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**ORIGINAL ARTICLE /** ARAŞTIRMA YAZISI

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# Examination of Dysfunctional Beliefs and Attitudes About Symptoms, Sleep Quality and Sleep in Patients Receiving Hemodialysis Treatment

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**Abstract**

**Objective:** This study was conducted to examine the relationship between symptoms, sleep quality, and dysfunctional beliefs and attitudes about sleep in patients receiving hemodialysis treatment.

**Material and Methods:** This descriptive and correlational study was conducted with 120 patients undergoing hemodialysis in a private hemodialysis center. Data were collected using the Descriptive Information Form, Dialysis Symptom Index (DSI), Pittsburgh Sleep Quality Index (PSQI), and Dysfunctional Beliefs and Attitudes About Sleep Scale-16 (DBAS-16). The statistical analysis of the data obtained as a result of the study was analyzed using number, percentage, standard deviation and arithmetic mean as descriptive statistics, Pearson correlation test and structural equation modeling in IBM SPSS 26 program. Ethics committee approval and permission from the research institution were obtained for the conduct of the study.

**Results:** The most common hemodialysis-related symptoms were fatigue (70.8%), feeling irritable (61.7%), difficulty falling asleep (60.8%). The mean PSQI Global sleep score of the patients was 7.40±5.02 points. Dialysis Symptom Index explained 26.5% of the change in PSQI Global sleep score in a statistically significant way (F=42.479 p<0.001). The DSI and the total score of the DBAS-16 explained 45.2% of the change in the PSQI Global sleep score in a statistically significant way (F=48.301 p<0.001).

**Conclusion:** As a result of this study, it was observed that symptom burden and dysfunctional beliefs and attitudes about sleep negatively affected sleep quality in hemodialysis patients. Studies on the management of sleep-related symptoms and regulation of dysfunctional beliefs and attitudes about sleep are recommended to improve sleep quality.

**Keywords:** Hemodialysis, sleep quality, symptom

**Özet**

**Amaç:** Bu çalışma, hemodiyaliz tedavisi alan hastalarda görülen semptomlar, uyku kalitesi ve uyku ile ilgili işlevsiz inanç ve tutumlar arasındaki ilişkinin incelenmesi amacıyla yapıldı.

**Gereç ve Yöntem:** Bu araştırma tanımlayıcı ve ilişki arayıcı türde, özel bir hemodiyaliz merkezinde hemodiyalize giren 120 hasta ile yapıldı. Veriler Tanıtıcı Bilgi Formu, Diyaliz Semptom İndeksi (DSİ), Pittsburgh Uyku Kalite İndeksi (PUKİ), Uyku ile İlgili İşlevsiz İnanç ve Tutumlar Ölçeği-16 (DBAS-16) kullanılarak toplandı. Araştırma sonucunda elde edilen verilerin istatistiksel analizi IBM SPSS 26 programında tanımlayıcı istatistikler olarak sayı, yüzde, standart sapma ve aritmetik ortalama, pearson korelasyon testi ve yapısal eşitlik modeli kullanılarak analiz edildi. Araştırmanın yürütülebilmesi için, etik kurul onayı ve araştırmanın yapılacağı kurumdan izin alındı.

**Bulgular:** Hemodiyalize bağlı en çok yaşanan semptomların yorgunluk (%70,8), sinirli hissetme (%61,7), uykuya dalmada zorlanma (%60,8) olduğu belirlendi.Hastaların PUKİ Global uyku puan ortalamasının 7,40±5,02 puan olduğu saptandı. DSİ'nin, PUKİ Global uyku puanı üzerindeki değişimin %26,5'ini istatistiksel olarak anlamlı şekilde açıkladığı (F=42,479 p<0,001) belirlendi. DSİ ve DBAS-16 toplam puanının PUKİ'deki Global uyku puanı üzerindeki değişimin %45,2'sini istatistiksel olarak anlamlı şekilde açıkladığı (F=48,301 p<0,001) görüldü.

