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Original Article

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The Association Between Perceived Stress with Sleep Quality and Insomnia in Hemodialysis Patients During the COVID-19 Pandemic

Dilek Barutçu Ataş[1], Esra Aydın Sünbül[2], Gülçin Kantarcı[3]

[1]Division of Nephrology, Marmara University, Pendik Training and Research Hospital, İstanbul, Turkey
[2]Department of Psychiatry, University of Health Sciences Erenköy Mental Health and Neurological Diseases Training and Research Hospital, İstanbul, Turkey
[3]Division of Nephrology, Department of Internal Medicine, Yeditepe University School of Medicine, İstanbul, Turkey

ABSTRACT

Objective: Hemodialysis patients are more vulnerable to significant psychological distress and sleep problems of outbreaks of infectious diseases and novel COVID-19. In this study, we evaluated the association between perceived stress scale with Pittsburgh sleep quality index, and insomnia severity index in hemodialysis patients during the COVID-19 pandemic.
Methods: Fifty-three hemodialysis patients were included in this cross-sectional study. Survey of "perceived stress scale," "Pittsburgh sleep quality index," and "insomnia severity index" was performed. The association between perceived stress scale with Pittsburgh sleep quality index and insomnia severity index in hemodialysis patients during COVID-19 pandemic investigated.
Results: Mean age of patients was 64.7 ± 12.8 years, and 28 (52.8%) of the patients were men. Sixteen (30.2%) of the patients had high perceived stress scale, 31 (58.5%) patients had poor sleep quality, and 29 (57.0%) of patients had mild to moderate insomnia. Perceived stress scale was positively correlated with Pittsburgh sleep quality index and insomnia severity index score. The high perceived stress scale score was an independent predictor of high insomnia severity index score.
Conclusion: Perceived stress was correlated with poor sleep quality and insomnia, and also, perceived stress was an independent predictor of insomnia in hemodialysis patients during lockdown of COVID-19. Early diagnosis of sleep disturbances is essential to improve the quality of life.
Keywords: COVID-19, insomnia, pandemic, perceived stress, sleep quality

Corresponding author: Dilek Barutçu Ataş ✉ drdilekb@gmail.com
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INTRODUCTION

Novel coronavirus disease (COVID-19) emerged in China in December 2019. Afterward, the World Health Organization declared a pandemic. To date (May 2, 2021), 150 989 419 confirmed cases and 3 173 576 confirmed deaths had been reported worldwide.[1] To prevent the spread of the disease, within the framework of social isolation measures and financial losses can act as a psychosocial stressor. Outbreaks of infectious diseases and novel COVID-19 are associated with major psychological distress and significant sleep problems.[2-4]

Poor sleep quality and insomnia are common sleep disturbances in chronic diseases.[5] Poor sleep quality has been reported between 9% and 45% in the general population.[6] It is reported that poor quality of sleep is prevalent among hemodialysis (HD) patients.[7] The psychological effects and sleep disturbances of the COVID-19 pandemic may be more pronounced in patients receiving chronic HD treatment. The pandemic may also have indirect effects on the psychosocial health of HD patients, even if they are not infected with COVID-19. Therefore, in this study, we aimed to investigate the association between perceived stress with sleep

quality and insomnia in patients undergoing HD during the novel COVID-19 pandemic.

METHODS

Study Design

The study is in accordance with the Declaration of Helsinki and was approved by the Institutional Review Board of Yeditepe University Ethics Committee (Protocol No. 1236). All participants gave written informed consent.

In this cross-sectional study, 53 HD patients in a commercial dialysis unit between the July 1, 2020, and October 1, 2020, were enrolled. Inclusion criteria were those undergoing HD more than 6 months, over age 18, and no psychiatric disease. Patients filled out the questionnaire forms during the regular dialysis session.

Study Survey

Questionnaire of "Socio-Demographics"

Questionnaire of "Socio-Demographics" consists of duration of HD and chronic kidney disease, history of renal transplantation or peritoneal dialysis, dialysis access problem, dialysis access site, history of COVID-19 infection, and any positive effect of the pandemic.

