A high prevalence of depression among diabetic patients at a teaching hospital in Western Saudi Arabia

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ABSTRACT

Objective: To determine the prevalence of depression among diabetic patients followed at the outpatient department of King Abdul-Aziz University Hospital, Jeddah, Kingdom of Saudi Arabia (KSA).

Methods. A cross-sectional study was conducted at King Abdul-Aziz University Hospital, Jeddah, KSA, between September 2002 and June 2003. Demographic features, marital status, smoking, presence of hypertension, hyperlipidemia, and other chronic illnesses were registered for both diabetic and non-diabetic groups. For diabetic patients, detailed information (duration of diabetes mellitus (DM), its type and treatment, glycemic control, presence of microvascular and macrovascular complications) were recorded. Depression was assessed by interviewing patients using the Beck depression inventory scale. Relation between depression and different variables was studied, analyzed and compared statistically in both groups.

Results. A total of 400 patients were studied (200 diabetic, 200 non-diabetic patients). Depression prevalence among diabetic patients was 34% in comparison with 13% among non-diabetic patients ($p<0.001$). Statistically significant relation was found between depression and duration of DM (11 versus 9 years), poor glycemic control; glycosylated hemoglobin (10% versus 9%) with p values of 0.03 and 0.04. Macrovascular complications and retinopathy were higher among depressed diabetics (64% and 54%) compared to non-depressed diabetics (43%, and 34%) ($p=0.004$, $p=0.007$). Hyperlipidemia and hypertension were found to be higher among depressed diabetics (69% and 63%) compared to non-depressed diabetics (50% and 42%), ($p=0.01$, $p=0.006$).

Conclusion. Depression is more common among diabetics than non-diabetics in this population. It was higher among diabetics with long duration of DM, poor glycemic control, macrovascular complications, retinopathy, hyperlipidemia and hypertension.

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Diabetes mellitus (DM) is one of the most common medical illnesses. Unfortunately, its prevalence is increasing among the Saudi population. A prevalence of 4.95% was reported in 1987,[1] which has recently increased to 11.8%.[2] It is expected to be higher according to new unpublished data. One of the major issues in DM is its multi-system involvement. With adequate mental health and compliance to treatment plan, diabetic outcome and rate of complications could be significantly lowered.[3] Depressive disorder is a well-known mental illness with a prevalence rate in adult general population of 2.3-3.2% in males, and 4.5-9.3% in females.[4] Depression does not only

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present with mental symptoms, but also it has a significant physical effects. It does commonly present as a co-morbidity that would impair the illness outcome.[3,5] It is well known that DM is associated with psychological changes.[5] The improvement of a psychological factor is associated with a better outcome.[3] Prevalence of depression among diabetics is 2-3 times higher than the general population.[6] Since the outcome of DM is strictly related to compliance and mental well being, detecting and treating depression are major parts of the management of DM. The aim of this study is to determine the prevalence of depression among diabetic patients as compared to non-diabetic patients.

Methods. A cross-sectional study was conducted at King Abdul-Aziz University Hospital (KAUH), a 500-bed teaching hospital in Jeddah, Western Saudi Arabia, between September 2002 and June 2003. Two groups were selected to compare the prevalence of depression in diabetic and non-diabetic patients. The first group comprising of 200 adult diabetics, who were regularly followed up at the outpatient department and were selected using systematic random technique. The second group comprising of 200 adult non-diabetic patients were also randomly selected. Diabetes mellitus was diagnosed according to American Diabetic Association criteria.[7]