**Sonuç:** Bu çalışma sonucunda hemodiyalize giren hastalarda semptom yükünün ve uyku ile ilgili işlevsel olmayan inanç ve tutumların uyku kalitesini olumsuz etkilediği görülmüştür. Uyku kalitesinin geliştirilmesi için uyku ile ilgili semptomların yönetimine ve uyku ile ilgili işlevsel olmayan inanç ve tutumların düzenlenmesine ilişkin çalışmalar yapılması önerilir.

**Anahtar Kelimeler:** Hemodiyaliz, uyku kalitesi, semptom

## Introduction

Although hemodialysis (HD) is a life-saving treatment method in Chronic Kidney Disease (CKD), symptoms such as muscle cramps, fatigue, sleeplessness, nausea and vomiting, loss of appetite, itching, and irritability are common in patients undergoing hemodialysis (1,2). Insomnia, which is among the common symptoms in HD patients (1,3-6). It is emphasized that it should be considered among the priority symptoms to be managed (7). Sleep problems may occur in association with many factors such as CKD and HD itself, pain, dietary limitations, fatigue, dyspnea, itching, restless leg syndrome, and psychosocial problems caused by a chronic disease, and sleep quality may be negatively affected due to these sleep problems (1,3,4,8). Inability to fall asleep on time, waking up unintentionally at night, not waking up rested in the morning, daytime sleepiness and impaired daytime functioning are indicators of poor sleep quality. In improving sleep quality, it is important to change dysfunctional beliefs and attitudes about sleep. Cognitive Behavior Therapy (CBT) can be used as an effective method in the treatment of chronic insomnia in adults (8). Cognitive Behavior Therapy-Insomnia (CBT-I) method can support the change of dysfunctional beliefs and attitudes about sleep. For this, it may be necessary to evaluate the symptom burden, sleep quality, and dysfunctional beliefs and attitudes about sleep in patients undergoing HD. This study was conducted to evaluate the relationship between symptom experiences, sleep quality and dysfunctional beliefs and attitudes about sleep in patients undergoing HD, which is expected to contribute to the management of sleep quality in patients undergoing HD.

## Materials And Methods

### Study Design

This descriptive and correlational study was conducted in a private dialysis center.

### Sample

Patients who underwent HD in a private dialysis center between 1 July and 30 September 2022 constituted the population of the study. Between these dates, 200 patients were evaluated for research. The sample of the study consisted of 120 patients who met the inclusion criteria and volunteered to participate in the study. Post hoc power analysis was performed for the results found to examine the power of the study. For a sample of 120 patients, the power of the study was found to be 99.9% for the effect of DSI score on PSQI at 5% significance level and power above 80% is considered sufficient in the literature. Individuals aged 18 and over, receiving hemodialysis treatment, volunteering to participate in the study, and having no communication barriers were included in the study.

### Measurement Tools

Personal Information Form: The Personal Information Form consisted of a total of 17 questions evaluating participants' age, gender, education, marital status, and information related to hemodialysis (1,6).

Dialysis Symptom Index (DSI): DSI was developed by Weisbord et al. (9) in HD patients in order to determine the symptoms experienced by patients and the level of their effects on patients. The responses were obtained through 5-point Likert scale. The symptoms experienced in the last seven days were answered as yes-no; if the answer was yes, the amount of the effect of this symptom was evaluated as "0=none, 1=a little, 2=sometimes, 3=very little, 4=too much" in 5-point Likert scale. The total score was found by summing up the points obtained. This value ranged from "0 to 150". The value of "0" indicated no symptoms. The increase in the total scores of the answers to 150 points indicated that the effect of the mentioned symptom increased. The validity and reliability of DSI in Turkish was performed by Önsöz and Usta Yeşilbakan (Cronbach's $\alpha = .83$) (10). In this study, Cronbach's Alpha coefficient was found to be 0.89.

**Pittsburgh Sleep Quality Index (PSQI):** The PSQI has 19-items that are categorised into seven components: subjective sleep quality, sleep latency, sleep duration, habitual sleep efficiency, sleep disturbances, use of sleep medications and daytime dysfunction. The score for each of the seven components can range from 0 to 3. The PSQI global sleep score is calculated by the sum of the seven components, which ranges from 0 to 21, with a global score $\geq 5$ indicating poor sleep quality in the previous month (11). The PSQI has acceptable reliability in Turkish (12). In this study, the Cronbach's Alpha coefficient for the PSQI scale calculated based on 7 components was found to be 0.84.

