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The Relationship between Depression and Sleep Duration with Components of Metabolic Syndrome in Patients with Type 2 Diabetes

Rozita Naseri[1], Maryam Babakhani[1], Mansour Rezaei[2], Mazaher Ramezani[3], Masoud Sadeghi[4*]
[1]Endocrinology and Metabolism Department, Kermanshah University of Medical Sciences, Kermanshah, Iran
[2]Biostatistics & Epidemiology Department, Kermanshah University of Medical Sciences, Kermanshah, Iran
[3]Molecular Pathology Research Center, Emam Reza Hospital, Kermanshah University of Medical Sciences, Kermanshah, Iran
[4]Medical Biology Research Center, Kermanshah University of Medical Sciences, Kermanshah, Iran

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***Corresponding author**
Masoud Sadeghi

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Abstract: The studies suggested that sleep duration and depression can associate with the metabolic syndrome (MS). The aim of this study is to investigate the relationship between sleep duration and depression with incidence of MS and its components in Iranian patients. Between Apr 2014 and Oct 2014 and in a cross-sectional study, out of all patients referred to the Clinic, 290 patients were entered into our study. Patients with neuropathy, nephropathy, retinopathy and history of mental illness and also taking psychiatric medication and sleeping pills and the patients that could not read were censored from study. MS was diagnosed based on American Heart Association (AHA), except for waist based on an Iranian study, more than 95 cm in both sexes was considered as more than normal. For status of depression and sleep duration, were used the Beck Depression Inventory (BDI) and self-reported sleep duration with 6 status. The mean age at diagnosis was 52.4 years, 74 patients (25.5%) were male and 81 patients (28%) had MS. There was a significant inverse correlation between HDL level and a significant direct correlation between HbA1c levels with sleep duration. Also, there were significant direct correlations between waist circumference and diastolic blood pressure with depression status. In conclusion, there was no significant correlation between sleep duration and depression with incidence of MS, but they were predictive factors for a number of components of MS.
Keywords: Diabetes, Metabolic syndrome, Sleep duration, Depression.

INTRODUCTION

Sleep duration is suggested to be associated with adverse health outcomes. However, few studies are available on the impact of sleep duration on metabolic syndrome (MS) in patients with diabetes, who were at high risk for cardiovascular diseases (CVD) [1]. Evidence from laboratory and epidemiologic studies suggests that decreased sleep duration or quality may increase diabetes risk [2]. MS is a common syndrome that results from obesity. The risk of CVD and type 2 diabetes (T2D) increases in people with MS [3, 4]. The reports have suggested that depression may lead to the development of CVD through its association with MS [5, 6]; however, little is known about the relationship between depression and MS [6]. Sleep disturbances may be associated with impaired glucose metabolism [7]. Sleep-disordered breathing (SDB) is associated with hypertension in the middle-aged the association is less clear in older persons. Most middle-aged hypertensives have systolic/diastolic hypertension, whereas isolated systolic hypertension (ISH) is common among persons over 60 years [8].

The aim of this study is to investigate the relationship between sleep duration and depreesion with incidence of MS and its components in Iranian patients.

MATERIALS AND METHODS

Patients

In this cross-sectional study, out of all patients with T2D referred to Taleghani Hospital, Kermanshah, Iran, between Apr 2014 and Oct 2014, 290 patients were entered into our study. The study was approved by the *Ethics Committee* of *Kermanshah University* of Medical Sciences, Kermanshah, Iran (Code: 94097). We checked the correlation between sleep duration and depression with components of MS in the patients.

Inclusion criteria

Diabetic patients with 18-65 years and almost a history of one-year diabetes.

Exclusion criteria

Patients with neuropathy, nephropathy, retinopathy and history of mental illness. Patients taking psychiatric medication and sleeping pills. The patients that could not read (Depend on someone else for reading). MS was diagnosed based on American Heart Association (AHA) [9], except for waist based on an Iranian study, more than 95 cm in both sexes was considered as more than normal [10]. To check the status of depression, was used the Beck Depression Inventory (BDI) [11], self-reported multiple-choice inventory in 21 questions for measuring the severity of depression. Scores of 0–9 indicate minimal depression, 10–18 mild depression, 19–29 moderate depression, 30–63 severe depression. To check the status of sleep duration, was used self-reported sleep duration: less than 4.5 hours, 4.5-5.4 hours, 5.5-6.4 hours, 6.5-7.4 hours, 7.5-8.4 hours and more than 8.5 hours [1].

