

# Association between depression and higher glucose levels in middle-aged Mexican patients with diabetes

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## ABSTRACT

**Objective.** We report an association between depression and glycemic control in patients with type 2 diabetes mellitus (DM-2). **Material and methods.** Sixty-five diabetic patients (26 men and 39 women) aged 40-60 years were studied within 5 years of the diagnosis. The patients were assessed using the depression scale validated in Spanish, and serum glucose and glycated hemoglobin (HbA1c) levels were measured. Pearson's correlation was used to identify associations between depression and DM-2 and glycemic control;  $p < 0.05$  was accepted as significant. **Results.** Sex, age, anthropometric measures, and time since the diagnosis of DM-2 did not differ between patients with and without depression. **Conclusion.** Patients with depression had higher fasting glucose and HbA1c levels, and these levels correlated significantly with the depression score.

**Key words.** Depression. Diabetes mellitus. Serum glucose. Glycated hemoglobin.

## INTRODUCTION

Type 2 diabetes mellitus (DM-2) is a chronic disease that affects more than 25% of the population in some countries and consumes up to 10% of health resources. The increase in prevalence makes DM-2 one of the ma-

## Asociación entre depresión y niveles altos de glucosa en pacientes mexicanos de edad media con diabetes

### RESUMEN

**Introducción.** La asociación de la depresión con el control glucémico en pacientes con diabetes mellitus tipo 2 (DM-2) es conocida en varios reportes científicos. **Material y métodos.** Se estudiaron 65 pacientes diabéticos (26 hombres y 39 mujeres) entre 40 y 60 años de edad con menos de cinco años de diagnóstico de la enfermedad. Se les aplicó la escala de depresión validada en español, se les midió glucosa sérica y hemoglobina glucosilada (HbA1c). Se utilizó el coeficiente de correlación de Pearson para encontrar la asociación considerando una  $p < 0.05$ . **Resultados.** Un análisis entre los participantes con depresión y sin depresión no mostró diferencias en género, edad, medidas antropométricas y el tiempo de diagnóstico de la DM-2. Se observó que los pacientes con depresión tuvieron valores más altos de glucosa en ayunas y de HbA1c. **Conclusión.** El presente estudio muestra la correlación estadísticamente significativa entre los niveles de glucosa sérica, la hemoglobina glucosilada y las puntuaciones de depresión en pacientes diabéticos de la mediana edad.

**Palabras clave.** Depresión. Diabetes mellitus. Glucosa sérica. Hemoglobina glucosilada. Mediana edad.

jor health challenges for the 21st Century. Globally, the number of people with diabetes is expected to grow from the current 150 million to 300 million in 2025, and the largest increases will occur in China, India, and in Latino populations, the latter of which is expected to have the most important growth.<sup>1</sup>

In Mexico, the number of DM-2 cases is increasing, and about 10 million people are now affected. Of these, 50% are unaware of their condition and the other 50% do not comply with their medical care; among the latter group, only 10–15% have adequate control of their condition. This disease represents a public health problem because of the associated complications, which often include cognitive decline in older adults, and it affects up to 20% of people older than 80 years. Currently, DM-2 is the most frequent reason for health consultation in adulthood. The diagnosis of DM-2 is based on serum levels of glucose and glycosylated hemoglobin A1 (HbA1c).<sup>2</sup>

Overweight and obesity are associated with DM-2. The prevalence of overweight and obesity has increased significantly, and correspondingly the proportional frequency of DM-2. Lifestyle interventions at the population level, such as encouraging people to attain a healthy weight and increase the level of physical activity, are effective in preventing DM-2.

Despite the extensive knowledge about the factors associated with the control of DM-2, little has been reported on the psychological aspects. DM-2 is associated with anxiety and depression.<sup>3–6</sup> Depression is a mood disorder that causes the affected person to lose interest and the ability to enjoy things, and to experience a decrease in vitality accompanied by feelings of sadness, insecurity, and excessive fatigue; depressed people often have feelings of guilt and a bleak vision of the future. Depression is accompanied by changes in sleep, appetite, and sexual desire. In the past decade, interest in the psychological and psychosocial aspects of DM-2 has increased. It is estimated that diabetic patients are at increased risk of developing depression and that the incidence of depression is up to three times higher in people with DM-2 than in the general population.<sup>7,8</sup> However, these studies did not randomize subjects with DM-2 or include control groups, which might have generated bias in the comparisons.