**The dysfunctional beliefs and attidudes about sleep-16 (DBAS-16):** It is a scale developed to determine individuals' false beliefs and attitudes about sleep (13). The total score of the scale is obtained by summing the scores obtained from all items (16 items) and dividing by 16. As the score obtained from the scale increases, dysfunctional beliefs about sleep also increase. The DBAS-16 has acceptable reliability in Turkish (Cronbach's $\alpha = .82$) (14). In this study, Cronbach's Alpha coefficient was found to be 0.92.

### Data Collection

For participation in the study and data collection, hemodialysis patients were informed about the study and patients who agreed to participate in the study were asked to fill out the data collection forms face to face. It took an average of 10-15 minutes to fill out the data forms.

### Data Analysis

Data were evaluated using IBM SPSS Statistics Standard Concurrent User V 26 (IBM Corp., Armonk, New York, USA) statistical package programs. Descriptive statistics were given as number of units (n), percentage (%), mean (Mean), standard deviation (SD), median (M) and minimum (min), maximum (max) values. The normal distribution of the numerical variables was evaluated by Shapiro Wilk normality test and it was found that the scale scores were normally distributed. Therefore, Independent Sample t Test was used to compare two groups and analysis of variance (ANOVA) was used to compare more than two groups. Multiple comparisons were made with Bonferroni test. The relationships between numerical variables were evaluated with Pearson correlation coefficient.

Before starting the basic analysis, the prerequisites of the structural equation model such as sample size, outlier analysis, multicollinearity problem and normality assumption were examined. The non-zero values of the mediating variables at 95% confidence intervals indicate that the indirect effect is significant. For this reason, the bootstrap method was preferred for testing mediation models as it provides more reliable results. $p<0.05$ level was considered statistically significant.

### Ethical Consideration

In order to conduct the research, ethical approval was obtained from the KTO Karatay University Non-Drug and Non-Medical Device Research Ethics Committee under the approval number 2022/033, and permission was obtained from the institution where the research would be conducted. Participation in the study was entirely voluntary, and written consent was obtained from the participants.

## Results

The mean age of the participants was 54.71±12.11 years, 55.8% were male, 75.8% were married, 84.2% had an additional chronic disease, and 50% had been on hemodialysis for ≥3 years (Table 1).

**TABLE 1: Distribution of participants' socio-demographic characteristics and hemodialysis history**

| | |
|---|---|
| **Age, (Year)** | |
| Mean±SS | 54.71±12.11 |
| Median (min-max) | 53.5 (35-86) |
| **Gender, n (%)** | |
| Woman | 53 (44.2) |
| Male | 67 (55.8) |
| **Marital Status, n (%)** | |
| Married | 91 (75.8) |
| Single | 29 (24.2) |
| **Education Status, n (%)** | |
| Primary School | 87 (72.5) |
| High School | 18 (15.0) |
| College | 15 (12.5) |
| **Working Status, n (%)** | |
| Working | 96 (80.0) |
| Not Working | 24 (20.0) |
| **Chronic Disease, n (%)** | |
| Yes | 111 (84.2) |
| No | 19 (15.8) |
| **Hemodialysis Time, n (%)** | |
| <1 year | 15 (12.5) |
| 1-3 years | 45 (37.5) |
| ≥3 year | 60 (50.0) |
| mean± standart deviation and Median (minimum, maximum) | |

The most common symptoms related to hemodialysis treatment were feeling fatigue/decrease in energy (70.9%), difficulty maintaining sleep (61.7%), difficulty falling asleep (60.8%), feeling irritable (58.4%), muscle cramps (48.3%), worrying (46.7%), dry skin (42.5%), itching (42.5%), feeling uncomfortable (40.9%), and numb feet (39.2%) (Table 2).

