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SLEEP QUALITY AND PERCEIVED SELF-MANAGEMENT IN PATIENTS WITH DIABETIC FOOT ULCERS: CORUM/TURKEY

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Abstract: *This study was conducted in order to evaluate sleep quality and perception of diabetes self-management in Turkish patients with diabetic foot ulcers (DFU). This study was conducted as a descriptive and cross-sectional study in patients with diabetic foot ulcers. This study was conducted with 61 people in the Diabetic Foot Clinic of the university hospital in Çorum. Patient Introduction Form, Pittsburgh Sleep Quality Index (PSQI) and Perceived Diabetes Self-Management Scale (PDSMS) were used as data collection tools. Of the patients included, 82% had a PSQI score 5≥ and the sleep quality was found to be poor. The mean PSQI score was significantly higher and poorer in smokers and those with other diseases/comorbidities ($p<0.05$). The mean PDSMS score of the patients was found as 22.75 ± 2.03. The mean PDSMS score was found to be statistically significantly higher in patienst with longer duration of diabetes than in patients with shorter duration of diabetes ($p<0.05$). The poor sleep quality of individuals with diabetic foot ulcers leads to the failure of diabetes management. It is therefore important that health professionals focus on determining the conditions that affect sleep quality in patients with diabetic foot problems.*

Keywords: *Diabetic foot ulcers, Sleep quality, Self management.*

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Diyabetik Ayak Ülseri Olan Hastalarda Uyku Kalitesi ve Öz-Yönetim Algısı: Çorum/Türkiye

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Özet: *Bu çalışma, diyabetik ayak ülseri olan Türk hastalarda uyku kalitesini ve diyabette öz-yönetim algısını değerlendirmek amacıyla yürütülmüştür. Tanımlayıcı ve kesitsel tipteki çalışma, Çorum'da üniversite hastanesinde yürütülmüştür. Bu çalışma, üniversite hastanesinin Diyabetik Ayak Kliniği'nde yatan 61 kişi ile yapılmıştır. Veri Toplama Araçları olarak Hasta Bilgi Formu, Pittsburgh Uyku Kalitesi İndeksi (PSQI) ve Algılanan Diyabet Öz Yönetim Ölçeği (PDSMS) kullanılmıştır. Çalışmaya dahil olan hastaların% 82'sinde PSQI puanı ≥ 5 ve uyku kalitesi kötü bulunmuştur. Ortalama PSQI skoru, sigara içenlerde ve diğer hastalık/komorbiditesi olan bireylerde PSQI puanı anlamlı olarak daha yüksekti (p<0.05). Hastaların ortalama PDSMS skoru 22.75 ± 2.03 bulunmuştur. Ortalama PDSMS skorunun, diyabet süresi daha uzun olan diyabetli hastalarda, diyabet süresi daha kısa olanlara göre istatistiksel olarak anlamlı derecede yüksek olduğu bulunmuştur (p <0.05). Diyabetik ayak ülseri olan bireylerin uyku kalitesinin kötü olması, diyabet yönetiminin başarısızlığına neden olmaktadır. Bu nedenle sağlık çalışanlarının diyabetik ayak sorunları olan hastalarda uyku kalitesini etkileyen koşulların belirlenmesine de odaklanması önem arz etmektedir.*

Anahtar Kelimeler: *Diyabetik ayak ülseri, Uyku kalitesi, Öz-yönetim.*

I. INTRODUCTION

Diabetes is a life-long disease significantly affecting lives of persons and their families, necessarily causing changes in life styles and serious complications with high morbidity and mortality rates. As in all over the world, diabetes mellitus is a common health problem also in Turkey (American Diabetes Association, 2014). According to 2015 data of International Diabetes Federation (IDF), number of diabetic persons aged between 20-79 is 415 million and will reach to 642 million in 2040 (Ogurtsova et al., 2017). It is seen in The Turkish Epidemiology Survey of Diabetes, Hypertension, Obesity and Endocrine Disease study II (TURDEP-II) which has examined 26.499 individuals over 20 years of age in Turkey that, the incidence of type 2

diabetes has been considerably increased compared with previous years and reached to 13.7% (Satman et al., 2013).