The purpose of this study was to identify possible associations between inadequate control of DM-2 with symptoms of depression in male and female patients with DM-2 but without pathology who attended a hospital within 5 years of the diagnosis of DM-2.

## MATERIAL AND METHODS

For this study, we selected 65 patients with DM-2 (39 men and 26 women) older than 40 years within 5 years of the diagnosis of the disease and with no evidence of associated diseases such as infection,

gastrointestinal disease, or cardiovascular, liver, kidney, or clinical complications of DM-2.

Patients were contacted within the outpatient specialist endocrinology and internal medicine clinics of UMAE Núm. 1 Bajío, a tertiary hospital within the health sector in Mexico. The patients completed a survey to obtain general identification data and the duration of DM-2. We measured the serum levels of glucose and HbA1c between 8 and 9 am after 10–12 h of fasting.

To identify symptoms of depression, the patients completed the General or Geriatric Depression Scale (GDS) version in Spanish for Latino populations, which has been validated previously.<sup>9,10</sup> The questionnaire comprises 30 items and provides a single score obtained by adding the scores for each of the items. Each item was scored 1 or 0, giving a GDS total score of 0–30. The recommended cutoff ranges are as follows:

- Normal: 0–10 points.
- Mild depression: 11–20 points.
- Suggestive of major depression: > 20 points.

The protocol was registered with the research committee of the host institution, Instituto Mexicano del Seguro Social, and all participants in the study provided written consent.<sup>9,10</sup>

Spearman's correlation was used to identify associations between metabolic control of DM-2 (glucose and HbA1c levels) and depression score. We also analyzed possible differences in age, sex, anthropometric variables, and metabolic control between patients without depression and those with depression (group B). The means were compared between groups using the Mann-Whitney test. The level of significance was set at  $p < 0.05$ .

## RESULTS

### General characteristics of the sample

The mean age was  $55.9 \pm 9.8$  years; 44.6% had some degree of depression (Table 1). Table 2 presents the clinical characteristics of the patients grouped according to the presence or absence of depression.

### Correlation between levels of depression, glucose, and other factors

Spearman correlation was used to analyze the relationships between the depression score and serum

Table 1. Clinical characteristics of participants.

Variable	Frequency (%) or Mean $\pm$ SD
• Sex	
Male, n (%)	26 (40%)
Female, n (%)	39 (60%)
• Age (years)	55.8 $\pm$ 9.8
• Weight (kg)	75.8 $\pm$ 13.6
• Anthropometric measures	
Height (m)	1.60 $\pm$ 0.09
Waist circumference (cm)	96.03 $\pm$ 11.03
Body mass index (kg/m <sup>2</sup> )	29.5 $\pm$ 4.5
• Factors related to DM-2	
Diagnosis time (years)	3.0 $\pm$ 1.7
Glucose (mg/dL)	175.0 $\pm$ 63.5
HbA1c (mg/dL)	8.12 $\pm$ 2.29
• Depression	
Without depression	36 (55.4%)
Mild	23 (35.4%)
Severe	6 (9.2%)

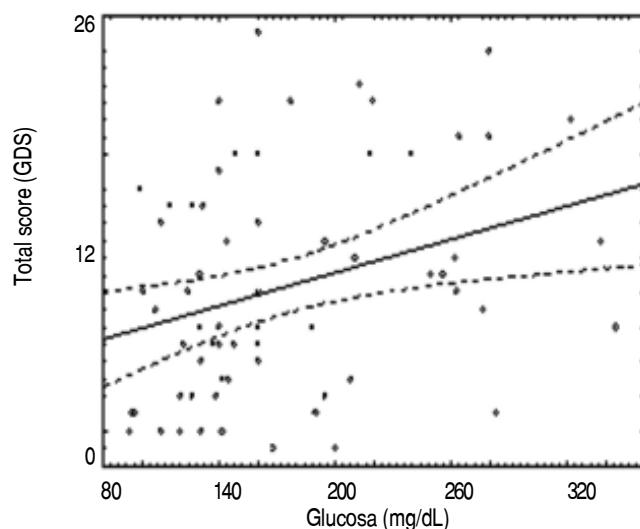


Figure 1. Correlation between glucose concentration and depression level.

glucose and HbA1c levels, body mass index, and age. Glucose level and depression score correlated significantly ( $r = 0.33$ ,  $p = 0.007$ ) (Figure 1). HbA1c level and depression score also correlated significantly ( $r = 0.39$ ,  $p < 0.004$ ).