**TABLE 2: The frequency and severity of the symptoms experienced by patients according to the dialysis symptom index (n=120)**

| | None % | Little% | Sometimes % | Very little % | Too much % |
|---|---|---|---|---|---|
| Feeling fatigue/Decrease in energy | 29,2 | 14,2 | 17,5 | 12,5 | 26,7 |
| Difficulty maintaining sleep | 38,3 | 7,5 | 10,8 | 4,2 | 39,2 |
| Difficulty falling asleep | 39,2 | 10 | 8,3 | 6,7 | 35,8 |
| Feeling angry | 41,7 | 10 | 10 | 9,2 | 29,2 |
| Muscle cramps | 51,7 | 8,3 | 16,7 | 7,5 | 15,8 |
| Worrying | 53,3 | 10 | 7,5 | 5 | 24,2 |
| Dryness in the skin | 57,5 | 5 | 6,7 | 7,5 | 23,3 |
| Itching | 57,5 | 4,2 | 7,5 | 5 | 25,8 |
| Feeling irritable | 59,2 | 8,3 | 6,7 | 6,7 | 19,2 |
| Drowsiness/Tingling in Feet | 60,8 | 5,8 | 9,2 | 5 | 19,2 |
| Bone-Joint Pain | 62,5 | 8,3 | 10,8 | 5,8 | 12,5 |
| Feelind sad | 64,2 | 9,2 | 7,5 | 5 | 14,2 |
| Feeling anxious | 64,2 | 10,8 | 3,3 | 3,3 | 18,3 |
| Constipation | 66,7 | 5,8 | 10 | 6,7 | 10,8 |
| Headache | 67,5 | 10 | 11,7 | 5 | 5,8 |
| Shortness of breath | 68,3 | 12,5 | 10 | 1,7 | 7,5 |
| Dry mouth | 68,3 | 5 | 12,5 | 4,2 | 10 |
| Muscle soreness | 68,3 | 5,8 | 9,2 | 5,8 | 10,8 |
| Swelling in the legs | 69,2 | 10 | 9,2 | 9,2 | 2,5 |
| Difficulty in keeping the legs still | 69,2 | 9,2 | 0,8 | 5,8 | 15 |
| Difficulty in concentrating | 70 | 5,8 | 10,8 | 5 | 8,3 |
| Drowsiness/Diziness | 71,7 | 10 | 8,3 | 6,7 | 3,3 |
| Cough | 75 | 6,7 | 10 | 5 | 3,3 |
| Difficulty becoming sexually aroused | 76,7 | 1,7 | 5 | 4,2 | 12,5 |
| Decrease in interest in sex | 77,5 | 3,3 | 3,3 | 5 | 10,8 |
| Decrease in appetite | 83,3 | 5,8 | 5 | 2,5 | 3,3 |
| Vomiting | 85 | 5,8 | 4,2 | 0,8 | 4,2 |
| Diarrhea | 88,3 | 5 | 1,7 | 0 | 5 |
| Chest pain | 88,3 | 4,2 | 5,8 | 0,8 | 0,8 |
| Nausea | 92,5 | 0,8 | 2,5 | 1,7 | 2,5 |

The mean DSI score of the participants was 28.44±21.23 points, the mean PSQI Global sleep score was 7.40±5.02 points, and the mean DBAS-16 total score was 5.34±1.99 points (Table 3).

**TABLE 3: Mean scores of Dialysis Symptom Index (DSI), Pittsburgh Sleep Quality Index (PSQI) and Dysfunctional Beliefs and Attitudes Scale-16 (DBAS-16).**

| Scale | Mean±SD | M (min-max) |
|---|---|---|
| Dialysis Symptom Index | 28.44±21.23 | 24.50 (0-80) |
| PSQI Subjective sleep quality | 1.42±1.07 | 1 (0-3) |
| PSQI Sleep latency | 1.77±1.17 | 2 (0-3) |
| PSQI Sleep duration | 1.04±1.16 | 0 (0-3) |
| PSQI Habitual sleep efficiency | 0.83±1.16 | 0 (0-3) |
| PSQI Sleep disorder | 1.14±0.58 | 1 (0-3) |
| PSQI Daytime dysfunction | 0.81±0.85 | 1 (0-3) |
| PSQI Sleep medication usage | 0.36±0.86 | 0 (0-3) |
| PSQI Global sleep score | 7.40±5.02 | 7 (0-21) |
| DBAS-16 Perceived consequences of insomnia | 7.71±2.41 | 5.17(1-17) |
| DBAS-16 Worry/helplessness about insomnia | 62,5 | 8,3 |
| DBAS-16 Sleep expectations | 64,2 | 9,2 |
| DBAS-16 Medication | 64,2 | 10,8 |
| DBAS-16 Total Score | 5.35±2.70 | 5,8 |

mean ± standart deviation ve Medyan (min- max)