Although diabetes is a preventable disease; it affects many organs. Hence, with its foot complications, it disrupts life quality (Güçlü, Çıbık, Görgün, Helvacı, and Can, 2016). Today, increasing prevalence of diabetes increases the incidence and importance of diabetic foot ulcers. Diabetic foot is one of the diabetic complications that are resulted from motor, sensory and autonomic neuropathy, macrovascular disease, skin infections and mechanical factors (Demirci et al., 2016). At the same time, diabetic foot is one of the important public health problems that can lead to organ loss over time, psychological, physical, social and economical problems, affecting quality of life and increasing hospitalization duration with gradually increasing mortality and morbidity (Ekpo, Duff, Bailey and Lindo, 2016; Yazdanpanah, Nasiri and Adarvishi, 2015; Yücel and Sunay, 2016). The prevalence of diabetic foot ulceration in the diabetic population is 4–10%; the condition is more frequent in older patients (Alexiadou and Doupis, 2012). About 15%-25% of diabetic patients will develop chronic ulcers of foot or lower extremity during their lifetime. Major consequences of diabetic foot problems include impaired blood circulation, non-healing wounds and amputations. Diabetic foot ulcers (DFU) is a serious diabetic complication which may develop in diabetic patients by 15% throughout their lives and require amputation in 7-20% of patients. More than 50% of non-traumatic lower extremity amputations are associated with diabetes (Demirci et al., 2016; Yücel and Sunay, 2016).

In the literature, it is reported that sleep problems may be caused by type 2 diabetes (Talaz and Kızılcı, 2015; Cappuccio, D'Elia, Strazzullo and Miller, 2010; Knutson, Ryden, Mander and Cauter, 2006), and diabetic patients may experience sleep problems caused by diabetic complications (Surani, Brito, Surani and Ghamande, 2015; Brod, Christensen, and Bushnell). DM, in addition to causing direct sleep disturbances as a result of nocturia, polyuria, diabetic neuropathy and neuropathy pain and depression which can impair sleep and quality of life (Surani, Brito, Surani and Ghamande, 2015).

Diabetic foot ulcers are a complication which negatively affect sleep quality of the patients, considerably influencing their daily life activities and quality of life. Sleep positively affects performance, productivity as well as cognitive

functions such as memory and concentration, and provides contribution to physical and psychological restoration. Because of these positive effects, sleep is considered as an important health component affecting quality of life and well-being of people. It is reported that, sleep disorders are frequent in diabetic patients, especially in persons with Type 2 diabetes and this is due to generalized physical stress disorder and impaired glucose metabolism (Griva et al., 2016; Obilor and Adejumo, 2015; Zhu, Li, Wang and Yu, 2014). Sleep process which is one of the most important daily life activities has healing roles such as tissue regeneration, repair of cell damage and hormonal regulation of persons and a positive supportive role in quality of life. Therefore, sleep is quite important in wound healing in diabetic foot ulcers (Ekpo et al., 2016; Salomé, Pellegrino, Blanes and Ferreira, 2013; Luyster and Dunbar-Jacob, 2011). The inadequate control of blood sugar is the primary cause of DFU and lead to impaired wound healing, resulting in reduced quality of life (Ekpo et al., 2016; Depner, Stothard and Wright 2014; Luyster and Dunbar-Jacob, 2011). The poor sleep quality and daytime sleepiness negatively affect multiple psychological and social factors required for optimal diabetes self-management (Chasens et al., 2013; Arora and Taheri, 2015; Adwan and Najjar, 2013; Hu, Amirehsani, Wallace and Letvak 2013).

Sleep disorders in diabetic patients may negatively affect self-management of diabetes. It is reported that self-management is helpful for glycemic control in diabetes and provides more benefit in prevention of diabetic complications than treatment (Pedras et al., 2016; Arora and Taheri, 2015; Chasens et al., 2013; Adwan and Najjar, 2013; Hu et al., 2013). Therefore, it is important to perform the interventions to determine, prevent or reduce factors that might affect self-management skills such as impaired sleep quality. The poor sleep quality and daytime sleepiness negatively affect multiple psychological and social factors required for optimal diabetes self-management (Arora and Taheri, 2015; Adwan and Najjar, 2013; Hu et al., 2013).