Statistical Analysis

Analysis data were done by SPSS version 20 software and Chi-square test was used for the comparison of sex and t-test for the comparison the means in two groups.

RESULTS

The mean age at diagnosis was 52.4 years (±7.3) that 74 patients (25.5%) were male. Other variables have been shown in Table 1.

Table-1: The baseline characteristics of the patients (n=290)

Variables	n (%)	Mean±SD	Range
Age, year		52.4±7.3	18-65
Sex			
Male	74(25.5)		
Female	216(74.5)		
Weight, kg		76.9±11.3	
Height, cm		161±8.3	
Waist circumference, cm		102.5±9.9	
Walking for thirty minutes, daily	186(64.1)		
Alcohol consumption	0		
Smoking	2(0.7)		

Abbreviation: SD, Standard Deviation.

Out of 290 patients with diabetes, 81 patients (28%) had MS. The correlation between a numbers of variables with MS status has been shown in Table 2. There was no significant difference between them (P>0.05).

Table-2: The prevalence of a number of variables in metabolic syndrome versus non- metabolic syndrome patients

Variables*	Metabolic syndrome N=81	Non-metabolic syndrome N=209
Sex, n(%)		
Male	19(23.5)	55(26.3)
Female	62(76.5)	154(73.7)
Weight, kg	78.8±8.8	76.1±12.1
Height, cm	161.1±8.9	161±8.1
Waist circumference, cm	105.5±7.3	101.2±10.5
HDL, mg/dl	45.5±9.8	47.1±12
Triglycerides, mg/dl	212.5±61.1	118±46.3
FBS, mg/dl	184.4±70	171.3±63.1
HbA1c, g/dl	7.9±1.7	8±1.9
Systolic blood pressure	132.8±21.8	130.2±20.9
Diastolic blood pressure	77.7±11.9	77.5±12.6
Depression	12.8±8.7	13.5±8.4
Sleep duration, hour	5.9±1.5	6±1.6

*There was no significant correlation between every variable with metabolic syndrome status (P>0.05); **Abbreviations**: HDL, *high-density lipoproteins; FBS*, fast blood sugar; HbA1c, hemoglobin A1c

Table 3 shows the correlation between components of MS with sleep duration in diabetic patients with MS. There was a significant inverse correlation between HDL level with sleep duration

(P=0.001) and a significant direct correlation between HbA1c level with sleep duration (P=0.049).

Table-3: The correlation between components of metabolic syndrome with sleep duration (Unit: hour) (n=81)

Variables (mean)	<4.5	4.5-5.4	5.5-6.4	6.5-7.4	7.5-8.4	>8.5
Waist circumference, cm	100.5	103.8	102.5	103.5	100.3	101.1
HDL*, mg/dl	49.5	48.1	47.3	44.8	46.6	40
Triglycerides, mg/dl	138.6	148	141.9	135.2	163.7	145.2
FBS, mg/dl	174.1	171	168.8	173.8	172.2	218.9
HbA1c*, g/dl	7.7	7.7	8	7.9	7.9	9
Systolic blood pressure, mmHg	131	128	127	137	128	136
Diastolic blood pressure, mmHg	78.5	77.5	78	79.5	73.6	77.4

*P<0.05, between the variable with sleep duration; Abbreviations: HDL, *high-density lipoproteins; FBS*, fast blood sugar; HbA1c, hemoglobin A1c.

Table 4 shows the correlation between components of MS with depression in diabetic patients with MS. There was a significant direct correlation between waist circumference with depression status (P<0.001) and also a significant direct correlation between diastolic blood pressure with depression status (P=0.030).

