

Relationship between symptoms observed in patients with type 2 diabetes and the sleep quality

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Abstract

Aim: The aim of this study was to investigate the relationship between disease-related symptoms observed in patients with type 2 diabetes and the sleep quality.

Material and Methods: This was a correlative descriptive study conducted between July 2015 and July 2016. The sample of the study was formed by 256 patients selected via the non-probability randomized sampling method and calculated according to the sample-size with the known universe formula. The DSC-R and the PSQI were used for the data collection.

Results: The mean total score obtained from the DSC-R was 2.12 ± 1.05 . 86.3% of the patients were determined to have poor sleep quality. The mean total score obtained from the PSQI was 10.71 ± 4.08 . A statistically significantly positive correlation was observed between all sub-dimensions of DSC-R and the PSQI total. A negative correlation was determined between diabetes-related symptoms and the sleep quality, and accordingly, the quality of sleep impaired as the incidence of diabetes-related symptoms became higher. Additionally, despite hyperglycemia-related symptoms having been observed more frequently, the cardiological symptoms affected the sleep quality at a higher extent.

Conclusions: It was determined that a negative relationship between sleep quality and symptoms of diabetes and increased symptoms of diabetes decreased in sleep quality.

Keywords: Diabetes; Diabetes Symptoms; Sleep Quality.

INTRODUCTION

Diabetes mellitus (DM) is a life-long social and communal problem that is increasingly being observed worldwide, and becoming one of the most important global health problems of the 21st century (1,2).

According to the data of the International Diabetes Federation, 425 million patients with diabetes were present worldwide in 2017, which is expected to increase to as high as 629 million by 2045 (2). According to the data of Epidemiological Study of Diabetes in Turkey (TURDEP-I and II), the prevalence of diabetes was increased from 7.2% to 13.7% (3).

Most patients with diabetes experience symptoms related to the disease. Patients included in the study of Yorulmaz et al. mentioned that the symptoms they had experienced were related to the disease and affected their physical, social and psychological functions (4). In addition to the symptoms related to hypoglycemia and hyperglycemia

observed in diabetes, sleep disorders are one of the most frequent problems encountered in type 2 DM (5). Barone and Menna-Baretto observed that sleep deprivation was a risk factor for impaired glucose tolerance (6). Cappuccio determined that sleep disorders observed in patients with type 2 diabetes was harmful for metabolic control (7).

The study of Gunes et al. revealed that patients with diabetes had poor sleep quality; the study of Lou et al. revealed that patients with type 2 diabetes and poor sleep quality had a higher developmental risk for impaired fasting blood glucose level; the study of West et al. revealed that sleeping disorders were common among patients with type 2 diabetes. In these studies, a significant correlation has been determined between diabetes and the sleep quality (8-10). Longer or shorter periods of sleep affected both the development of diabetes and control of the disease (11).

The main goal of the nursing services and treatment

Received: 08.01.2019 Accepted: 22.01.2019 Available online: 25.01.2019

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given to patients with diabetes is to minimize the negative symptoms experienced by the patients and to prevent the acute and chronic complications of the disease. Sleep disorders are common and the sleep quality is poor among patients with type 2 diabetes (12,13). In order to deal with these problems, one should know to what extent these symptoms affect the sleep quality and plan the treatment priority according to this conclusion. The aim of this study was to determine the relationship between the disease-related symptoms observed in patients with type 2 diabetes and their sleep quality.

MATERIAL and METHODS

This was a correlative descriptive study conducted on patients hospitalized in the endocrinology clinics of a university hospital between July 2015 and July 2016. The study was approved by the Scientific Research and Ethics Board of Inonu University Health Sciences Institute (Decision No: 2016/1-5). Verbal information was provided to all participants in accordance with the principles of the Declaration of Helsinki. The statistical population of the study was formed by 783 patients with type 2 diabetes undergoing in-patient treatment in the endocrinology clinic of a university hospital in one year. The sample of the study was formed by 256 patients with type 2 diabetes who fulfilled the inclusion criteria. The inclusion criteria were: a minimum of 6 months of diagnostic period for type 2 diabetes, absence of a diagnosed psychiatric disease and being able to communicate. The sample of the study was selected via the non-probability randomized sampling method in the period in which the investigator was at the endocrinology clinic.