Self-management perception which is one of the health development behaviours, is an important determinant of starting and maintaining positive health behaviours. Therefore, defining self-management of diabetic persons for their self-care and their adaptation to diabetes should be a part of care delivered by health professionals (Powers et al., 2015; Chrvala, Sherr and Lipman, 2016). Nurses who are an important member of healthcare team

have a key role in development of self-management skills and evaluation of sleep quality of diabetic patients (Lawless et al., 2016).

It is seen when studies conducted about sleep quality in diabetic persons in Turkey (Güneş, Körükcü and Özdemir, 2009; Akça, 2016). But literature has limited studies about sleep quality and perceived self-management in patients with diabetic foot ulcers.

Therefore, the present study aims to evaluate sleep quality and perception of diabetes self-management in patients with diabetic foot ulcers. It is believed that, this study would be useful for providing awareness of healthcare professionals in questioning sleep patterns when creating care plans of individuals with diabetic foot patients and in supporting the clinical practices in order to increase self-management in diabetes.

II. MATERIAL AND METHODS

Sample of this non-randomized, descriptive cross-sectional study consisted of patients followed-up in Hitit University Training and Research Hospital Diabetic Foot Clinic with the diagnosis of diabetic foot ulcer between 01/07-01/10/2016 in Turkey. Diabetic foot clinic had 9 rooms and 15 bed. The average number of patients per month was 40 because of the new service at the time of the study.
the number of physicians working in diabetic foot care was two, and the number of nurses was eight. The research sample was calculated using G* power analyzed according to confidence interval 95%, alpha 5% and power 80% on the based of previous researches (Luyster and Dunbar-Jacob, 2011). Accordingly, sample size was found as 22. Considering number of 22 which is the upper limit in order to provide a sample representing representing the universe at a higher level, 61 persons were included. Eligibility criteria included ≥18 years of age or older, diagnosis of type 2 diabetes mellitus, presence of DFU, and treatment at the inpatient diabetic foot service. Data were collected through a self-administered questionnaire. For relatively illiterate patients, the questions were read word-by-word by the researcher to assist them in completing the survey, after first informing them about the aim of the study. Data collection was completed in about 15-20 minutes for each patient through data collection tools.

Data Collection Tools

Patient Information Form was prepared by the researchers and using literature search, clinical and research experts, a questionnaire was developed, modified, and improved. The questionnaire form consists of 22 questions including participants' demographic information such as gender, age, education, marital status, body mass index (BMI) and life style (smoking, drinking and exercise) were evaluated. Additionally, data on diabetic foot care methods, complications and diabetic foot wound grade were collected to assess their disease status. Physiological and biochemical indicators such as HbA1c and body mass index (BMI) were obtained using this questionnaire.

Pittsburgh Sleep Quality Index (PSQI) was developed by Buysse, Reynolds and Monk, 1989.Validity and reliability study in Turkey was performed by Ağargün, Kara and Anlar, 1996 and cronbach alpha internal consistency coefficient was found as 0.80. The Cronbach's alpha reliability coefficient for our study was found as 0.72. PSQI is a self-rating scale PSQI. A total of 19 self-rating items were categorized into seven components, all subjective, sleep quality, sleep latency, sleep duration, sleep efficiency, sleep disturbance, use of sleeping medications, and daytime dysfunction. Each components is evaluated over 0-3 points. The sum of 7 components give total score of the scale. The total score varies between 0 and 21 points. A total score higher than 5 indicates "poor sleep quality". Pittsburgh Sleep Quality Index (PSQI) does not give the frequency of sleep problems.

