducted in the specific area of south Saudi Arabia which is characterized with its rural to suburban communities, with people mostly belong to a few number of tribes while consanguine marriage is common.

The aim of the present study is to assess rate of depression and to investigate some of its correlates and risk factors among type 2 diabetic patients in the specific Arabic-speaking sample from southern Saudi Arabia.

Patient and Methods

The present cross-sectional study was carried out at the Diabetic Center, Armed Forces Hospital- Southern Region, Khamis Mushait, through the period from 1st March to 30th June 2017. The number of patients registered in this center during 2015 was 12,880 patients.

Sample size calculator was used to determine our sample with the following suggestions: total number of patients registered at Diabetic center = 12,880, prevalence of depression among diabetic patients (49.6%),[23] confidence interval (CI) = 95% and margin errors = 5%. The estimated sample size was 374. It has been increased to 410 to compensate for non-or incomplete responses.

Inclusion criteria: Patients aged 18 years or above and who are registered at a diabetes center.

Exclusion criteria: Patients taking anti-depressant drugs, with Neurological or psychiatric diseases, having been severely disabled, deaf or mute.

A proposed random number of 410 type 2 diabetic outpatients attending the diabetic specialized clinic were invited to participate in the study as a convenience sample. Two researchers (A Mujairi and Y Agdi) have interviewed the patients, described the aim and method of the study to them, and those candidates who gave written consent was given the study questionnaires to complete in the same venue, while illiterate subjects were helped by their care givers, nurses or health educators to fill in their responses.

All patients included in the study were subject to self-administered questionnaire that was composed of Personal characteristics; Diabetes-related information and The Arabic version of the Patient Health Questionnaire (PHQ-9): This questionnaire is a multipurpose instrument for screening, diagnosing, monitoring and measuring the severity of depression. It is composed of 9 statements.[34] PHQ-9 had a good internal consistency ($\alpha = 0.80$) and test-retest reliability (0.87). It is significantly correlated with the external validators such as the 17-item of Hamilton Rating Scale ($P < 0.001$).

A PHQ-9 score of 10 or higher had a sensitivity of 0.86 and a specificity of 0.94 for recognizing major depressive disorders.[35]

Fasting blood sugar level (mmol/dL), glycated hemoglobin level (%), cholesterol, triglycerides and creatinine serum levels (mmol/L) were collected. Other two researchers (A Abdullah & M Elsheikh) have searched the electronic files for demographic, clinical, and the most recent lab results. The lab results were used for statistical analyses if it was not older than 3 months.

Administrative and Ethical Considerations

The study complies with the Declaration of Helsinki. Ethical approval was obtained from ethical committee of Armed Forces Hospital Southern Region and Saudi board for family medicine – Asir region before data collection. All potential participants were informed about the study objectives and measures and only subjects who give written consent to participate were involved in the study. All diabetic patients who had been identified as having depression (scores > 10) were referred to a psychiatrist to establish the final diagnosis and to start their management.

Data Management

Computerized data entry and analysis according to Statistical Package for Social Sciences (SPSS) software version 22.0 were used. Descriptive statistics (number, percentage for categorical variables and mean, standard deviation (SD) and range for continuous variables) and analytic statistics using Chi Square tests (χ^2) to test for the association and/or the difference between two categorical variables were applied. P-value < 0.05 was considered statistically significant. Multivariate logistic regression analysis was done to identify factors associated with depression among type 2 diabetic patients. The adjusted measure of association between risk factors and depression was expressed as the odds ratio (OR) with 95% CI . Adjusted or crude ORs with 95% CI that did not include 1.0 were considered significant.

Results

The study included 350 diabetic patients out of 410 with a response rate of 85.4%. Their ages ranged between 28 and 100 years with a mean±SD of 61.4±13 years with 17.7% of them aged over 70 years. In total, 52.6% were female, 55.7% were illiterate and 52.8% were not employed. The majority of the participants (86.6%) were married. The income ranged between 5001 and 10,000 SR/month in 45.1% of them, whereas it exceeded 10,000 SR/month among 11.4%. The prevalence of smoking was 4%.

