

## **Sleep Quality and Dynmptoms of Depression in Patients With Type 2 Diabetes Mellitus**

**León Vázquez María de la Luz<sup>1</sup>, Domínguez San Martín Emilio<sup>2</sup>, Mejía Hernández Oliver Akin<sup>3</sup>, Galicia Flores María del Carmen<sup>4</sup>, Zamora Lira María Monserrat<sup>5</sup>**

<sup>1,2,3,4,5</sup>Instituto Mexicano del Seguro Social, Tlaxcala, México

### **ABSTRACT**

Diabetes mellitus and depression are common comorbidities, a relationship that may indicate a shared autonomic and neurohormonal etiology, which affects the quality of life, including sleep quality.

**Objective:** To determine the relationship between sleep quality and symptoms of depression in patients with type 2 diabetes mellitus in a family medicine unit.

**Material and method.** Observational, analytical, cross-sectional study; patients diagnosed with diabetes mellitus, older than 18 years, indistinct sex were included, the clinimetric scale was applied to assess depressive symptoms and the Pittsburgh Sleep Quality Index, previously validated, descriptive statistics were used, chi-square (X<sup>2</sup>), Mann Whitney U and Kruskal-Wallis H. **Results:** 308 patients were included, 64% women, between 31 and 87 years, median 64 years, diabetes diagnosis time between 1 and 35 years, 41.9% (129) uncontrolled. According to the clinimetric scale for the diagnosis of depression, 26.3% have mild depression, 6.5% moderate depression, and 12.7% severe depression. 56.8% have poor sleep quality and 43.2% have good sleep quality according to the Pittsburgh Sleep Quality Index. Depression was not associated with age (p 3.26), occupation (p .677), education (p= .083), marital status (p = .475), body mass index (p= .083) or job quality. sleep (p= 0.065). **Conclusions:** Sleep quality is poor in more than half of the population, it is not associated with depression or glyceemic control.

**KEYWORDS:** diabetes mellitus, sleep, depression

### **ARTICLE DETAILS**

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### **INTRODUCTION**

Diabetes mellitus type 2 (DM2) is currently considered an epidemic, affecting more than 400 million people in the world, with an increase projection in the coming years, its etiology is multifactorial, deterioration in insulin sensitivity, pancreatic failure, genetic predisposition, and environmental triggers [1].

The patient with DM2 is twice more likely to suffer from depressive symptoms and, in turn, depression increases the probability of developing DM2; a relationship that may suggest a shared autonomic and neurohormonal etiology, with inflammation and structural changes of the hippocampus [2], although recent studies have shown that they are independent events. This comorbidity leads to a deterioration in the quality of life, deterioration in personal care, weight gain, non-compliance with dietary and pharmacological management, an increase in complications, and, as a consequence, an increase in the cost of medical treatment.

In addition to mood disorders, patients with DM2 suffer from changes in the sleep cycle that alter carbohydrate metabolism and induce an increase in appetite, weight gain, and glyceemic control [9], nocturnal insomnia is one of the most frequent symptoms, some antidepressants can worsen or induce primary sleep disorders [3].

Poor sleep quality has negative effects such as increased adiposity, obesity, and a pro-inflammatory state that favors insulin resistance, progression of chronic kidney disease (CKD), and increased mortality [4].

Sleep quality includes both quantitative aspects (duration, sleep latency, number of awakenings) and subjective aspects such as depth or rest.

Despite being independent pathologies, the comorbidity DM2-sleep disorder-depression is frequent, which makes it difficult to control the patient's metabolism, having family repercussions and high costs for the health sector. Therefore, the objective of this study was to identify the association between sleep quality and symptoms of depression in

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patients with type 2 diabetes mellitus in a family medicine unit in Tlaxcala, Mexico