Perceived Diabetes Self-Management Scale (PDSMS) was developed by Smitth, Wallston and Smith, 1995 and adopted from the "Perceived Health Competence Scale" and its validity and reliability study was performed by Wallston, Rothman and Cherrington, 2007. The validity and reliability study of the scale in Turkey was conducted by Çevik and Özcan (2014) and cronbach alpha internal consistency coefficient was found as 0.77. The Cronbach's alpha reliability coefficient for our study was found as 0.78.This perceived self-management scale involves 8 items. Data collection tool is evaluated with 5-item Likert scale. Items of the scale vary between "strongly disagree" (1), "disagree" (2), "undecided" (3), "agree" (4) and "strongly agree" (5). Four items (1, 2, 6, 7) were asked in negative form. The minimum score which could be obtained from the scale is 8 and the maximum score is 40. A higher total score obtained indicates to a better awareness of the person in diabetes management.

Statistical Analysis

The data obtained was analyzed using SPSS 15.0 statistical software. First, normality of the data was tested in order to determine the tests that will be used in data analysis. The mean total scores obtained from the scales in analysis process were studied with Kolmogorov Smirnov test outcomes, skewness-kurtosis values and histogram graphs. As a result of these analyses some variables were found to not exhibit normal distribution. Therefore, parametric tests (student t-Testi, ANOVA) were used in the analysis of normally distributed data and non-parametric tests (Kruskal Wallis, Mann-Whitney U, Spearman's Correlation Analysis) were used in non-normally distributed data.

Ethical Consideration

The study was approved by the local ethic committee (Hitit University Ethics Committee) and the hospital management. Patients gave written consents before beginning of the study. During the study, the Helsinki Declaration Principles were noted.

III. RESULTS

The mean age of patients included in our study was 65.31 ± 10.66 with majority of them (70.5%) was aged 60 and over. It was determined that, 63.9% of the patients were males, educational level was primary graduate in 41%, 71.1% were married, 85.2% were unemployed and 14.8% were smokers. Body mass index (BMI) was evaluated as overweight in 54.1% of patients (Table 1).

Duration of diabetes diagnosis was found as 6-10 years in 41% of the patients, while 45.9% were receiving combination of insulin/oral hypoglycaemic agent, 54.1% adhered to diabetes diet, 78.7% did not do regular exercises, 80.3% had other disease/comorbidite disease with diabetes. Of the patients 44.3% reported to have nocturia, 77% vision problems/change in vision, 82% sensation loss in feet, 34.4% abnormal pain sensation in feet, 47.5% deformity in feet. Diabetic wound site was in toes in 49.2%, foot anterior/posterior side in 26.2% and foot heels in 24.6% of the patients. Wound stage of diabetic foot according to the Wagner classification was found as stage I and II in 36.1%, stage III in 24.6% and stage V in 3.3% of the patients. Diabetic foot infections were found in 42.6% and amputated tissue in 32.8% of the patients. (Table 2).

Of the patients included in our study, PSQI scores were ≥ 5 in 82% with the mean score found as 7.72 ± 3.38 and the sleep quality was poor (Table 2). When PSQI sub-components of the patients were evaluated; the mean scores were respectively found as 1.31 ± 0.67 in the Component 1 (Subjective sleep quality), 1.31 ± 0.67, 2.86 ± 1.28 in the Component 2 (Sleep Latency), 0.60 ± 0.73 in the Component 3 (Sleep Duration), 0.13 ± 0.38 in the Component 4 (Sleep Efficiency), 1.86 ± 0.56 in the Component 5 (Sleep disturbances), 0.40 ± 1.02 in the Component 6 (Use of sleeping medication) and 0.54 ± 0.94 in the Component 7 (Daytime dysfunction) (Table 3). Among the components, positive significant correlations were found between the mean total PSQI scores subjective sleep quality (r = .61), sleep latency (r = .69), sleep duration (r = .55), sleep disturbances (r = .70), daytime dysfunction (r = .65) and use of sleep medication (r = .55; p = .000).