Prevalence and Severity of Depression

Prevalence of depression among type 2 diabetic patients was 36.6%. It was mild among 20% of patients. Moderate and moderately severe depressions were observed among 10.9% and 4% of patients, respectively whereas severe depression was reported among 1.7% of patients.

Factors Associated with Depression and Its Severity

Socio-Demographic Factors

(Table 1) shows that 64% of younger age patients (30–40 years) compared to 26.6% of those aged between 51 and 60 years were depressed (p = 0.003). Also, 12% of those aged between 30 and 40 years compared to none of those aged over 70 years had severe depression (p < 0.001). In all 64.3% of smokers compared to 35.4% of non-smokers were depressed (p = 0.028). In addition, 14.3% of smokers compared to 1.2% of non-smokers had severe depression (p = 0.003).

Other studied socio-demographic characteristics (gender, educational level, job status, marital status and income) were not significantly associated with depression and its severity.

Diabetes-Related Factors

It is evident from (Table 2) that 47.9% of patients with shorter duration of diabetes (≤ 5 years) compared to 27.1% of those with 6–10 years duration were depressed (p = 0.025); Severity of depression was not significantly associated with duration of diabetes (p > 0.05). Less than half (43.4%) of patients treated with insulin, compared to 28.1% of those treated with oral hypoglycemics, were depressed (p = 0.025); The severity of depression was again not significantly

Table 1 Socio-Demographic Factors Associated with Depression and Its Severity Among Type 2 Diabetic Patients

	Total	Depression				P1	P2
		No	Yes				
			Mild	Moderate	Moderately Severe	Severe		
	n = 350 n (%)	n = 222 n (%)	n = 70 n (%)	n = 38 n (%)	n = 14 n (%)	n = 6 n (%)		
Gender								
Male	166 (47.4)	109 (65.7)	32 (19.3)	15 (9.0)	8 (4.8)	2 (1.2)		
Female	184 (52.6)	113 (61.4)	38 (20.7)	23 (12.5)	6 (3.3)	4 (2.2)	0.410	0.680
Age in years								
30–40	25 (7.1)	6 (36.0)	9 (36.0)	3 (12.0)	1 (4.0)	3 (12.0)		
41–50	58 (16.6)	30 (51.7)	15 (25.9)	7 (12.1)	5 (8.6)	1 (1.7)		
51–60	94 (26.9)	69 (73.4)	16 (17.0)	7 (7.4)	1 (1.1)	1 (1.1)		
61–70	111 (31.7)	74 (66.7)	24 (21.6)	9 (8.1)	3 (2.7)	1 (0.9)		
>70	62 (17.7)	40 (64.5)	6 (9.7)	12 (19.4)	4 (6.5)	0 (0.0)	0.003	< 0.001
Educational level								
Illiterate	195 (55.7)	128 (65.6)	37 (19.0)	22 (11.3)	5 (2.6)	3 (1.5)		
Read and write	19 (5.4)	9 (47.4)	7 (36.8)	2 (10.5)	1 (5.3)	0 (0.0)		
Primary school	43 (12.3)	27 (62.8)	9 (20.9)	4 (9.3)	2 (4.7)	1 (2.3)		
Intermediate school	44 (12.6)	28 (63.6)	9 (20.5)	6 (13.6)	1 (2.3)	0 (0.0)		
Secondary school	28 (8.0)	19 (67.9)	5 (17.9)	0 (0.0)	3 (10.7)	1 (3.6)		
University/above	21 (6.0)	11 (52.4)	3 (14.3)	4 (19.0)	2 (9.5)	1 (4.8)	0.568	0.551
Job status								
Employed	30 (8.6)	16 (53.3)	8 (26.7)	3 (10.0)	1 (3.3)	2 (6.7)		
Not employed	185 (52.8)	112 (60.5)	38 (20.5)	24 (13.0)	7 (3.8)	4 (2.2)		
Retired	135 (38.6)	94 (69.7)	24 (17.8)	11 (8.1)	6 (4.4)	0 (0.0)	0.121	0.190
Marital status								
Single	6 (1.7)	4 (66.7)	1 (16.7)	0 (0.0)	1 (16.7)	0 (0.0)		
Married	303 (86.6)	194 (64.0)	62 (20.5)	31 (10.2)	11 (3.6)	5 (1.7)		
Divorced	8 (2.3)	3 (37.3)	3 (37.3)	1 (12.5)	1 (12.5)	0 (0.0)		
Widowed	33 (9.4)	21 (63.7	4 (12.1)	6 (18.2)	1 (3.0)	1 (3.0)	0.495	0.597
Smoking								
Smoker	14 (4)	5 (35.7)	4 (28.6)	2 (14.3)	1 (7.1)	2 (14.3)		
Non-smoker	336 (96)	217 (64.6)	66 (19.6)	36 (10.7)	13 (3.9)	4 (1.2)	0.028	0.003