Patients in both groups were interviewed after their acceptance (informed consent form) to participate in the study. The following data were collected as follows: age, gender, marital status, presence of hypertension (patient is known hypertensive if the blood pressure is >140/90 mm Hg on more than one occasion), presence of hyperlipidemia (known to have hyperlipidemia or total cholesterol >5.2mmol/L, triglycerides >2.3 mmol/L, or both), smoking history (active or passive) and presence of other chronic illnesses (for example malignancy, hypothyroidism, chronic obstructive airway disease, and peptic ulcer disease). For diabetic patients, duration of DM, its type (type 1 or type 2), type of treatment, diet, oral hypoglycemic agents (OHG), insulin, combined insulin and OHG, degree of glycemic control; poor control if fasting blood sugar (FBS) >8mmol/l, post prandial blood sugar (PPS) >11mmol/l and glycosylated hemoglobin (HbA1c) >8%, presence of microvascular complications (retinopathy; was assessed by history of visual disturbance, history of cataract and fundus examination by an ophthalmologists, nephropathy, was assessed by proteinuria or raised serum urea and creatinine after exclusion of other causes, neuropathy; was assessed by a history of numbness or decreased sensation and evidence of decreased sensation or reflexes on neurological examination or evidence of electrophysiological testing), and presence of macrovascular complications, stroke, diabetic foot, ischemic heart disease (IHD): defined as angina or myocardial infarction by self report or by analysis of 12 leads electrocardiography was studied. Depression was assessed in both groups using self-report instruments that measure the severity of recent depression symptoms. In this study, Beck depression inventory scale was used.[8] It consists of 21 items and each item has 4 answer choices; the highest score on each of the 21 questions is 3, highest possible total for the whole test is 63 and the lowest possible score is zero. The total score levels of depression were graded as follows; normal 0-10, mild mood disturbance 11-16, borderline clinical depression 17-20, moderate depression 21-30, severe depression 31-40 and extreme depression >40. The Arabic version of Beck depression inventory scale was tested and validated on Arabic patients.[9,10] Moderate, severe and extreme depression categories of the scale are the ones considered with clinically significant depression. Other categories (normal, mild mood disturbance and borderline clinical depression) were excluded.

Data analysis were carried out using statistical package for social sciences.[11] Mean ± SD was calculated for quantitative data, and frequency for categorical variables. Students' t-test was used for comparing means of continuous variables. Proportions were compared by Chi-square test and Fisher's exact test if needed. Multiple logistic regression analysis was performed to identify the risk factors and to test for the independent effect of different variables. The odds ratio was the antilogarithm of the regression co-efficient of an indicator term that corresponded to a certain level of the independent variable. The 95% confidence interval was calculated using the standard error of the regression co-efficient. Significance level was set at <0.05 throughout the analysis.

Results. Four hundred patients were studied (200 diabetics and 200 non-diabetics). The mean age for all patients was 44.1±15.4 years with a range of 15-90 years and male to female ratio of 1:1.6. The majority of the patients was married (72%). Hyperlipidemia and hypertension were significantly higher in diabetics while the presence of chronic disease was higher among the non-diabetic group. (**Table 1**). Depression was significantly higher in diabetic patients, 67 (34%) versus 26 (13%) in non-diabetic (p<0.001). Statistically significant relation was found between age and depression with older patients being more likely to be depressed than young. Mean age of depressed patients was 48.6±13.7 years versus 42.7±15.6 years in non-depressed (p<0.001). Depression was more common in females in both diabetics and

non-diabetics with a male to female ratio of 1:1.7 in depressed patient and 1:1.6 in non-depressed (p=0.7). As shown in **Table 2**, most of diabetics are type 2 (90%) and have poor glycemic control (78%). The mean duration of DM was 9.3±7.2 years, HbA1C mean was 9.7±2.2%. Microvascular complications were found in 62% of diabetics, while macrovascular complications were found in 50% of them. Depressed diabetics were found to have poor glycemic control and longer duration of diabetes, compared to non-depressed diabetics. Glycosylated hemoglobin was 10.4±2.1% in depressed diabetics versus 9.2±2.1% in non-depressed (p=0.04). The mean duration of DM was 10.8±7.9 years in depressed patients compared to 8.6±6.7 years in non-depressed diabetics (p=0.03). **Table 3** shows that there is a significant relation between depression and hyperlipidemia, hypertension, retinopathy and macrovascular complications among diabetics. In contrast, non-diabetic patients showed no significant relation between depression and hyperlipidemia, hypertension, smoking and chronic diseases (**Table 4**). Logistic regression analysis was performed to test the independent effect of age, DM, marital status, hyperlipidemia, hypertension, smoking and chronic disease on the depression, after the adjustment for the effect of the variables included in the regression model on each other. The association between depression and DM was statistically significant with no significant relation to hyperlipidemia, hypertension, smoking and chronic diseases. The likelihood of developing depression was doubled among diabetics as compared to non-diabetics. In addition, the likelihood of developing depression was 10 times higher among married compared to single patients (**Table 5**).