In the present study, no significant differences were found between the mean PSQI scores in terms of patients' age groups, gender, marital status, educational status, employment status and body mass index (p > 0.05). However, the mean PSQI score was found to be statistically significantly higher in smoker patients (8.07 ± 3.40) compared with non-smoker patients (5.66 ± 2.50) (p = .046; Table 4). When the mean PSQI scores were analyzed in terms of disease and treatment characteristics of the patienst; the mean PSQI score was found to be statistically significantly higher in patients with other diseases /comorbidity (8.14 ± 3.50) than in patients without (6.00 ± 2.17) (p = .048). In addition, the mean PSQI score was found to be statistically significantly higher in patients who were regularly attending to health check (8.16 ± 3.39) compared with the patients who were not (p = .030; Table 5).

No statistically significant differences were observed between the mean PSQI scores in terms of other diseases and treatment characteristics including duration of diabetes, regimen for glucose control, assessment of health status, eye problems/change in vision, presence of abnormal signs in feet such as lack of feeling/sensory loss, abnormal pain and distortion in feet, wagner classification of diabetic foot, non-healing or infected wounds. Amputated tissue, using of other methods besides standard diabetic foot treatment, regular blood sugar control at home, diabetes education status and HgA1c values (Table 5).

In our study, the mean PDSMS score of the patients was found as 22.75 ± 2.03. No statistically significant differences were found between the mean PDSMS scores in terms of the descrptive characteristics of the patients ($p > 0.05$). It was found when the mean PDSMS scores were evaluated in terms of disease and treatment characteristics of the patients that total PDSMS scores were increased with duration of diabetes and the mean PDSMS score was statistically significantly higher in the patients with a duration of diagnosis of 16 years and longer (24.11 ± 1.90) than in patients with a shorter duration of diagnosis ($p = .002$). No significant differences were observed between the mean PDSMS scores in terms of other disease and treatment characteristics ($p > 0.05$).

In our study, no significant correlation was found between the mean PSQI and PDSMS scores of the patients with diabetic foot ulcers ($r = -.07$, $p = .572$).

IV. DISCUSSION

Sleep deprivation has been shown to worsen diabetes by increasing glucose levels and cortisol levels. Insufficiency in blood glucose control which delays wound healing is frequently seen in patients with diabetic foot ulcers (DFU). In patients with DFU, impaired glucose metabolism is indicated by frequent deprivation in sleep quality due to pain and decreased quality of life (Zhu et al., 2014).

In our study, majority of patients with DFU (82%) were found to have a total PSQI score ≥ 5 points and the mean PSQI score was found as 7.72 ± 3.38 with poor sleep quality. In study of Salome et al. was reported similar findings that patients with DFU. In our study, positive significant correlations were found between the mean total PSQI scores and subjective sleep quality, sleep latency, sleep duration, sleep disturbances, daytime dysfunction and use of sleep medication of the components. These results are consistent with those of the other studies (Obilor and Adejumo, 2015; Zhu et al., 2014; Luyster and Dunbar-Jacob, 2011).

In our study, the mean PSQI score was found to be statistically significant and sleep quality was found to be worse in smoker patients than in non-smoker ones. Cigarette smoking is known to increase the risk of diabetes foot ulcer and it also negatively impacts wound healing. Since smoking

delays wound healing, it may predispose accompanying pain and sleep problems (McDaniel and Browning, 2014).

In the present study, no significant correlation was found between the mean PSQI and PDSMS scores of the patients with DFU ($r = -.07$; $p = .572$). However, the mean PDSMS score of patients with DFU was found to be statistically significantly higher in patienst with longer duration of diabetes than in patients with shorter duration of diabetes ($p < 0.05$). This result indicates to a better self management of patients with longer duration of diabetes. Participants with longer duration of diabetes may have developed better adaptation strategies to self-manage diabetes compared to those with shorter duration of diabet (Alrahbi, 2014). Abubakari, Cousins, Thomas, Sharma and Naderali (2016) similar findings reported similar findings that longer duration since diagnosis was associated with higher confidence in patients' ability to self-manage their diabetes. Conversely, Adwan and Najjar (2013) found a significant negative correlation between duration of diabetes and PDSMS. Which means that increase of diabetes duration, decrease diabetes self-management and control.