Abbreviations: P1, Depression (No versus yes); P2, (Depression with its severity (no, mild, moderate, moderately severe, severe).

associated with type of diabetes treatment ($p > 0.05$). More than half (52.8%) of noncompliant compared to 34.7% of compliant patients were depressed ($p = 0.033$); Severity of depression was also not significantly associated with compliance ($p > 0.05$). Concerning medical comorbidities, patients with thyroid dysfunction ($p = 0.006$), neuropathy ($p = 0.014$), and diabetic foot ($p = 0.015$) were significantly more depressed and severe depression was more significantly reported among them. There was no statistically significant association between physical activity and family history of diabetes and depression ($p > 0.05$).

Laboratory Findings

As demonstrated in (Table 3) there was no statistically significant association between laboratory findings (glycated hemoglobin (%), fasting blood glucose, serum cholesterol, triglycerides, and creatinine (mmol/L)) and depression/its severity ($p > 0.05$).

Table 2 Diabetes-Related Factors Associated with Depression and Its Severity Among Type 2 Diabetic Patients

	Total	Depression				P1	P2
		No	Yes				
			Mild	Moderate	Moderately Severe	Severe		
	n = 350 n (%)	n = 222 n (%)	n = 70 n (%)	n = 38 n (%)	n = 14 n (%)	n = 6 n (%)		
Family history of DM								
Yes	242 (69.1)	160 (66.1)	48 (19.8)	25 (10.3)	7 (2.9)	2 (0.8)		
No	108 (30.9)	62 (57.4)	22 (20.4)	13 (12.0)	7 (6.5)	4 (3.7)	0.118	0.130
Duration of diabetes (years)								
≤5	96 (27.4)	50 (52.1)	25 (26.0)	11 (11.5)	7 (7.3)	3 (3.1)		
6–10	96 (27.4)	70 (72.9)	18 (18.8)	4 (4.2)	2 (2.1)	2 (2.1)		
11–15	46 (13.1)	31 (67.4)	7 (15.2)	8 (17.4)	0 (0.0)	0 (0.0)		
>15	112 (23.0)	71 (63.4)	20 (17.9)	15 (13.4)	5 (4.5)	1 (0.9)	0.025	0.062
Type of treatment								
Oral hypoglycemics	139 (39.7)	100 (71.9)	25 (18.0)	10 (7.2)	3 (2.2)	1 (0.7)		
Insulin	113 (32.3)	64 (56.6)	25 (22.1)	16 (14.2)	5 (4.4)	3 (2.7)		
Both	98 (28.0)	58 (59.2)	20 (20.4)	12 (12.2)	6 (6.1)	2 (2.0)	0.025	0.262
Physical activity								
Never	200 (57.1)	128 (64.0)	43 (21.5)	20 (10.0)	6 (3.0)	3 (1.5)		
1–2 days/week	40 (11.4)	27 (67.5)	8 (20.0)	2 (5.0)	3 (7.5)	0 (0.0)		