Data Collection

The data of the study were collected between January and April 2016. The participant identification survey prepared by the investigator, the Diabetes-Related Symptoms Checklist (DSC-R) and the Pittsburgh Sleep Quality Index (PSQI) were used for the data collection. The investigator was at the endocrinology clinic twice a week (on Wednesday and Friday) in order to collect face-to-face data from the patients who had fulfilled the inclusion criteria, until he reached the planned sample size. Each interview took a mean of 20-25 minutes.

Data Collection Tool

Participant identification survey: This survey was prepared by the investigator and included 11 questions on descriptive characteristics of the patients such as age, gender, marital status and educational status, and on the history of health.

DSC-R: This scale was developed by Grootenhuis et al. Its' validity and safety studies in Turkey were conducted by Terkes. This scale was divided into 6 categories on diabetes including 34 items (14,15). In the study of Terkes, the internal consistency analysis of the Turkish version of the scale revealed a Cronbach's alpha value of over 0.90 for the total score of the scale (15). In our study, the Cronbach's alpha value of the total score of the scale was determined to be 0.94.

PSQI: This scale was developed by Buysse et al. in 1989 (16). The validity and safety studies for the Turkish version were conducted by Agargun et al., and the Cronbach's alpha value was found to be 0.80 (17). The Pittsburgh Sleep Quality Index (PSQI) is a self-report questionnaire that assesses sleep quality and disturbances over a 1-month time interval. The index consists of seven components. These are subjective sleep quality (component 1), sleep latency (component 2), sleep duration (component 3), habitual sleep efficiency (component 4), sleep disturbances (component 5), use of sleeping medication (component 6), and daytime dysfunction (component 7). The sum of seven component scores gives the total PSQI score. The response of each component is scored between 0 and 3 according to the symptom frequency. The total score has a value in the range of 0–21. High values indicate a poor sleep quality, a high level of sleep disturbance. Having a total score below 5 (0–4 points) clinically indicates that sleep quality is good, and a score of and above 5 (5–21 points) indicates poor sleep quality (16,17). In our study, the Cronbach's alpha value of the scale was determined to be 0.82.

Data analysis

Coding and assessment of the data were carried out in the computer environment using the IBM SPSS Statistics 16 package software. Descriptive statistics, independent samples t test, and the ANOVA correlation analysis were used for the statistical analyses of the data. Statistical significance was accepted as $p < 0.05$.

RESULTS

This study included a total of 256 patients with type 2 diabetes. The mean age was 57.55 ± 12.5 years (min: 20, max: 87). The participants were: women (53.1%), married (87.1%), illiterate (32%), obese (48.5%), unemployed (77.7%), and had a similar income and expense rate (60.5%). Among the patients, 82.2% were under insulin treatment, 66.6% had an additional chronic disease; among the patients with an additional chronic disease, 62.7% had hypertension and 82% had made glucose measurements at home. The mean duration to the diagnosis was 11.17 ± 7.23 years, the mean level of fasting blood glucose was 181.05 ± 77.9 mg/dl, the mean level of postprandial blood glucose was 271.45 ± 109.70 mg/dl and the mean HbA1c measurement was 10.84 ± 2.35 %. The mean total score obtained from DRSC was 12.7 ± 6.35 , and the highest score was observed in the hyperglycemia sub-dimension (3.11 ± 1.30) (Table 1).

Among the participants 86.3% had poor sleep quality and 13.7% had good sleep quality (Table 2).

The mean PSQI score was 10.71 ± 4.08 , and the highest score was observed in the period of sleep parameter with a mean score of 2.33 ± 1.18 (Table 3). A statistically non-significant difference was observed between the age parameter and the total score in PSQI, and a significant difference was observed between the period to the diagnosis, HbA1c and BMI parameters, and the total score in PSQI (Table 4).