Discussion. Depression is a commonly occurring medical problem, which frequently coexists with DM.[12] Reports indicate that >25% of patients with DM reached clinical criteria for depression,[13] a number of potential explanations to account for this finding have been offered[14-16] and integrated into 3 hypothesis: Firstly, the intensity of the disease and different treatment regimens burden patients and affect their everyday lives. Secondly, duration of the disease and its complications provide a chronic on-going stress, which affects the quality of life. Thirdly, DM and depression are parts of a linked set of metabolic disorder. Depressed people have low self-care, which may negatively affect their compliance with diet and medications. Diabetes mellitus is by definition, an illness that needs significant compliance to diet, medications and exercise, and an issue that is usually deficient in depressed patients.

This study supports the high prevalence of depression among diabetics: 34% versus 13% among non-diabetics. The presence of diabetes doubles the odds of co-morbid depression, which is similar to the findings of other researchers.[6] In this study, depression is common among middle age patients and females, which are consistent with previous results.[15,17-24] Previous studies[15,25] documented a higher rate of depression in single patients compared to married. However, this study showed a higher depression rate among married people, which could be explained by their higher percentage in the study group (72%). In this study, depression was higher among diabetic patients with longer duration of DM 10.8 ± 7.9 years compared to 8.6 ± 6.7 years among non-depressed. Many studies evaluated the mean duration of diabetes, but none of them studied the role it plays in the development of

Table 1 - General characteristics of the study groups.

Variable	Diabetic group (N=200) n (%)	Non-diabetic group (N=200) n (%)	p value
Age (Mean ± SD)	52 ± 13.6	36 ± 12.6	<0.001
Gender			0.5
Male	77 (38.5)	76 (38)	
Female	123 (61.5)	24 (62)	
Marital status			<0.001
Single	9 (4.5)	75 (37.5)	
Married	169 (84.5)	120 (60)	
Widow or divorced	22 (11)	5 (2.5)	
Hyperlipidemia	113 (56.5)	18 (9)	<0.001
Hypertension	98 (49)	22 (11)	<0.001
Smoking	34 (17)	25 (12.5)	0.2
Chronic diseases	25 (12.5)	46 (23)	0.006
Depression	67 (33.5)	26 (13)	<0.001

p value of <0.05 is significant

Table 2 - General characteristics of diabetic patients (N=200).

Variable	n (%)
Type of diabetes mellitus	
Type 1	20 (10)
Type 2	180 (90)
Treatment	
Diet alone	17 (8.5)
OHG	125 (62.5)
Insulin	43 (21.5)
Combined OHG + Insulin	15 (7.5)
Poor glycemic control	155 (77.5)
Microvascular complications	123 (61.5)
Retinopathy	81 (40.5)
Nephropathy	47 (23.5)
Neuropathy	102 (51)
Macrovascular complications	100 (50)

OHG - oral hypoglycemic drugs

Table 3 - Relation between depression and different variables in diabetics.