Diabetes care is complex, requiring regular medical care and follow-up. Diabetes care involves a change in lifestyle. In diabetic patients, lifestyle management include medical nutrition therapy, physical activity, stopping smoking, weight control and effective problem-solving strategies, disease self-management (medication taking and management; self-monitoring of glucose and blood pressure) and prevention of diabetes complications. Therefore, health check/follow-up are quite important in evaluation of self-management skills of diabetic patients on the management of the disease (Pedras et al., 2016; Xu, Pan and Liu, 2010). Majority of the patients (82%) in our study were found to attend to health check follow-ups. In our study, sleep quality of patients who regularly attended health controls was found to be worse than the patients who did not attend. This might be caused by that, majority of patients attended health controls because of their diabetic metabolic control was not at a good level. In our study more than half of the patients (68.9%) had a HbA1c level >7%, which means patients had uncontrolled blood sugar levels. So that impaired sleep quality disrupts the adequate glycemic control, the most important factor in the development of diabetic foot ulcers is untreated or uncontrolled blood sugar levels (Ekpo et al., 2016; Obilor and Adejumo, 2015; Luyster and Dunbar-Jacob).

V. CONCLUSION

Our study results show that sleep quality of patients with diabetic foot ulcers is poor. Nurses' sleep quality of patients with diabetic foot ulcers may contribute positively to the increase in the quality of nursing care. In addition, our study suggests that sleep quality of patients with diabetic foot ulcers with smoking and comorbid diseases is poor, and education about planned, periodic smoking cessation and chronic disease management for this disease is needed. Therefore, healthcare professionals should focus especially on the determination of conditions causing sleep process to be influenced, creating evidence based interventions in nursing care related to sleep and the development of self-management skills in patients with diabetic foot ulcers.

Limitations of the Study: The results of this study are limited on a diabetes clients in a Çorum, so they cannot be generalized on other cities in Turkey. Future studies on evaluating sleep quality and self management and affecting factors in patients with DFU should be conducted with a larger sample size. In addition Pittsburgh Sleep Quality Index (PSQI) does not give the frequency of sleep problems.

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Tables

Table 1. Descriptive Characteristics Of Patients With Diabetic Foot Ulcers

	Number	**%**
Age (year)		
44-59	18	29.5
60 and over	43	70.5
Gender		
Female	22	36.1
Male	39	63.9
Level of Education		
Illiterate	7	11.5
Literate	18	29.5
Primary graduate	25	41.0
Secondary school graduate	6	9.8
High school graduate	5	8.2
Marital status		
Married	44	72.1
Single + widow/widower	17	27.9
Working status		
Employed	9	14.8
Unemployed	52	85.2
Body Mass Index		
Normal	11	18.0
Overweight	33	54.1
Obese	17	27.9
Smoking status		
Yes	9	14.8
No	52	85.2
Total	61	100

Table 2. Clinical Characteristics of Patients With Diabetic Foot Ulcers

	Number	**%**
Duration of diabetes(mean ± sd=10.13 ± 5.95, range 1-30)		
1-5	13	21.3
6-10	25	41.0
11-15	14	23.0
16 years and longer	9	14.8
Regimen for glucose control		
Oral hypoglycaemic agent	17	27.9
Insulin therapy	16	26.2
Combination of insulin/oral hypoglycaemic agent	28	45.9
Adherence to diet		
Yes	33	54.1
No	28	45.9
Regular exercising		
Yes	13	21.3
No	48	78.7
Other disease		
Yes	49	80.3
No	12	19.7
Nocturia		
Yes	27	44.3
No	34	55.7
Problems/changes in vision		

Yes	47	77.0
No	14	23.0
Sensation loss in feet		
Yes	50	82.0
No	11	18.0
Abnormal pain sensation in feet		
Yes	21	34.4
No	40	65.6
Deformity in feet		
Yes	29	47.5
No	32	52.5
Wound site		
Toes	30	49.2
Foot heels	15	24.6
Anterior/posterior sides of the foot	16	26.2
Wagner classification of diabetic foot		
Stage I	22	36.1
Stage II	22	36.1
Stage III	15	24.6
Stage V	2	3.3
Infection in wound site		
Yes	26	42.6
No	35	57.4
Amputated tissue		
Yes	20	32.8