Perceived Stress Scale

Perceived Stress Scale (PSS), which was developed in 1983, indicates perceived stress during the last month. The scores of the PSS-14 vary between 0 and 56, and the high score indicates a high perception of stress (cut-off point > 25).[8] Reliability and validity were analyzed by adapting the PSS form to Turkish.[9]

Pittsburgh Sleep Quality Index

Pittsburgh Sleep Quality Index (PSQI) assesses sleep quality in the last months. Total score ranges from 0 to 21. A global PSQI score greater than 5 indicates a "poor" sleep quality.[10] The validity of the questionnaire was adopted in Turkish in 1996.[11]

Insomnia Severity Index

Insomnia Severity Index assesses the severity of both nighttime and daytime components of insomnia.[12] Boysan et al[13] revealed adequate validity and reliability of ISI in Turkish sample.[13] The survey assesses the nature, severity, and impact of insomnia.[14,15] The usual recall period is the "last month." The total score is interpreted as follows: the absence of insomnia (0-7), mild insomnia (8-14), moderate insomnia (15-21), and severe insomnia (22-28).[16]

Statistical Analysis

SPSS version 22.0 (IBM Corp., Armonk, NY, USA) package was used for the statistical analysis. Chi-square test was used to compare categorical variables. Continuous variables were reported as mean ± standard deviation. Kolmogorov–Smirnov was performed to determine whether continuous variables were distributed normally. Continuous variables were compared using either the independent samples *t* test or the Mann–Whitney *U* test. Receiver operating characteristic (ROC) curve analysis was performed to determine the cut-off PSS that predicted patients with insomnia. Pearson correlation analysis was used to determine the correlation between PSS and PSQI and ISI. Logistic regression analyses were performed to determine independent predictors of insomnia in HD patients. For all analyses, *P* value <.05 was considered significant.

RESULTS

In this study, 53 HD patients were consecutively included. The mean age of patients was 64.7 ± 12.8 years, and 28 of patients (52.8%) were men. Three (5.7%) of the patients had a history of peritoneal dialysis before starting HD, and 4 (7.5%) of the patients had a renal transplantation history. Twenty-one (39.6%) of the patients had a dialysis access problem before. Only 1 patient had a history of COVID-19 infection.

Sixteen (30.2%) of patients had high perceived stress, 31 (58.5%) of patients had poor sleep quality, and 29 (57%) of patients had mild to moderate insomnia. The mean PSS was 26.4 ± 8, mean PSQI was 6.6 ± 3.9, and mean ISI was 8.4 ± 5.3. Eleven (20.8%) of the patients thought that the pandemic process affected them positively. The baseline demographic data of patients are shown in Table 1.

The PSS was 26.4 ± 6.8, and the ISI was 8.4 ± 5.3. Total PSQI was 6.6 ± 3.9. Components of PSQI are shown in Table 2.

PSS was correlated with PSQI and ISI score positively in the Pearson analysis (Figure 1). ROC curve analyses showed that PSS > 27.5 predicted insomnia with 66% sensitivity and 71% specificity (area under curve: 0.72, CI:0.59-0.86, *P* = .005) (Figure 2).

High PSS scores were significantly related to mild or moderate ISI score than low ISI score (28.8 ± 6.2 vs. 23.5 ± 6.6, *P* = .004) during COVID-19 pandemic. The PSQI was significantly higher in mild to moderate ISI score than low ISI score (8.8 ± 3.8 vs. 3.9 ± 1.7, *P* < .001). Comparison of baseline characteristics of patients according to ISI is shown in Table 3.

MAIN POINTS

- Hemodialysis (HD) patients are more vulnerable to significant psychological distress and sleep problems of outbreaks of infectious diseases and novel COVID-19.
- Perceived stress is correlated with poor sleep quality and insomnia in HD patients during the lockdown of COVID-19.
- Perceived stress is an independent predictor of insomnia in HD patients during the lockdown of COVID-19.
- Early diagnosis of sleep disturbances is essential to improve the quality of life.

