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Undiagnosed Depression in Patients with Type 2 Diabetes and Its Associated Factors

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Article info

Abstract

Objective: To estimate the prevalence of undiagnosed depression in the diabetic clinic and factors that may indicate the presence of depression.
Materials and Methods: The Chinese version of the Beck Depression Inventory II (BDI-2) was used to assess the depressive symptoms of subjects who attended the diabetes education program of a regional teaching hospital in Chiayi County, Taiwan. Correlation with patient characteristics, symptoms and laboratory data were compared.
Results: A total of 167 cases were analyzed. Twenty-two cases (13.17%) scored above or equal to 17, indicating at least mild depression. Multivariate logistic regression analysis showed that using injection to control blood glucose and total cholesterol levels were associated with higher BDI scores. Those who were told that they had heart disease and those who worked as manual laborers had less association with depression.
Conclusion: The prevalence of undetected depression is high among type 2 diabetics. Routine screening for depression during outpatient visits is recommended. (*Tzu Chi Med J* 2008;20(1):44–48)

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1.   Introduction

Diabetes mellitus is one of the chronic disorders that cause many symptoms and requires constant careful management by the patients themselves. It is generally agreed that people with diabetes have more depressive symptoms [1]. A recent meta-analysis reported a twofold higher odds of depression in individuals with diabetes compared to those without

diabetes [2]. There are two hypotheses about this association. One is that diabetes mellitus and depression are linked biologically, that is, patients with depression are more prone to become diabetic, or vice versa. The other is that the association could be the result of the complexity of the disease itself and the associated comorbidity [3,4]. Depressive symptoms are more common in the medically ill than it is in the general population [5]. Patients' subjective

symptom perception of diabetes is more related to depressed mood than to objective measures of blood glucose control (6). Ludman et al showed that the total symptom burden of diabetes was correlated with the number of depressive symptoms (7). Several factors such as gender, being unmarried, low levels of education, higher number of comorbidities and complications, and the necessity of insulin treatment have been associated with higher incidence of depression (8–11). Treatment of depression with antidepressants was shown to improve glycemic control in some studies but the effects of cognitive behavior therapy appeared to have no such benefit (12–14). Nonetheless, depressive symptoms are still not assessed routinely during the treatment course of our diabetic patients. The goal of this study was to examine the prevalence of undetected depressive symptoms in Taiwanese type 2 diabetes patients and the factors that may be associated with such symptoms.

2.   Materials and methods

The subjects consisted of 187 patients with diabetes who attended the diabetes education program at Dalin Tzu Chi Hospital in 2006. Those who were less than 25 years of age, had experienced diabetic ketoacidosis in the past, had severe comorbidities of liver cirrhosis, end-stage kidney disease, ongoing cancer treatment, amputation or stroke were excluded. Those who were receiving treatment for depression were also intentionally left out. Appropriate consent forms were obtained from the participants.

The following information were obtained: age, sex, body mass index, marital status, educational status, occupation, living condition, duration of diabetes, type of oral agents used, type of insulin injection, number of injections per day, presence of retinopathy, neuropathy, proteinuria and number of comorbid chronic illnesses. The most recent laboratory data collected included: fasting blood glucose, total and low-density cholesterol, hemoglobin A_1C, and systolic and diastolic blood pressures.

Questionnaires of the Chinese version of the Beck Depression Inventory II (BDI-2) were either completed by the patients themselves or, in the cases of illiterate patients and those with impaired vision, by our specially trained nurse assistant during interview. This study was approved by the institutional review board of Dalin Tzu Chi General Hospital.