No	41	67.2
***Diabetes related complications**		
Neuropathy	46	75.4
Retinopathy	43	70.1
Nephropathy	33	54.1
Methods used out of standard diabetic foot theraphy		
Yes	19	31.1
No	42	68.9
Applications used out of standard diabetic teraphy (n = 19)		
Washing the wound site with shampoo	3	15.8
Applying Yoghurt, vaseline, cologne, garlic/onion juice, ash and salt	14	73.7
Wrapping a clean cloth or scarf	2	10.5
Performing regular glucose control at home		
Yes	54	88.5
No	7	11.5
Attending to regular health check		
Yes	50	82.0
No	11	18.0
Receiving diabetes training		
Yes	38	62.3
No	23	37.7
HgA1c value (mean ± sd=8.292 ± 2.21, range 5.3-14.3)		
≤ 7	19	31.1
> 7	42	68.9

*More than one answer was given in each group.

Table 3. Mean PSQI And PDSMS Scores of Patients With Diabetic Foot

	Mean ± Sd	**Median**	**Minimum**	**Maximum**
*PSQI Total Score (Total component score ≥5)	7.72 ± 3.38	7.00	2.00	15.00
**Subjective sleep quality	1.31 ± 0.67	1.00	0.00	3.00
**Sleep Latency	2.86 ± 1.28	3.00	0.00	5.00
**Sleep Duration	0.60 ± 0.73	0.00	0.00	3.00
**Sleep Efficiency	0.13 ± 0.38	0.00	0.00	2.00
**Sleep disturbances	1.86 ± 0.56	2.00	1.00	3.00
**Use of sleeping medication	0.40 ± 1.02	0.00	0.00	3.00
**Daytime dysfunction	0.54 ± 0.94	0.00	0.00	3.0
**PDSMS total score	22.75 ± 2.03	22.00	18.0	31.0

*PSQI and PDSMS: r = -.07, p = .572

**PSQI and Subjective sleep quality: r = .61, p = .000

**PSQI and Sleep latency: r = .69, p = .000

**PSQI and Sleep duration: r = .55, p = .000

**PSQI and sleep disturbances: r = .70, p = .000

**PSQI and use of sleeping medication: r = .55, p = .000

**PSQI and daytime dysfunction r = .65, p = .000

Ulcers

Table 4. Mean PSQI and PDSMS Scores of Patients With Diabetic Foot Ulcers According to Descriptive Characteristics

Descriptive Characteristics	PDSMS		PSQI	
	Mean ± sd	p value	Mean ± sd	p value
Age (year) (mean=65.31 ± 10.66 range 44-95)				
44-59	23.05 ± 1.98	p = .450	7.94 ± 3.88	p = .742
60 and over	22.62 ± 2.07		7.62 ± 3.19	
Gender				
Female	22.04 ± 2.25	p = .072	8.59 ± 3.60	p = .133
Male	23.15 ± 1.81		7.23 ± 3.19	
Level of Education				
Illiterate	21.57 ± 3.10	p = .067	8.44 ± 3.53	p = .075
Literate	22.00 ± 1.97		7.36 ± 3.16	
Primary graduate	23.32 ± 1.74		7.16 ± 2.63	
Secondary school graduate	23.83 ± 0.98		4.60 ± 1.94	
High school graduate	23.00 ± 1.73		9.85 ± 3.84	
Marital status				
Married	23.02 ± 1.87	p = .137	7.68 ± 3.64	p = .885
Single + widow/widower	22.05 ± 2.33		7.82 ± 2.67	
Working status				
Employed	23.88 ± 1.36	p = .054	5.88 ± 2.14	p = .078
Unemployed	22.55 ± 2.08		8.03 ± 3.46	
Body Mass Index				
Normal	23.00 ± 2.00	p = .627	7.36 ± 2.80	p = .420
Overweight	22.84 ± 2.16		7.36 ± 3.30	
Obese	22.41 ± 1.87		8.64 ± 3.85	
Smoking status				
Yes	23.00 ± 1.73	p = .717	8.07 ± 3.40	**p = .046***
No	22.71 ± 2.09		5.66 ± 2.50	

