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Relationship between sleepiness, physical activity, and functional outcomes in Iranian patients with type II diabetes

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Abstract

Introduction: Sleepiness refers to drowsiness, feelings or strong will to sleep, and decreased functional outcomes. This study was conducted to determine the relationship between sleepiness, physical activity, and functional outcomes of sleep in Iranian patients with type II diabetes.

Materials & Methods: In this cross-sectional study 220 outpatients with type II diabetes were selected through a simple sampling method in 2010. Data collection measures included a demographic questionnaire, the Epworth Sleepiness Scale, and the Functional Outcomes of Sleep Questionnaire. Physical activity was based on mean self-reported minutes walked per week; the American Diabetes Association's recommendation of 150 minutes activity per week was used to dichotomize participants as sedentary or active.

Results : A total of 33.6 % of participants were sleepy. For physical activity, 72.6 % had a sedentary lifestyle. There was no significant relationship between physical activity and sleepiness. 57.7 % of subjects had functional outcomes of sleepiness scores greater or equal to 67. There was seen significant difference ($p < 0.001$) between functional outcomes and sleepiness.

conclusion: Although the majority of subjects were not sleepy. The mean score of functional outcomes in the non-sleepy group were higher than the sleepy group. It can be concluded that sleepiness is effective in decreasing functional outcomes. Although there is no significant correlation between sleepiness and physical activity; physical activity and exercise share an important part of peoples' lives that can be affected by sleepiness. Sleepiness is considered as a major barrier in executing daily activities in patients with diabetes type II.

Keywords: sleepiness; functional outcomes of sleepiness; physical activity; diabetes type II.

Introduction

Diabetes is one of the most prevalent chronic illnesses in the world. It is considered as a disease leading to the high morbidity and mortality (1). Globally, 4,000,000 people die annually due to diabetes. Diabetes is a chronic illness and needs patient's precise self-control. Diabetic patients are at risks for cardiovascular and neurological diseases (2) and suffer many complications. One of complications in these patients is sleep disorders. Sleep disorders also has direct relationship with developing diabetes. However it has been rarely discussed as a basic precipitating factor of the diabetes (3). Sleep disorders can decrease the quality of life and influence on social and psychological aspects of patients' life (4). Fatigue and anxiety are among the symptoms of sleep disorder which can lead to disability in diabetic patients. Sleep disorders can influence a patient's family life, job, and social activities (4). In addition; it needs to be considered that sleep disorders have a significant impact on the

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functions and activities of patients which are important factors for developing and worsening of their diabetes.

Sleepiness is one of the significant sleep disorders which refer to a feeling of drowsiness or a strong will to sleep, and a manifestation of poor sleep quality or disrupted sleep. Indeed, sleepiness is a disability in maintaining consciousness that could be a sign of hypersomnia. It can decrease the functional outcomes (5).

Sleepiness endangers people's health through disturbing physical, cognitive, and mental functions and is identified as a potential risk source for vehicle and other serious accidents in workplaces (6). Also, napping and drowsiness is related to physical dysfunction. It decreases functional outcomes, impairs mood, causes overweight, and increases risk of cardiovascular diseases, stroke, congestive heart failure, and mortality (7).

There is a moderate to strong correlation between increased sleepiness and decreased functional outcomes. Sleepy individuals report lower functional outcomes than non-sleepy individuals (5). Sleep functional outcomes has effects on functional status of diabetes patients in five aspects including activity level, general productivity, social outcome, vigilance, and intimacy/sexual relationship (5). Consequently sleepiness involves nearly all aspects of patients' life.

Sleepy individuals have a higher stress score and a physical-mental fatigue score than that of non-sleepy individuals (5). These factors have also negative effects on the control and treatment of diabetes. Sleepy people have undesirable effects on healthy lifestyle behaviors such as exercise and physical activity, while these behaviors are crucial in controlling and treating diabetes.

Therefore physical activity has a positive effect in controlling the blood sugar level. Exercise enhances insulin sensitivity and glucose tolerance in diabetic patients (8). There is an inverse relationship between energy spent during physical activity and the progress of diabetes type II. Patients who do moderate level of exercise have shown favorable effects in control of blood sugar in short period. Exercise decreases insulin resistance in patients with diabetes type II and reduces risk of cardiovascular diseases in them (9). Furthermore, patients can benefit from mental advantages of exercise such as decrease level of anxiety and depression and improve the quality of sleep (7).

It seems that physical activity and functional status are affected by sleepiness. However there is limited knowledge to show the relationship between physical activity, functional status and sleepiness in patients with diabetes type II. It needs to have further studies to confirm the relationship between those factors. The main objective of this research is to study sleepiness in patients with diabetes type II in order to determine its relationship with physical activity and functional outcomes.