Table-4: The correlation between components of metabolic syndrome with depression status (n=81)

Variables (mean)	0-9	18-10	19-29	30-63
Waist circumference*, cm	99	102.3	106.4	107.6
HDL, mg/dl	46.8	45.8	47.1	49.8
Triglycerides, mg/dl	141	152	142.5	136
FBS, mg/dl	171.5	176	179	163.5
HbA1c, g/dl	7.9	7.8	8.1	6.8
Systolic blood pressure, mmHg	127	135	131.3	133.2
Diastolic blood pressure*, mmHg	76	78	78.9	80

*P<0.05, between the variable with depression; Abbreviations: HDL, *high-density lipoproteins; FBS*, fast blood sugar; HbA1c, hemoglobin A1c.

DISCUSSION

Two study in Iran [12, 13], showed that the female gender, cholesterol, and triglyceride in their studies were predicting factors for MS in T2D patients. Also, another study, reported that among the females, low HDL, high BMI, weight, blood pressure, LDL, total cholesterol, and triglyceride were associated with increased MS prevalence and the prevalence of MS according to ATPIII in 950 patients with T2D was 73.4% [14]. In this study, the prevalence of MS was 28% and there were no associations between HDL, obesity, triglyceride, sex, weight, and blood pressure with incidence of MS.

One study on 45325 Australian adults (range,55 to 95 years) [15], suggested that the relationships between sleep duration and obesity previously reported in young and middle-aged adults are not evident in older adults. The absence of these relationships could reflect a combination of age-related factors that impact on sleep and body composition. Another study [16] showed that short sleep (≤5 h) is significantly associated with weight gain and obesity in both male and female adults, but Watanabe *et al*.[17] reported short sleep duration was associated with weight gain and the development of obesity over 1 year in men, but not in women. Williams *et al*.[18] studied the correlation between sleep duration with HDL in 935 women (range, 43 to 69 years) with T2D and concluded that HDL was decreased with short and long sleep duration among normotensive (P=0.02), but not hypertensive women. Knutson *et al*.[19] showed that there was the association between poor sleep quality and higher glucose, insulin, and estimated insulin resistance among subjects with diabetes warrants further examination of the effect of sleep disturbances on glucose control in T2D. In Ohkuma's study [1], was shown that sleep duration had a U-shaped relationship with MS and insulin resistance, independent of potential confounders, and therefore may be an important modifiable risk factor for CVD prevention in patients with T2D. Knutson *et al*.[2] reported that sleep duration and quality were significant predictors of HbA1c, a key marker of glycemic control that another study [7] showed that HbA1c correlated nversely with sleep efficiency (0.047). Result of one study on 4810 persons, showed that short sleep duration was a significant risk factor for hypertension [21]. Also, in a cross-sectionalanalyses of 6120 participants, sleep-disordered breathing (SDB) is associated ith systolic/diastolic hypertension in those aged <60 years [8]. In this study, there was a significant inverse correlation between HDL level with sleep duration and a significant direct correlation between HbA1c level with sleep duration.

Although, the studies had different results, but a lot of them such as our study, showed that there was the correlation between HDL and HBA1c with sleep duration (inverse or direct). Therefore, sleep duration is a significant predictor for HDL and HbA1c.

One study [5] reported that there was no association between MS and psychological distress, but Kinder *et al*.[6] explained that the prevalence of the MS is elevated among women with a history of depression. It is important to better understand the role depression may play in the effort to reduce the prevalence of MS and its health consequences. Calamaro's study on 13568 persons (range, 12-18 years) [21] showed that depression were significantly associated with obesity. Analyses included 5232 participants (41-61 years of age) [22] suggested that MS, in particular the obesity and dyslipidemia components, is predictive of depressive symptoms. In this study, there was no association between incidence of MS and depression status, but there were significant direct correlations between waist circumference and diastolic blood pressure with depression status. Therefore, depression can be a predictive factor for waist circumference and diastolic blood pressure and incidence of MS.

CONCLUSION

There was no significant correlation between sleep duration and depression with incidence of MS, but they were predictive factors for a number of components of MS. Therefore, sleep duration and depression can be risk factors for MS in T2D patients.

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