**Material and Method:** Observational, analytical, cross-sectional study. It included patients over 18 years of age, indistinct sex, diagnosed with DM2 for at least one year of diagnosis, in regular control in the family medicine unit, patients with chronic kidney disease in substitution therapy, diabetic foot, history of cancer, were excluded. rheumatic diseases, pregnancy, depression, bereavement period, or COVID-19 in the previous three months. The sample size was calculated using the finite population formula considering a total of 2,634 patients under control for diabetes in the unit, considering a prevalence of 30 to 80%, a shortage of 0.5 was found, with a confidence interval of 95% ( 1.64); error or precision of 0.05, resulting in 335 patients to include. The survey was random. After signing the informed consent, general data (age, sex, schooling, occupation, marital status), information related to DM2 (time of diagnosis, treatment, and last blood glucose) were interrogated, and weight and height were measured to calculate body mass index ( BMI). Subsequently, the clinimetric scale was applied for the diagnosis of depression in patients with diabetes, previously validated [5], considering: mild depression: The presence of two or more positive responses of the three symptoms of criterion B (questions 1-3) of annex A, plus the presence of at least four positive responses to the symptoms of criterion C (questions 4 to 13), considering questions 5, 6 or 6b as a single positive response, as well as question 13 or 13a and the quality index of Self -applied Pittsburgh Sleep (ICSP) validated in Spanish and in the Mexican population with a reliability coefficient of 0.78 that assesses the quality of sleep and disturbances in one month [6]. The project was authorized by the local research committee with registration number R-2021-2902-025. A descriptive analysis was performed with frequencies and percentages, mean and standard deviation or median and interquartile range (IQR), and 95% confidence interval (CI95%) according to the distribution of the data, in addition to Pearson's chi-square test. Fisher exact test, Mann Whitney U test, and Kruskal-Wallis H test to compare groups, considering a p-value  $\leq 0.05$  as significant.

**Results.** 308 patients are included, 64% (199) women, 42.9% (132) under 60 years, the general data without significant difference between men and women (Table 1).

The time of diagnosis of DM2 was between 1 and 35 years, median 10 IQR 12 95% CI 10,746 - 12,579, current treatment in 63.3% (192) is with oral hypoglycemic agents, 8.4% (26) with insulin, 23.4% ( 72) mixed and 4.9% (15) discontinued treatment.

Reported serum glucose levels were between 81 and 36mg/dl, median 150 IQR 80 95% CI 158.18 – 176.28, glycated hemoglobin (HbA1c) between 5.6 and 16%, median 7.9 IQR 1.95 95% CI 7.94 – 8.57, in Based on these levels, 41.9% (129) were classified as uncontrolled and 58.1% (179) controlled.

According to the clinimetric scale for the diagnosis of depression, 54.4% (168) do not have criteria for depression, 26.3% (81) have mild depression, 6.5% (20) have moderate depression, and 12.7% (39) have severe depression. The overall score of the ICSP was between 1 and 15, considering 56.8% (175) poor sleep quality, and 43.2% (133) good sleep quality, with no difference between those under and over 60 years of age (Table 2).

The time it takes to fall asleep is less than 15 minutes in 53.9% (166) of the cases, between 16 and 30 minutes in 26% (80), and between 31 and 60 minutes in 12.3% (38), and 7.8% more of 60 minutes. The most frequently reported sleep disturbances were waking up during the night, having to get up to go to the toilet, coughing or snoring, feeling cold, hot, and having nightmares or pain, other reasons mentioned were fear and family problems.

The results of the clinimetric scale for depression were associated with sex (.005) but not with age (Kruskal-Wallis H 3.26), occupation (p .677), education (p .083), marital status (p .475), body mass index (p .083) or sleep quality (p 0.062).

The presence of depression was not related to glycemic control (figure 1).

When separated into two groups (without criteria or mild and moderate to severe), depression is associated with gender, latency, and sleep quality (p 0.000 and 0.009).

Statistical difference between the presence of depression and quality of sleep was reduced (chi-square .013), when dividing into groups ( $\geq 60$  and  $\leq 59$  years) in the group of 59 years and less there was no difference (figure 2).

**Discussion:** DM2, depression, and sleep disorders are frequent and independent comorbidities. In this study, the presence of depressive symptoms was associated with poor sleep quality, especially in older adults.

Among the main sleep disorders is the difficulty starting sleeping, the duration, bad dreams or nightmares, and coughing or snoring loudly, for which a quarter of the included population uses medication to sleep at least once a week.

Sleep quality was perceived as poor in more than half of the patients, being worse in older adults, lower than that reported by Solange Campos et al (52.5 vs 75.2), coinciding with no association among the variables studied, except for depressive symptoms [7].

Sleep efficiency (percentage difference between what is referred to as the number of hours of sleep and number of hours spent in bed) was highly variable, reporting between 0 and 11 hours of sleep, and between 3.5 and 13 hours in bed, being in some cases little. congruent. According to this, Alshehri et al. point out that there is a discrepancy in the measurement of sleep duration, which in addition to subjective measurement, objective methods must be used due to the complexity of its measurement [8].

Almost 60% of the patients had poor glycemic control, of which just over half were classified as having poor sleep

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quality, unlike what was reported in previous studies that mention that both HbA1C and glucose levels are associated with symptoms of insomnia, even in patients without diabetes, suggesting a causal relationship [09], a difference that may be due to the measurement instrument since in this case not only insomnia was evaluated but also sleep disorders in general.