Methods and materials

This is a cross-sectional study investigating 220 type II outpatients with diabetes who referred to the Iranian Diabetic Association from June to November 2010. Subjected selected through a convenient sampling method. Inclusion criteria were known case of diabetes type II, healthy physical condition, lack of mental and psychological disorders such as Delirium, Dementia, Parkinson's,

Alzheimer's, lack of taking psychiatric medications, having no addiction, and ability to walk.

A researcher developed questionnaire was used to collect demographic data of subjects. The assessment of physical activity was performed through three main questions which had been used in the Chasen's study. These questions are: 1) in the last week, did you walk for at least 10 minutes for any reason? (Yes/No); 2) How many days per week do you walk for at least 10 minutes at a time? (0–7); 3) on the days when you walk at least 10 minutes at a time, how many minutes do you actually walk? The physical activity level score of each subject was calculated based on the total number of minutes walked per week. According to the total score of physical activity level, the subjects were categorized into two sedentary (the score of less than 150) and active (the score of greater than 150) groups: The categorization of physical activity level of subjects was based on the recommendation of the American Diabetes Association (ADA) (5).

Sleep level of subjects was assessed by using the Epworth Sleepiness Scale Questionnaire (ESS) which assesses sleepiness or sleep in eight soporific situations and is categorized into two groups according to Likert scale from 0 (never dozing) to 3 (high chance of dozing). The scoring scale in the ESS questionnaire varies from 0 to 24 where the scores higher than 11 indicated sleepiness. Epworth Sleep Scale is a standard tool where its reliability in Chasen's study (2009, in: Jones) through a test-retest method and α-Cronbach's is mentioned as 0.82 and 0.88, respectively (5).

The Functional Outcomes Sleep Questionnaire (FOSQ) also used to determine functional outcomes in subjects. FOSQ is a self-reported questionnaire, which has 30 items based on likert scale. FOSQ measures five aspects of functional outcomes including activity level, general productivity, social outcomes, vigilance, and intimacy/sexual activity. In order to adapt the questionnaire with Iranian culture, three sexual items of FOSQ eliminated and it was reduced to 27 items. Scoring systems were based on a 1-4 scale and the total score of the questionnaire was 9-108, which was converted later to a 100 point scale.

Both ESS and FOSQ reliability were tested in a pilot study. The α-Cronbach's value for ESS and FOSQ was obtained as 0.75 and 0.90 respectively. Before providing data collection questionnaires to eligible subjects, they were asked to sign an informed consent form. The collected data were analyzed through SPSS software package (version12).

Results

The mean age of subjects was 55.52±10.04. 47.3% and 52.7% of subjects were male and female respectively and 89.5 % of them were married. The finding showed the majority of subjects (59.5%) had diploma or higher certification. In terms of economical status, 65% of subjects had an average economic status. The majority of subjects were retired or housewives. Diabetes had been diagnosed between 1 to 10 years in 63 % of the subjects and 46.4 % of them were suffering one of the diabetes complications such as eye, heart, and neurological problems.

The sleepiness mean score was 9.4±4.9 where 33.6% of the participants were sleepy,

while the remaining 66.4% were non-sleepy. In addition, the mean of functional outcomes score was 69.55±16.17, and the minimum and maximum obtained scores were 29.29 and 97.98 respectively. There was a significant statistical difference ($p<0.001$) between sleepiness and the functional outcomes (Table 1). Moreover, independent t-test showed a significant statistical difference between sleepiness and five domains of functional outcome. Hence, it can be inferred that sleepiness affected all domains of functional outcomes and has led to decreased function of individuals in those domains (Table 2).

In terms of physical activity, finding showed 72.6% of subjects had sedentary and 27.4 % had active life-style. It is to be notified that one of the subjects in this study was excluded because of an unusual dispersed score. There was no significant statistical difference between physical activity and sleepiness relationship (Table 3).

Table1: comparison of FOSQ score in the sleepy and non sleepy patients

FOSQ	ESS			
	<11		>=11	
	f	%	f	%
<33	0	0	3	1.4
33-66.9	45	30.8	45	60.8
≥67	101	69.2	26	35.1
p	146	100	74	100
x̄±SD	74.21 ±14.34		60.36±15.72	
T-test	t =6.551	df =218	p<0.001	

Table2: comparison of FOSQ's aspects of score in the sleepy and non sleepy patients