A statistically significant difference was observed between all sub-dimensions of DRSC and the total score, and the total score in PSQI (Table 5).

Table 1. Distribution of the mean scores obtained from the DSC-R scale

DSC-R	($\bar{X} \pm SD$)	Min-Max
Neurology	1.93±1.43	0-25
Psychology/fatigue	2.54±1.35	0-20
Cardiology	1.65±1.08	0-40
Ophthalmology	1.64±1.47	0-20
Psychology/cognition	1.87±1.32	0-30
Hyperglycemia	3.11±1.30	0-20
Total	12.7±6.35	0-155

Table 2. Distribution of the patients according to the total PSQI score

PSQI Total Score	n	%
≥5	221	86.3
< 5	35	13.7

Table 3. Distribution of the mean scores obtained from the PSQI

PSQI	($\bar{X} \pm SD$)	Min-Max
Subjective sleep quality	1.59±.98	0-3
Sleep latency	1.43±1.17	0-3
Sleep duration	2.33±1.18	0-3
Habitual sleep efficiency	2.21±1.20	0-3
Sleep disturbances	1.63±0.63	0-3
Use of sleeping medication	0.17±0.63	0-3
Daytime dysfunction	1.33±1.03	0-3
Total	10.71±4.08	0-21

Table 4 Relationship between some descriptive characteristics of patients and the PSQI

Descriptive characteristics	PSQI Total	
	r	p
Age	0.09	p>0.001
Duration of the illness	0.20	p<0.001
HbA1c	0.18	p<0.001
BMI	0.19	p<0.001

Table 5. Relationship between the DSC-R and the PSQI Total

DSC-R	PSQI Total	
	r	p
Neurology	0.43	p<0.001
Psychology/fatigue	0.42	p<0.001
Cardiology	0.50	p<0.001
Ophthalmology	0.33	p<0.001
Psychology/cognition	0.34	p<0.001
Hyperglycemia	0.27	p<0.001
Total DSC-R	0.47	p<0.001

DISCUSSION

The data obtained in order to determine the relationship between diabetes-related symptoms and sleep quality in

patients with type 2 diabetes were discussed in the light of the literature.

The mean total score obtained from SRSC was 2.12±1.05. The mean total score obtained in the study of Terkes was found to be 1.47±0.92 (15). In our study, the higher mean total score obtained may be due to the lower educational status of the participants. The compliance is expected to be better in diabetic patients with higher educational status, which would directly affect prevention and treatment, and help patient regulate the blood glucose level.

The mean total PSQI score was 10.71±4.08. A PSQI score of 5 or higher indicates a poor sleep quality. Accordingly, 86.3% of the participants in our study had a poor sleep quality, and 13.7% had a good sleep quality. In previous studies conducted on patients with type 2 diabetes, 60% of the participants in the study of Jin et al. and 64.3% of the participants in the study of Keskin et al. had poor sleep quality (18,12). In other studies, poor sleep quality was reported among patients with diabetes as well (19-22). Therefore, the outcomes of our study are parallel to those in the literature.

A statistically non-significant difference was observed between age and sleep quality parameters in our study. Likewise, in the study of Gunes on patients with diabetes, no significant difference was observed in the mean PSQI scores according to age groups (8).

Gokpinar reported that patients over 58 years of age with type 2 diabetes had poor sleep quality; however, the difference between the age groups with regard to the mean PSQI scores was found to be non-significant (23). These studies support the findings of our study, whereas Bjorkelund et al. reported increased complaints about the sleep quality in patients observed over 32 years (24). The differences observed in the outcomes of different studies may be due to the different distribution within the age groups, effective dealing method of elderly patients with the disease, and the differences between working and living conditions of the patients.

It was observed in our study that the sleep quality decreased as the time to the diagnosis of diabetes increased. Cunha reported that the sleep quality was even worse in patients with a diagnosed type 2 diabetes of more than 10 years (25).