Most of the patients did not have criteria for depression or were mild, the percentage of moderate and severe depression was 7 and 16%, higher than that reported in previous studies in which the frequency of depression reported is 5.8%, probably due to the scale used [10].

The main limitation is that there was no control group to be able to establish a relationship between sleep disorders and the presence of diabetes, another limitation was the subjective form of measurement that, although it was with a validated instrument, was not enough to make the comprehensive evaluation, in addition to the sample size due to the current sanitary conditions due to the coronavirus disease, since due to the increased risk the patients did not attend the control consultation or it was carried out by telephone.

It is important to intentionally evaluate sleep disorders, mainly insomnia, to initiate management as early as possible and contribute to the control of patients with diabetes, or, where appropriate, reduce one of the risk factors in the development of DM2.

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TABLES

Table 1 General data.

		Mens 109 (35.4)	Women 199 (64.6)	p
	Age	63 RIQ 15 IC95% 60.3-64.3	60 RIQ 14 IC 95% 57.9-61.1	.037**
Age group	Under 60 years 60 to 75 years old 76 to 90years old	40 (13) 58 (18.8) 11 (3.6)	92 (29.9) 94 (30.5) 13 (4.2)	.207*
Level of stady	None Primary Secondary Preparatory Bachelor´s degree	5 (1.3) 49 (15.9) 30 (9.7) 18 (5.8) 7 (2.3)	13 (4.2) 97 (31.5) 56 (18.2) 21 (6.8) 12 (3.9)	.614*
Marital status	Single Married Widower Divorced Free Union	4 (1.3) 80 (26) 12 (3.9) 5 (1.6) 8 (2.6)	22 (7.1) 130 (42.2) 30 (9.7) 4 (1.3) 13 (4.2)	.101*
Occupation	Employee Unemployed Home Farmer Pensioner/retired	45 (14.6) 43 (14) 5 (1.6) 2 (.6) 14 (4.5)	33 (10.7) 95 (30.8) 68 (22.1) 0 3 (1)	.000*
Pathological history	Smoking	9 (2.9)	7 (2.3)	.066
	Alcoholism	14 (4.5)	17 (5.5)	.158
	Dyslipidemia	22 (7.1)	38 (12.3)	.465 <sup>0</sup>
	Arterial hipertensión	43 (14)	87 (28.2)	.273
	Heart disease	5 (1.6)	12 (3.9)	.403
Medium RIQ: interquartile range. Frecuency (percentage) Chi squared * U Mann Whitney** Fisher´s exact test <sup>0</sup>				

Table 2. Pittsburgh Sleep Quality Index

Component		59 years of younger 132 (43)	60 years or more 176 (57)	p*
Subjective sleep quality	Really good	8 (6.1)	7 (4)	.765
	Good	92 (69.7)	122 (69.3)	
	Bad	28 (21.2)	39 (22.2)	
	Pretty bad	4 (3)	8 (4.5)	
Sleep latency	0	39 (29.5)	59 (33.5)	.543
	1 to 2	53 (40.2)	74 (42)	
	3 to 4	35 (26.5)	40 (22.7)	
	5 to 6	5 (3.8)	3 (1.7)	
Sleep duration	More tan 7 hours	54 (40.9)	62(35.2)	

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	6 to 7 hours	20(15.2)	47 (26.7)	.095
	5 to 6 hours	43 (32.6)	46 (26.1)	
	Less than 5 hours	15 (11.4)	21 (11.9)	
Usual sleep efficiency	More than 85%	120 (90.9)	163 (92.6)	.051
	Between 75 and 84%	8 (6.1)	5 (2.8)	
	Between 65 and 75%	4 (3)	2 (1.1)	
	Less than 65%	0	6 (3.4)	
Sleep disturbances	None in the last month	10 (7.6)	14 (8)	.993
	Less than once a week	102 (77.3)	137 (77.8)	
	Once or twice a week	19 (14.4)	24 (13.6)	
	Three or more times a week	1 (.8)	1 (.6)	
Use of sleep medication	None in the last month	96 (72.7)	136 (77.3)	.653
	Less than once a week	18 (13.6)	16 (9.1)	
	Once or twice a week	7 (5.3)	9 (5.1)	
	Three or more times a week	11 (8.3)	15 (8.5)	
Daytime dysfunction	No problem	55 (41.7)	74 (42)	.438
	Just a minor problem	56 ( 42.4)	24 (66)	
	A problem	19 (14.4)	28 (15.9)	
	A serious problem	2 (1.5)	8 (4.5)	
Frequency (percentage) pearson chi square *				

**FIGURE**