3–5 days/week	18 (5.1)	12 (66.7)	0 (0.0)	5 (27.8)	1 (5.6)	0 (0.0)		
6–7 days/week	92 (26.3)	55 (59.8)	19 (20.7)	11 (12.0)	4 (4.3)	3 (3.3)	0.820	0.263
Compliance								
Compliant	314 (89.7)	205 (65.3)	60 (19.1)	33 (10.5)	10 (3.2)	6 (1.9)		
Not compliant	36 (10.3)	17 (47.2)	10 (27.8)	5 (13.9)	4 (11.1)	0 (0.0)	0.033	0.062
Medical history								
Cardiac diseases	77 (22.0)	44 (57.1)	17 (22.1)	10 (13.0)	6 (7.8)	0 (0.0)	0.195	0.166
Renal diseases	40 (11.4)	23 (57.5)	7 (17.5)	5 (12.5)	4 (10.0)	1 (2.5)	0.408	0.316
Hypertension	175 (50.0)	108 (61.7)	32 (18.3)	23 (13.1)	9 (5.1)	3 (1.7)	0.505	0.477
Thyroid dysfunction	50 (14.3)	23 (46.0)	16 (32.0)	7 (14.0)	1 (2.0)	3 (6.0)	0.006	0.006
Retinopathy	133 (38.0)	76 (57.1)	30 (22.6)	19 (14.3)	5 (3.8)	3 (2.3)	0.056	0.313
Neuropathy	50 (14.3)	24 (48.0)	7 (14.0)	13 (26.0)	4 (8.0)	2 (4.0)	0.014	0.001
Diabetic foot	32 (9.1)	14 (43.8)	4 (12.5)	10 (31.3)	3 (9.4)	1 (3.1)	0.015	0.001
Obesity	246 (70.3)	155 (63.0)	54 (22.0)	26 (10.6)	8 (3.3)	3 (1.2)	0.802	0.406
Cerebral stroke	12 (3.4)	6 (50.0)	2 (16.7)	2 (16.7)	2 (16.7)	0 (0.0)	0.326	0.199

Notes: P1: Depression (No versus yes); P2: Depression with its severity (no, mild, moderate, moderately severe, severe).

Predictors for Depression

Multivariate logistic regression model (shown in Table 4) adjusted the results for all significant risk factors that had been reported in primary analyses. It revealed that patients older than 50 years were at lower risk for developing depression as compared to those aged between 30 and 40 years; AORs and (95% CI) of age groups 51–60, 61–70 and > 70 years were 0.21 (0.08–0.57), 0.30 (0.12–0.78) and 0.33 (0.12–0.91) respectively. Patients with thyroid dysfunction had greater than double folds risk for developing depression compared to those without thyroid dysfunction (AOR = 2.26, 95% CI = 1.20–4.27, p = 0.012). Similarly, patients with neuropathy (AOR = 2.35, 95% CI = 1.22–4.53, p = 0.011). Patients treated with insulin only were almost at double risk for developing depression compared to those treated with only oral

Table 3 Association Between Laboratory Findings and Depression and Its Severity Among Type 2 Diabetic Patients