Variable	Depressed (N=67) n (%)	Non-depressed (N=133) n (%)	*p* value
Marital status			0.001
Single	2 (3)	7 (5.3)	
Married	50 (74.6)	119 (89.5)	
Widow or divorced	15 (22.4)	7 (5.3)	
Hyperlipidemia	46 (68.7)	67 (50.4)	0.014
Hypertension	42 (62.7)	56 (42.1)	0.006
Smoking	15 (22.4)	19 (14.3)	0.15
Chronic diseases	9 (13.4)	16 (12)	0.7
Type of diabetes mellitus			0.7
Type 1	6 (9)	14 (10.5)	
Type 2	61 (91)	119 (89.5)	
Type of treatment			0.7
Diet	4 (6)	13 (9.8)	
OHG	42 (62.7)	83 (62.4)	
Insulin	15 (22.4)	28 (21)	
Combined OHG + insulin	6 (9)	9 (6.8)	
Macrovascular complications	43 (64.2)	57 (42.9)	0.004
Microvascular complications	45 (67.2)	78 (58.6)	0.2
Complications			
Retinopathy	36 (53.7)	45 (33.8)	0.007
Nephropathy	16 (23.9)	31 (23.3)	0.9
Neuropathy	36 (53.7)	66 (50)	0.5

p value of <0.05 is significant, OHG - oral hypoglycemic drugs

Table 4 - Relation between depression and different variables in non-diabetics.

Variable	Depressed (N=26) n (%)	Non-depressed (N=174) n (%)	*p* value
Marital status			0.7
Single	6 (23.1)	69 (39.7)	
Married	18 (69.2)	102 (58.6)	
Widow or divorced	2 (7.7)	3 (1.7)	
Hyperlipidemia	3 (11.5)	15 (8.6)	0.6
Hypertension	1 (3.8)	21 (12.1)	0.2
Smoking	3 (11.5)	22 (12.6)	0.8
Chronic diseases	5 (19.2)	41 (23.6)	0.6

p value of <0.05 is significant

depression.[26] In contrast to duration of diabetes, relation of depression to glycemic control was the main concern of most of the reviewers' studies. Depression was significantly higher in diabetics with poor glycemic control, which is consistent with our results.[27] Another interesting finding is the association between diabetic complications and depression. Macrovascular complications and retinopathy were the main associated complications with depression in my study. This was already observed by de Groot et al[26] in their meta-analysis study which showed that depression was significantly associated with a variety of diabetic complications (retinopathy, nephropathy, neuropathy, macrovascular complications and sexual dysfunction). In contrast, other studies did not find association between depression and diabetic retinopathy,[28] or nephropathy.[29] This study showed that hyperlipidemia and hypertension increased the risk of depression in diabetics. Whether there is a role of insulin resistance in the development of depression, further studies are needed on this issue. Early diagnosis of depression among diabetics is strongly recommended. Successful treatment of depression has been documented to improve compliance, glycemic control and decrease the risk of diabetic complications.[30-32] Teamwork between

Table 5 - Adjusted odds ratio of risk factor of depression among the study groups.

Variables	Odd's ratio	95 % CI	*p* value
Age	0.98	0.96 –1.00	0.09
Diabetes mellitus			0.04
Present	1		
Absent	0.50	0.26 – 0.97	
Marital status			
Single	1.0		
Married	10.13	2.79 – 36.72	0.0004
Widow or divorced	2.15	0.84 – 5.48	0.1
Hyperlipidemia			0.09
Present	1.0		
Absent	0.60	0.33 –1.09	
Hypertension			0.18
Present	1.0		
Absent	0.66	0.36 –1.21	
Smoking			0.35
Yes	1.0		
No	0.72	0.37 –1.42	
Chronic disease			0.58
Present	1.0		
Absent	1.21	0.60 –2.45	

p value of <0.05 is significant, CI - confidence interval

internist and psychiatrist will improve DM outcome. Further research should focus on the role of depression that impairs functioning and quality of life in the development and exacerbation of diabetic complications.

In conclusion, depression is higher among diabetics compared to non-diabetics in this setting. Longer duration of DM with poor glycemic control, presence of macrovascular complications, diabetic retinopathy, hyperlipidemia and hypertension increase the likelihood of depression among diabetics.

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