* The Mann–Whitney *U*-test, $p < 0.05$

Table 5. Mean PSQI And PDSMS Scores of Patients With Diabetic Foot Ulcers According to Disease and Treatment Characteristics

Clinical characteristics	PDSMS		PSQI	
	mean ± sd	p value	mean ± sd	p value
Duration of diabetes (mean=10.13 ± 5.95, range 1-30)				
1-5	21.30 ± 2.42	**p = .002***	7.69 ± 3.77	p = .700
6-10	23.44 ± 1.55		7.28 ± 3.27	
11-15	22.00 ± 1.46		8.50 ± 2.98	
16 and longer	24.11 ± 1.90		7.77 ± 4.02	
Regimen for glucose control				
Oral hypoglycaemic agent	22.58 ± 2.18	p = .216	7.29 ± 2.31	p = .671
Insulin therapy	23.43 ± 1.89		7.43 ± 4.33	
Combination of insulin/oral hypoglycaemic agent	22.46 ± 2.00		8.14 ± 3.38	
Other disease				
Yes	22.95 ± 1.84	p = .206	8.14 ± 3.50	**p = .048***
No	21.91 ± 2.60		6.00 ± 2.17	
Evaluation of health status				
Good	23.25 ± 2.21	p = .715	5.50 ± 3.10	p = .431
Moderate	22.80 ± 2.13		7.83 ± 3.46	
Poor	22.46 ± 1.80		8.00 ± 3.20	
Nocturia				
Yes	23.22 ± 1.84	p = .111	8.14 ± 3.35	p = .384
No	22.38 ± 2.13		7.38 ± 3.41	
Problems/changes in vision				
Yes	22.76 ± 2.17	p = .848	7.68 ± 3.21	p = .866
No	22.71 ± 1.54		7.85 ± 4.03	

Sensation loos in feet				
Yes	22.70 ± 2.08		7.68 ± 3.35	
No	23.00 ± 1.89	p = .753	7.90 ± 3.64	p = .749
Abnormal sensation in feet				
Yes	23.23 ± 1.84		8.61 ± 3.81	
No	22.50 ± 2.11	p = .195	7.25 ± 3.07	p = .134
Deformity in feet				
Yes	22.93 ± 2.08		7.79 ± 3.75	
No	22.59 ± 2.01	p = .692	7.65 ± 3.06	p = .828
Wagner classification of diabetic foot				
Stage I	22.45 ± 2.17		6.36 ± 2.87	
Stage II	22.81 ± 1.62		8.68 ± 2.95	
Stage III	23.00 ± 2.36	p = .927	8.20 ± 3.58	p = .075
Stage V	23.50 ± 3.53		8.50 ± 9.19	
Infection in wound site				
Yes	23.15 ± 1.91	p = .238	7.34 ± 3.42	p = .460
No	22.45 ± 2.10		8.00 ± 3.36	
Amputated tissue				
Yes	22.65 ± 2.23	p = .617	8.40 ± 3.73	p = .277
No	22.80 ± 1.96		7.39 ± 3.19	
Using of other methods besides standard diabetic foot treatment				
Yes	22.89 ± 1.88	p = .745	8.47 ± 3.61	p = .381
No	22.69 ± 2.12		7.38 ± 3.26	
Regular glucose control at home		p = .274		p = .562

Yes	22.83 ± 2.12		7.83 ± 3.47	
No	22.14 ± 1.06		6.85 ± 2.60	
Attending to regular health check				
Yes	22.70 ± 2.11	p = .789	8.16 ± 3.39	**p = .030****
No	23.00 ± 1.73		5.72 ± 2.61	
Receiving diabetes training				
Yes	22.89 ± 2.16		7.55 ± 3.47	
No	22.52 ± 1.83	p = .283	8.00 ± 3.27	p = .441
HgA1c value				
≤ 7	22.42 ± 2.45	p = .496	8.10 ± 3.74	p = .555
>7	22.90 ± 1.83		7.54 ± 3.24	

*The Kruskal–Wallis analysis of variance, $p < 0.05$

** The Student's *t*-test, $p < 0.05$