	Total	Depression					P1	P2
		No	Yes					
			Mild	Moderate	Moderately Severe	Severe		
	N Mean±SD	n = 222 Mean±SD	n = 70 Mean±SD	n = 38 Mean±SD	n = 14 Mean±SD	n = 6 Mean±SD		
Glycated haemoglobin (%)	n = 265	n = 158	n = 58	n = 32	n = 12	n = 5	0.225	0.119
	9.4±2.1	9.3±2.0	9.5±2.4	10.1±2.0	9.2±2.6	7.9±1.0		
Fasting blood glucose (mmol/L)	n = 325	n = 202	n = 68	n = 37	n = 13	n = 5	0.078	0.076
	11.09±4.4	10.7±4.1	11.0±4.4	12.3±5.5	13.6±5.8	10.1±4.4		
Triglycerides (mmol/L)	n = 204	n = 121	n = 48	n = 24	n = 8	n = 3	0.911	0.760
	1.6±1.03	1.6±1.1	1.6±0.9	1.6±1.0	2.1±1.6	1.3±0.8		
Cholesterol (mmol/L)	n = 204	n = 121	n = 48	n = 24	n = 8	n = 3	0.300	0.337
	4.2±1.1	4.2±1.1	4.3±0.9	4.3±1.4	4.4±0.8	5.5±0.9		
Creatinine (mmol/L)	n = 208	n = 124	n = 48	n = 24	n = 9	n = 3	0.529	0.913
	89.6±95.2	86.2±61.9	99.8±165.9	86.1±48.5	77.5±25.8	67.7±11.0		

Notes: P1, Depression (No versus yes); P2, (Depression with its severity (no, mild, moderate, moderately severe, severe).

Table 4 Predictors of Depression Among Type 2 Diabetic Patients: Results of a Multivariate Logistic Regression Analysis

	B	SE	AOR	95% CI	p-value
Age in years					
30–40[a]			1.0		
41–50	−0.420	0.519	0.65	0.24–1.82	0.413
51–60	−1.552	0.504	0.21	0.08–0.57	0.002
61–70	−1.198	0.486	0.30	0.12–0.78	0.014
>70	−1.104	0.516	0.33	0.12–0.91	0.032
Thyroid dysfunction					
No[a]			1.0		
Yes	0.816	0.324	2.26	1.20–4.27	0.012
Neuropathy					
No[a]			1.0		
Yes	0.854	0.335	2.35	1.22–4.53	0.011
Type of treatment					
Oral hypoglycemics[a]			1.0		
Insulin	0.650	0.293	1.92	1.08–3.40	0.026
Both	0.499	0.298	1.65	0.92–2.95	0.094
Compliance					
Compliant[a]			1.0		
Not compliant	0.760	0.383	2.14	1.01–4.53	0.047

Notes: [a]Reference category. Variables of smoking, duration of diabetes, diabetic foot were not significant.
Abbreviations: AOR, Adjusted odds ratio; CI, Confidence interval; SE, Standard error.

hypoglycemics (AOR = 1.92, 95% CI = 1.08–3.40, p = 0.026), and noncompliant patients were at double risk to develop depression as compared to compliant patients (AOR = 2.14, 95% CI = 1.01–4.53, p = 0.047). Smoking, duration of diabetes, and diabetic foot were no more significantly associated with depression after controlling for confounders.

Discussion

The current study found that one-third of our type 2 diabetic patients (36.6%) were depressed according to PHQ-9. This prevalence rate falls in the middle of the rates' range that has been reported by previous studies, from 14.5%[36] to 64%.[37] It goes along with our previous studies on Saudi population with diabetes[32,38] and with large meta-analysis in 2001 that found the prevalence of co morbid depression was significantly higher in clinical (32%) than in community (20%) samples, and by using self-report questionnaires (31%) than by standardized diagnostic interviews (11%).[33]

The present study has reported a higher prevalence of depression among younger diabetic patients. This finding is consistent with Gavard et al[39] findings which could be attributed to the fact that younger patients are usually exposed to more stress, conflicts and irritability or fear of the unknown future compared to older patients. Our findings go against other reports[40,41] of higher prevalence of depression among older patients that have been explained by the long duration of the disease and increasing possibility of diabetes complications.[42] This controversy can be understood by noticing that our sampling process has excluded markedly complicated subjects through exclusion of severely disabled persons, and by taking our sample from outpatient clinics which points to a general condition of the patient that is good enough to attend outpatient clinics.