Many studies in the literature support the findings of our study (18). According to these studies, it may be concluded that time is inversely proportional to the sleep quality. As the years with diabetes increases, metabolic control becomes more difficult, longterm exposure to hyperglycemia leads to increased incidence of chronic complications observed in the disease, and the sleep quality is negatively affected by these variables.

In our study, patients with poor sleep quality had higher mean HbA1c levels. A positive correlation was determined between HbA1c and the mean total PSQI score. As the HbA1c level increased, the total sleep quality score

increased and the sleep quality decreased. In the study of Jin et al., a significant correlation was determined between HbA1c and the sleep quality, which was supportive of our findings (18). Keskin et al. determined that HbA1c was a risk factor for sleep disorders (12). In the study of Rajendran et al. on patients with type 2 DM, no significant correlation was observed between HbA1c and PSQI [27]. An impaired sleep quality negatively affects the glucose metabolism (27). A high HbA1c level indicates a poorly controlled blood glucose level. The incidence of acute and chronic complications of the disease increases if the disease is not taken under control. Therefore, it may be concluded that as the level of HbA1c increases, the sleep quality is negatively affected, and the sleep disorders in turn increases the risk of increased level of HbA1c.

In our study, a significant correlation was determined between the total scores of BMI and PSQI. As the BMI increased, the sleep quality decreased. In the study of Lam and Ip, a poor sleep quality was determined in patients with high BMI score (28). It was reported in the study of Bayram that diabetic obese patients had worse sleep quality compared to patients in the other groups (18). Parallel to the outcomes of our study, sleep disorders are reported to be common among patients with type 2 diabetes in the literature (8,29-31). The symptoms are more common in obese patients since the number of insulin receptors is reduced and insulin resistance is observed in these patients, and the sleep quality may therefore be affected.

When the relationship between DRSC and PSQI was investigated, a significant correlation was determined between all sub-dimensions of DRSC and the total score of PSQI. As the incidence of diabetic symptoms increased, the sleep quality was impaired. It may be concluded that sleep quality is negatively affected in patients with poorly controlled diabetes, and in the relatively frequently observed symptoms and complications of diabetes.

According to our study, although the hyperglycemia sub-dimension of DRSC had the highest mean score, the sub-dimension that mostly affected the sleep quality was cardiology. Cardiological symptoms observed in the patients were less frequent compared to the symptoms of hyperglycemia; however, it affected the sleep quality to a higher extent. Cardiovascular diseases are important diseases where sleep disorders are observed (32).

It may be concluded that symptoms such as night insomnia, respiratory distress, sleep apnea, chest pain during the night and rhythm disorders affect the sleep quality more negatively compared to the symptoms of hyperglycemia.

Limitations of the study

This study is limited to the patients with type 2 diabetes registered at the only one medical center affiliated with the Central District of the province of Malatya, and individual declarations of the patients with type 2 diabetes involved. Another limitation is that the non-probability randomized method was used to select the sample from the universe

CONCLUSION

In this study that aimed to investigate the relationship between diabetes-related symptoms and the sleep quality in patients with type 2 diabetes, it was determined that more than one third of the patients had a poor sleep quality, which worsened as the symptoms of diabetes increased. Furthermore, it was concluded that all symptoms of diabetes negatively affected the sleep quality; however, although the symptoms of hyperglycemia were more frequently observed, cardiological symptoms affected the sleep quality more significantly.

The nurse should observe the cardiovascular symptoms and findings of diabetes in order to improve the sleep quality and treat the patient according to these observations. They should inform the patients on how to deal with the symptoms of diabetes and support them physically, psychologically and socially.

Acknowledgements

The financial support for this study was provided by the researchers themselves.

The research was accepted as a Master Thesis by the institute of health sciences at İnönü University in July 2016 with the name of Relationship Between Symptoms Observed in Patients with Type 2 Diabetes and the Sleep World Nursing and Healthcare Conference in 2017.

Competing interests: The authors declare that they have no competing interest.

Financial Disclosure: There are no financial supports

Ethical approval: The study was approved by the Scientific Research and Ethics Board of Inonu University Health Sciences Institute (Decision No: 2016/1-5).

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