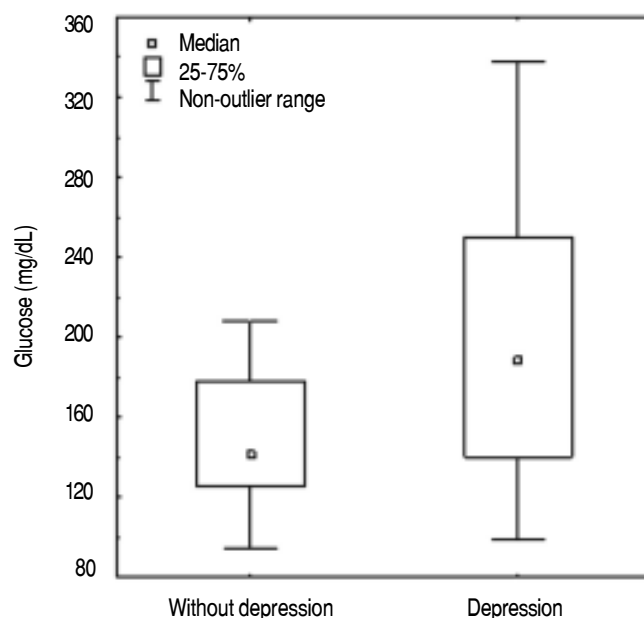


Figure 2. Comparison of glucose levels between the groups with and without depression.

### Comparison between groups with and without depression

Patients with and without depression did not differ on any variable except for blood glucose level, which was higher in patients with depression ( $p < 0.05$ ) (Figure 2).

### DISCUSSION AND CONCLUSIONS

In these patients, the depression score correlated significantly with serum levels of glucose and HbA1c, indicators of metabolic control 4-5 years after the diagnosis of DM-2. These data are consistent with other reports showing that depression in patients with DM-2 is not related to age.<sup>11,12</sup> By contrast, another study found no significant increase in the incidence of depression among patients with DM-2: 27.3% of patients with DM-2 had depression compared with 20.3% of patients with other chronic diseases who had depression.<sup>13</sup>

In conclusion, the incidence of depression was not influenced by sex or the anthropometric characteristics of the patients; these results are consistent with other reports<sup>14,15</sup> of no higher prevalence of depression in obese patients, regardless of sex. However, other studies in patients showed that disease progression was associated with an increased frequency of depression in middle-aged women with a 10-year

Table 2. Clinical characteristics of patients according to the absence or presence of depression.

Variable	Without depression Frequency (%) or Mean $\pm$ SD	With depression Frequency (%) or Mean $\pm$ SD
• Sex		
Male, n (%)	10 (34.5%)	16 (44.4%)
Female, n (%)	19 (65.4%)	20 (55.5%)
• Age (years)	55.17 $\pm$ 9.9	56.7 $\pm$ 9.8
• Anthropometric measures		
Weight (kg)	75.8 $\pm$ 13.6	75.83 $\pm$ 13.9
Height (m)	1.61 $\pm$ 0.09	1.59 $\pm$ 0.09
Waist circumference (cm)	95.19 $\pm$ 11.3	96.72 $\pm$ 10.8
Body mass index (kg/m <sup>2</sup> )	29.2 $\pm$ 4.26	29.95 $\pm$ 4.98
• Factors related to DM-2		
Diagnosis time (years)	36.26 $\pm$ 23.1	33.36 $\pm$ 19.45
Glucose (mg/dL)	159.0 $\pm$ 56.6	195.8 $\pm$ 65.83
HbA1c (mg/dL)	7.52 $\pm$ 2.37	8.74 $\pm$ 2.08

history of the disease.<sup>16</sup> The presence of complications of DM-2 also contributes to the onset of depression.<sup>17</sup> Our data and those of others suggest that control of DM-2 and depression are interrelated.<sup>18</sup>

The data from this study suggest that there is a need for strategies for early detection of signs of depression because about 40% of patients with DM-2 show symptoms of depression within 5 years of their diagnosis. If left untreated, depression may worsen and influence the long-term control of the disease, possibly leading to an early onset of complications and preventing successful treatment.

In conclusion, depression is associated with hyperglycemia and poor metabolic control, which may increase the risk of complications from DM-2. There is an urgent need to identify patients with DM-2 showing signs of depression soon after their diagnosis; this may achieve greater efficiency and success in the treatment of DM-2.

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