In the current study we have found that self-reported noncompliance with diabetic treatment is significantly associated with higher depression rates. That runs in accordance with other studies.[28,43] Due to the cross-sectional design of the study, we do not not know if depression leads to non-compliance or vice versa.

The significant association of depression with thyroid dysfunction that had observed in the current study agrees with what has been reported by the American Association of Clinical Endocrinologists.[44] The mechanisms underlying the association between thyroid dysfunction and depression were not well defined despite the discovery of a positive role of thyroid autoimmunity in the pathogenesis of depression.[45] Nevertheless, the recent study has reported that pathophysiology of neuropsychiatric manifestations of thyroid disease, includes changes in neurotransmission, alterations in neuronal or glial cell gene expression, blood-brain barrier dysfunction, increased risk of cerebrovascular disease, and occasionally cerebral inflammatory disease in the context of autoimmune thyroid disease.[46]

In the current study, diabetic neuropathy was significantly associated with depression. This finding was confirmed in a meta-analysis[47] which reported a significant association between diabetic complications including neuropathy and depression.

The current work revealed a higher rate of depression among diabetics treated with insulin compared to those treated with oral hypoglycemics. This finding was reported in some previous studies[38,48] which observed 40% increase in the risk of depression among diabetics type 2 who were using insulin. This can be explained by the fact that insulin is used for uncontrolled and/or complicated type 2 patients.

We did not observe that smoking, diabetic foot and uncontrolled diabetes – evidenced by levels of glycated hemoglobin and fasting blood glucose – are associated with higher risk of having depression. However other studies reported a link between levels of glycated hemoglobin and fasting blood glucose from one side and depression from the other side.[23,25,27,28,32,38] Systematic review as well had found a significant small to medium sized correlation between depression and A1c,[33] nevertheless some studies failed to detect such like relation. Furthermore, we can notice that our sample of uncomplicated patients may have a role in missing this association.

Discrete identification of the mechanisms that stand behind the correlation of different risk factors and depression is beyond the scope of our study; it needs to be addressed through properly designed studies. The impacts of treating depression in diabetic patients on the outcome of both disorders needs specially designed studies as well. However, The current study sheds the light on the importance of screening of diabetic patients for depression, taking in consideration the people at higher risk for depression, and proper management of depression among diabetic populations.

Some recent studies have reported that Identification and management of psychological and psychiatric aspects in subjects with diabetes is an integral and critical component in treating subjects with diabetes.[49] An international study,

carried out in four independent centers in India assessed the impact of a trained but not qualified non-psychiatrist in coordinating and forming a fulcrum between the patient, the family and the consultant endocrinologist/diabetologist. It was shown that the outcomes of both depression and diabetes could be improved by the employment of a clinical care coordinator.[50]

Limitations

Among possible limitations of the present study, the cross-sectional nature which proves only association but not causality. Clinical-based sample usually does not represent the full realm of diabetic population in the community. The use of self-administered questionnaire is proved to be associated with high rates of depression.[33] Finally, the study was carried out in one health facility that makes it difficult to generalize the findings to other populations.

Conclusion

Almost one third of type 2 diabetic patients at Diabetes Center, AFHSR were depressed, mostly of mild and moderate severity. Younger age patients, patients treated with insulin, having comorbid thyroid disorders or neuropathy and noncompliant patients were at greater risk for developing depression compared to their counterparts. Proper screening and treatment of depression is crucial part he of health care management of diabetic people.

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Author Contributions

All authors made a significant contribution to the work reported, whether that is in the conception, study design, execution, acquisition of data, analysis and interpretation, or in all these areas; took part in drafting, revising or critically reviewing the article; gave final approval of the version to be published; have agreed on the journal to which the article has been submitted; and agree to be accountable for all aspects of the work.

Disclosure

The authors report no conflicts of interest in this work.

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