There were statistically significant positive correlations between PSQI Global sleep score and DSI scale total scores (r=0.649 p<0.001), positive correlations between DBAS-16 and DSI scale total scores (r=0.514 p<0.001), and positive correlations between DBAS-16 and PSQI Global sleep scores (r=0.485 p<0.001) (Table 4).

**TABLE 4: Correlation between total scores of DSI, PSQI, and DBAS-16 scales (N=120).**

| | DSI | PSQI |
|---|---|---|
| PSQI | r=0.649 p<0.001 | |
| DBAS-16 | r=0.514 p<0.001 | r=0.485 p<0.001 |

r: Pearson correlation coefficient, Bolded sections are statistically significant (p<0.05).

DSI had a statistically significant positive effect of 0.05±0.01 units on the PSQI (zβ=0.52 p<0.001). DSI explained 26.5% of the change in PSQI in a statistically significant manner (F=42.479 p<0.001) (Table 5). In the mediator model, DSI had a statistically significant positive effect of 0.13±0.02 units on the PSQI (zβ=0.54 p<0.001). DBAS-16 had a statistically significant positive effect of 0.52±0.20 units on PDSI (zβ=0.21 p<0.001). The total scores of DSI and DBAS-16 statistically significantly explained 45.2% of the change in PDSI (F=48.301 p<0.001) (Table 5).

**TABLE 5: Evaluation of the mediator role of DBAS-16 in the impact of DSI on PSQI.**

| | Result Variables | | | |
|---|---|---|---|---|
| Prediction Variables | DBAS-16 | | PSQI | |
| | β±se | p | β±se | p |
| DSI | 0.05±0.01 | <0.001 | 0.13±0.02 | <0.001 |
| DBAS-16 | - | - | 0.52±0.20 | 0.011 |
| Constant | 3.97±0.26 | <0.001 | 0.98±0.98 | 0.324 |
| | $R^2$=0.265 | | $R^2$=0.452 | |
| | F=42.479 p<0.001 | | F=48.301 p<0.001 | |

β: Regression coefficient, se: Standard error, R2: Coefficient of determination, Bolded sections are statistically significant (p<0.05).

While the increase in the overall total score of DSI increases the DBAS-16 score, the increase in these two scales statistically significantly increases the PSQI Global sleep score. The model created is given in Figure 1.

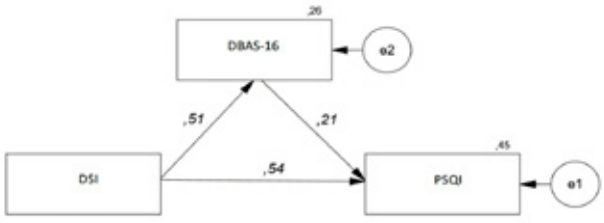


**Figure1.** Structural Equation Model (SEM) for the mediating role of DBAS-16 in DSI's impact on PSQI

## Discussion

In this study, it was determined that patients on hemodialysis most commonly experienced fatigue, difficulty maintaining and falling asleep, feeling irritable, and muscle cramps. In a recent study on the symptom burden of 620 patients undergoing hemodialysis, it was determined that the most common symptoms were muscle cramps, itching, nervousness and anxiety (2). Another study found that patients undergoing hemodialysis most frequently experienced symptoms of fatigue/lack of energy, muscle cramps, bone/joint pain, constipation an difficulty falling asleep (1). In a study evaluating the symptoms reported by 512 patients undergoing hemodialysis at three time points, it was found that the most common symptoms were fatigue, dry skin, difficulty maintaining sleep and muscle cramps (15). As seen in the studies, symptoms such as fatigue, muscle cramps and itching are common in patients undergoing hemodialysis. This shows the importance of symptom management in hemodialyzed patients.