2.1.   Statistical analysis

Data were analyzed using SAS version 9.1.3 (SAS Institute Inc., Cary, NC, USA). The odds ratios (ORs)

Table 1 — Demographic data*

Male	69 (41.3%)
Female	98 (58.7%)
Age (yr)	60.2±11.0
Years of having DM	5.0 (2.0, 11.0)
Unemployed, retired or homemaker	112 (67.07%)
Blue collar worker	46 (27.54%)
White collar worker	9 (5.39%)
Methods of treatment	
Oral medications	130 (72.8%)
Injection	12 (7.2%)
Both	25 (15.0%)
BMI	25.6 (23.5, 27.9)
BDI	6.0 (3.0, 11.0)
AC sugar	140.5 (118.0, 177.0)
HbA_1C	7.5 (6.8, 8.7)
TC	175.5 (154.0, 203.0)
TG	150.5 (103.0, 224.0)
HDL-C	50.0 (42.0, 59.0)
LDL-C	118.1±34.4

*Data are presented as n (%), or mean±standard deviation, or median (first quartile, third quartile). DM=diabetes mellitus; BMI = body mass index; BDI = Beck Depression Inventory; HbA_1C = glycosylated hemoglobin; TC = total cholesterol; TG = triglycerides; HDL-C = high-density lipoprotein cholesterol; LDL-C = low-density lipoprotein cholesterol.

of factors associated with depression as indicated by BDI-2 scores were estimated. In descriptive analysis, mean±standard deviation (SD) was chosen for those data fitting the normal distribution, and median (first quartile, third quartile) for those not fitting the normal distribution (Table 1). Multiple logistic regression models were fitted to the collected data. In selecting the variables, the stepwise procedure was applied to logistic regression analysis. The percentage of concordant pairs was 80.1. The p value of the Hosmer-Lemeshow goodness-of-fit test was 0.255. In all statistical testing, a type 1 error of $\alpha=0.05$ was taken, thus $p<0.05$ indicated a statistically significant result.

3.   Results

Of the 187 patients interviewed, 167 (89.3%) cases were included in the study. The demographic and clinical characteristics of the patients are listed in Table 1. The median BDI score was 6.0. There were 35 (21.6%) cases with BDI score ≥14. A total of 22 (13.17%) cases had BDI score ≥17, which was considered to be an indication of depression in the present study. This was chosen based on the study of Lu et al who suggested that BDI scores in the range of 0–16

Table 2 — Significant factors*

Variable	BDI ≥ 17 ($n = 22$)	BDI < 17 ($n = 145$)	p
Age	59.5 ± 13.9	60.3 ± 10.6	0.725
Years of having DM	7.5 (3, 16)	5 (2,10)	0.196
AC sugar	154 (115, 173)	137 (118, 177)	0.298
HbA$_1$C	7.4 (6.4, 9.1)	7.5 (6.8, 8.6)	0.802
TC	203 (156, 239)	174 (154, 197)	0.051
TG	172 (118, 249)	145.5 (101.5, 222.0)	0.348
HDL-C	51 (40, 63)	49 (42, 58)	0.440
LDL-C	114.2 ± 35.4	118.6 ± 34.4	0.601
Heart disease	2 (9.1%)	40 (27.6%)	0.047[†]
Blue collar	1 (4.5%)	45 (31.0%)	0.005[†]
Oral medications	11 (50.0%)	118 (81.4%)	0.002[†]

*Data of normal distribution are expressed as mean ± standard deviation and t test was used, data of not normal distribution are expressed as median (first quartile, third quartile) and Mann-Whitney U test was used, and χ^2 or Fisher's exact test was used for categorical data; [†]$p < 0.05$. BDI = Beck Depression Inventory; DM = diabetes mellitus; HbA$_1$C = glycosylated hemoglobin; TC = total cholesterol; TG = triglycerides; HDL-C = high-density lipoprotein cholesterol; LDL-C = low-density lipoprotein cholesterol.

Table 3 — Factors associated with depression in the logistic model

	β	OR	95% CI	p
Intercept	–2.555			0.022
Heart disease				
Yes	–1.758	0.172	0.036–0.832	0.029
No		Reference		
Blue collar				
Yes	–2.373	0.093	0.012–0.746	0.025
No		Reference		
Injections				
Yes	0.709	4.126	1.471–11.570	0.007
No		Reference		
TC*	0.012	1.012	1.002–1.023	0.0245

*This item was computed as a continuous variable. OR = odds ratio; CI = confidence interval; TC = total cholesterol.

were considered to be not depressed in a sample of Taiwan's psychiatric outpatient visitors [15].