Dimension of FOSQ	ESS		T-test
	<11 x̄±SD	≥11 x̄±SD	
General productivity	76.7±15.5	67.1±16.5	p<0.001 t=4.25 df=218
Activity level	70.01±19.2	57.4±19.05	p<0.001 t=4.65 df=218
Vigilance	73.4±17.9	54.3±19.9	p<0.001 t=7.16 df=218
Social outcome	84.3±21.9	71.6±24.9	p<0.001 t=3.71 df=131.1
Intimacy/Sexual Relationships	71.4±34.11	53±32.8	p<0.001 t=3.82 df=218

Table3: Comparison of physical activity score in the sleepy and non sleepy patients

Physical activity	ESS			
	<11		≥11	
	f	%	f	%
Sedentary(<150)	103	71	56	75.7
Active(≥150)	42	29	18	24.3
p	145	100	74	100
x̄±SD	127.10 ±157.64		111.14 ±171.95	
T-test	t =0.687	df =217	p=0.493	

Discussion

The results showed sleepiness is common in patients with diabetes type II. Although the incidence of sleepiness in this study was less than that of Chasens's study that reports sleepiness 61% of diabetes patients (5). It seems that the difference between these two studies is due to the differences between the societies which had been conducted the studies. However the incidence of sleepiness of patients with diabetes in this study was similar to the findings of the American National Sleep Foundation that reported the incidence of intense sleepiness in society as 37% (10). Since the majority of subjects were supported by the Iranian Diabetic Association, they were a fairly educated and were aware about sleep problems. Therefore the sleep disorders and sleepiness incidence are less common than general population.

The published papers report about one third of people in societies suffer from sleepiness. A study performed by Asplund revealed that the sleepiness ratio is 51 % for women and 49 % for men (10). A research conducted by Mignot estimated that the percentage of sleepy people is approximately 24 to 36% (11). Shen states that the sleepiness rate varies from 0.3 to 35.8%. She believes that the wide range incidence rate of sleepiness is due to different definitions of sleepiness and types of societies (12).

Findings showed sleepiness impacts on the functional activities. The mean functional outcome in the non-sleepy group was higher than the sleepy group. In addition, the sleepiness score was reversely correlated with functional outcomes. According to Stepanski's study, sleep disorders causes daytime sleepiness and decreased function (13). There are several studies indicate the effect of sleepiness in the functional outcome and daily life. Gooneratnes found that the elderly with daytime sleep had moderate levels of impaired function (14). Goldman indicats that individuals with higher daytime sleepiness had lower musculoskeletal and daily functions (7). Newman's study reported that sleepiness is correlated with poor health condition. Ohayon reported a significant relationship among snoozing and daytime sleepiness, poor health condition, impaired physical and mood functions, overweight, cardiovascular diseases, stroke, congestive heart failure, and mortality rate(15).

The study found that 72.6% of subjects were sedentary. A study in the United States found physical activity level is low in diabetic patients (16). One of the reasons for inactive life style in the subjects specifically women was false belief that daily routine activities such as house duties and shopping can be an alternative for exercise. Farahani states that this false belief is even more harmful obstacle for physical activity by putting individual's health in risk of cardiovascular disorders (17). Therefore, it is necessary to offer required educations concerning the type and intensity of physical activities suitable for diabetes patients.

Sedentary life style was higher in sleepy subjects than non-sleepy subjects. There was a relationship between sleepiness and physical activity. This finding did not confirm in the study which has been conducted by Chasens's study (5). The reason for such a difference could be caused due to the difference in the lower rate of sleepiness in this study (33.6%) compared with Chasens's study (61%). However Chasens believes that sleepiness is a predictive of lower physical activity and functional outcome (18).

In general, sleepiness decreases functional outcomes and activity level. Activity level and functional outcomes of the patient plays a significant role in controlling diabetes. The reciprocal effects of these factors highlight the necessity in further investigating of sleep disorders and sleepiness in patients with diabetes. It is recommended to conduct other studies about the effects of sleepiness in diabetic patients and comparing the findings with the present study in order to confirm the factors effective in sleepiness and decreased functional outcomes and activity.

Using a self-reported method to measure subjects' activity level was the major limitation of this study. In addition, disruptions and sleep affecting factors such as neurological disorders, addiction, and psychotropic drugs were self-reported. The finding of the study must be generalized cautiously.

The study showed sleepiness has adverse effects on functional outcome and physical activity. Decreased functional outcome and physical activity in patients with type II diabetes leads a worsen diabetes and poor quality of life in these patients. Sleep disorders in general and sleepiness in particular are common in patients who suffer diabetes. It is possible to manage sleep disorders in these patients before their adverse effects. Health professionals play a significant role in detection and management of sleep disorders. Therefore, it is suggested all patients with diabetes assess for sleepiness and sleep disorder to find and to manage these problems before their adverse outcome on the disease and patients' quality of life.

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