In this study, it was determined that the PSQI global sleep score average of the participants was above 5 points. In the study of Pan et al., similar to the findings of this study, it was found that the global PSQI score average of patients undergoing hemodialysis was 5 points above (16). Primary insomnia may also occur at the beginning of HD treatment, and the incidence of HD-related insomnia may increase further (17). Studies have shown that most of the patients undergoing hemodialysis have poor sleep quality (18-20). In a meta-analysis evaluating the sleep quality of patients entering HD, it was found that 75.30% of the patients had poor sleep quality (21). Side effects such as fatigue, anxiety, muscle cramps and itching may negatively affect sleep quality (20, 22). In a study, they found that fatigue, anxiety, and depression were higher in patients with poor sleep quality, and that patients with insufficient sleep experienced 3.9 times more fatigue (20). In another study, in patients entering HD, feeling tired/lack of energy and difficulty falling asleep; difficulty falling asleep and staying asleep; It was determined that feeling tired/lack of energy and difficulty in maintaining sleep constitute a symptom cluster (23). As can be seen, the side effects experienced in patients undergoing hemodialysis may cause sleep quality, and poor sleep quality may cause more adverse effects and adversely affect the quality of life (24). Cognitive Behavioral Therapy-Insomnia (CBT-I), which is applied with the use of various combinations such as stimulus control, sleep restriction, sleep hygiene, relaxation and psychoeducation of cognitive restructuring for dysfunctional beliefs and attitudes about sleep, is a treatment approach with proven effectiveness in eliminating sleep problems (8,25). In order to manage sleep problems and improve sleep quality, it is important to evaluate the sleep problem and the factors affecting it and to create a care plan according to the results of this evaluation. In this study, it was determined that dysfunctional beliefs and attitudes about sleep together with symptom burden negatively affect sleep quality in patients undergoing hemodialysis. Studies have shown that changing false beliefs and attitudes about sleep supports improvements in sleep (26,27) and cognitive behavioral therapy for insomnia has moderate to large effects on dysfunctional beliefs about sleep (28). In a study in which the effect of CBT on sleep-related cognitive status was evaluated, it was determined that DBA mediated the effect of CBT-I on the severity of insomnia and had a 6-month effect on sleep quality and sleep problems (29). Studies on improving sleep quality with CBT-I in HD patients are limited (30). According to the results of this study, it is thought that evaluating dysfunctional beliefs and attitudes about sleep and managing the symptoms that are thought to be effective on sleep quality will be effective in improving sleep quality in HD patients.

Conducting the study in a single HD center constituted the limitation of the study. In addition, patients may have been tired due to the use of a subjective form for symptoms, sleep quality and false belief attitudes.

## Conclusion

This study investigated the effects of symptom burden and dysfunctional beliefs and attitudes about sleep on sleep quality. It was concluded that sleep quality was poor in HD patients and symptom burden and dysfunctional beliefs and attitudes about sleep negatively affected sleep quality. This result reveals the importance of improving sleep quality in patients undergoing HD. In improving sleep quality, it is recommended to reduce symptom burden and to conduct studies to identify symptoms associated with sleep quality in patients undergoing HD. In addition, in order to improve sleep quality in patients undergoing HD, it is recommended that symptoms, sleep

quality and false beliefs and attitudes about sleep should be evaluated regularly in patients undergoing HD and care should be planned according to the results of the evaluation.

## Declarations

**Funding:** No financial support was received fort he study.

**Conflict of interest:** No potential conflict of interest was reported by the authors.

**Ethics Approval:** The study was approwed by KTO Karatay University Tıbbi Cihaz ve İlaç Dışı Ethics Committe, report number 2022/033 (date:15.06.2022).

**Avaliability of Data and Material:** The dataset of this study are available from the corresponding author on a reasonable request.

**Authors Contributions:** All authors contributed to the study's conceived and designed the analysis. Collected the data HGH, HH, contributed data or analysis tools, FG,HGH,HH, performed the analysis, FG, Wrote the paper FG, HGH, HH. All authors read and approved the final manuscript. The article was presented as an oral presentation at the 1st International Selcuk Health Sciences Congress on 13 November 2022.

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