Adjusted for the 2006 age distribution of the population of Taiwan, the prevalence rate of depression in the elderly (age≥65) in our study population was 16.6%.

Factors such as sex, age, hypertension, weight, marital status, occupation, number of years of having diabetes, A$_1$C level, triglyceride, and body mass index appeared not to have any correlation with BDI scores. The significant factors are listed in Table 2. On multivariate logistic regression, we extracted four factors that were associated with depression, namely total cholesterol levels, use of any form of injection to control diabetes, absence of heart disease, and not being a blue collar worker (Table 3). The OR for total cholesterol was 1.012 (95% confidence interval (CI), 1.002–1.023; $p=0.0245$). The risk of depression rose as the level of total cholesterol increased.

The odds for having depression appeared to favor those who used insulin injection to control diabetes (OR, 4.126; 95% CI, 1.471–11.570; $p=0.007$). Two factors were found to have a negative correlation with depressive symptoms: those who were told that they had heart diseases (OR, 0.172; 95% CI, 0.036–0.832; $p=0.029$) and those who were blue collar workers (OR, 0.093; 95% CI, 0.012–0.746; $p=0.025$).

4. Discussion

The prevalence of undiagnosed depression in our sample population was 13.17%. The actual prevalence ought to be higher because of the following. First, in order to minimize the effect of psychosocial stress caused by having diabetes, we limited our enrolment to those patients without complex comorbidities and complications. Second, we excluded patients with an established diagnosis of depression (ICD-9: 311). Third, a large proportion of the patients were illiterate and required interview by our nurse assistant. The scores obtained this way tend to be lower than that obtained when patients answer the questionnaires privately [16].

We also excluded patients who were less than 25 years of age as they were more likely to have type 1 diabetes, and those who were incapacitated due to diabetic complications as they were more likely to be depressed due to the severe comorbidities rather than to the diabetes *per se*. Those who had already been diagnosed with depression were also not included since they might already be under treatment and their BDI scores might not be accurate in representing their underlying depression.

Our results showed that higher levels of total cholesterol appeared to be related to the presence of

depression. Whether or not this is due to the fact that depressed patients are less vigorous in controlling their diabetes, we are not sure. On the other hand, some patients may find that controlling diabetes requires a major change in their lifestyle, and those with difficulty in doing so might get depressed. However, we could not find a significant association between depressive symptoms and glycohemoglobin levels in our study.

A study from Korea (10) found that patients who required insulin injection had a higher risk of being depressed. We found this to be the case in our study population as well. Daily injection may be perceived to be a chore and therefore causes more stress.

Diabetic patients who were told that they had heart disease appeared to have less tendency to have depressive symptoms. This is in contradiction to the belief that comorbidity tends to increase the odds of having depression. In the interview, the nature of the heart disease was not specified, although our intention was to pick up those diabetic patients who were also diagnosed with coronary artery disease. Further study may be necessary to confirm or refute this negative association.

Diabetic patients who worked as manual laborers appeared to have less association with depression. Since the majority of the non-blue-collar workers were actually unemployed or retired, being actively working may be the factor that had a negative correlation with depression.

As far as common diabetic symptoms are concerned, none of the symptoms appeared to have significant correlation with depression. Those somatic symptoms that are common in people with either diabetes or depression (BDI items 15, 16, 18, 20 and 21) would have a tendency to raise the BDI score in our population. However, due to the fact that we had chosen the higher BDI score of 17 as our cut-off for depression, this tendency might have been offset.

In conclusion, depression symptoms are fairly common in type 2 diabetics. Patients who have more diabetes-related symptoms may actually be depressed. We cannot state the causal direction of such an association. The combination of diabetes with depression causes poorer glycemic control (17,18), poorer quality of life (19), higher cost of care (20,21), worse complications (22), more work loss and disability bed days (22), and even higher mortality (23). Therefore, we recommend routine screening for depression in people with diabetes, especially during diabetic education classes when they can spend more time with the diabetes educators. We ought to pay more attention to those with higher total cholesterol levels, those who are not working or retired, and those who use injections to control their blood sugar.

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