Table 1. Baseline Characteristics of Patients	
Age (years)	64.7 ± 12.8
Sex (female/male)	25/28
Smoking (n)	8 (15.1%)
Alcohol (n)	2 (3.8%)
Perceived stress level	26.4 ± 6.8
Insomnia Severity Index Score	8.4 ± 5.3
Body mass index	26.3 ± 6.2
Duration of hemodialysis (years)	7.4 ± 7.5
Duration of chronic kidney disease (years)	11.6 ± 7.5
Marital status (n)	
Single	16 (30.2%)
Married	37 (69.8%)
Education status (n)	
Illiterate	13 (24.5%)
Literate	40 (75.5%)
Economic Status (n)	
Low	9 (17.0%)
Middle/high	44 (83.0%)
Working	6 (11.3%)
Family status (n)	
Nuclear family	40 (75.5%)
Extended family	13 (24.5%)
History of renal transplantation (n)	4 (7.5%)
History of peritoneum dialysis	3 (5.7%)
Dialysis access problem (n)	21 (39.6%)
Dialysis access site	
Arteriovenous fistula	41 (77.4%)
Catheter	12 (22.6%)
History of COVID-19 infection (n)	1 (1.9%)
Positive psychological effect of pandemic	11 (20.8%)

Table 2. Components of Pittsburgh Sleep Quality Index (PSQI)	
Sleep quality	1.4 ± 0.8
Sleep latency	1.7 ± 0.9
Sleep duration	0.6 ± 0.9
Habitual sleep efficiency	0.6 ± 0.9
Sleep disturbance	1.6 ± 0.6
Use of sleeping medication	0.2 ± 0.8
Daytime dysfunction	0.6 ± 0.7
Total PSQI score	6.6 ± 3.9

Multivariate logistic regression analyses showed that high PSS is an independent predictor of high ISI score (Table 4).

DISCUSSION

The principal findings of this study are that: HD patients perceive a high level of stress, they have a low quality of sleep, and they have insomnia, during the COVID-19 pandemic. The poor quality of sleep and insomnia are related to perceived stress.

Dialysis dependency is associated with poor sleep quality and increased prevalence of insomnia.[17-19] Besides, it is reported that more than a third of HD patients have high perceived stress and have symptoms of stress disorders. Therefore, dialysis patients suffered from psychological distress and sleep problems even before the COVID-19 pandemic. First, Lee et al[20] investigated the psychosocial impact of the COVID-19 pandemic in HD patients.[20] They found that about 33% of HD patients have poor sleep quality and 30% of participants have high perceived stress during COVID-19 pandemic. In our study, the prevalence of poor sleep quality (57%) and insomnia (44%) was higher than the study conducted by Lee et al.[20] However, severe insomnia was rare in our population, and most of our patients with poor sleep quality had only mild insomnia. The total PSQI score of our study population was 6.6 ± 3.9 compared to previous studies, which classified patients as poor sleepers when having a score > 5 in PSQI.[21] So, these results suggested that the COVID-19 pandemic may intensify sleep disorders and insomnia in HD patients. Also, we found that high perceived stress was significantly correlated with poor sleep quality and insomnia. To the best of our knowledge, no studies are investigating the relationship between perceived stress and sleep disorders in HD patients during the COVID-19 pandemic.

Although HD is a therapeutic approach, most dialysis patients are coping with stressful factors due to the disease and the complications of treatment. HD is essential; when ordinary people were restricted from going out, HD patients have to go to hospitals where there are high-risk areas for infection at least 3 times a week, and due to lack of protective equipment during the quick spread of COVID-19 infection, the patients may be worried about being infected. In accordance with these results, Xia et al showed that HD patients had more severe trauma-related stress symptoms than peritoneal dialysis patients during the COVID-19 lockdown period.[22] Another potential explanation for the high perceived stress in HD patients is the possibility of COVID-19 infection to be more severe in these patients. They have an increased risk of severe COVID-19 infection, poor prognosis, and mortality. The socioeconomic level of most dialysis patients is low, and the dialysis center where this study was conducted is close to a residential area where the poor of the city live.

For this reason, economic problems and financial difficulties that may arise due to the pandemic may also be the cause of the perceived high stress and sleep disorders. On the other

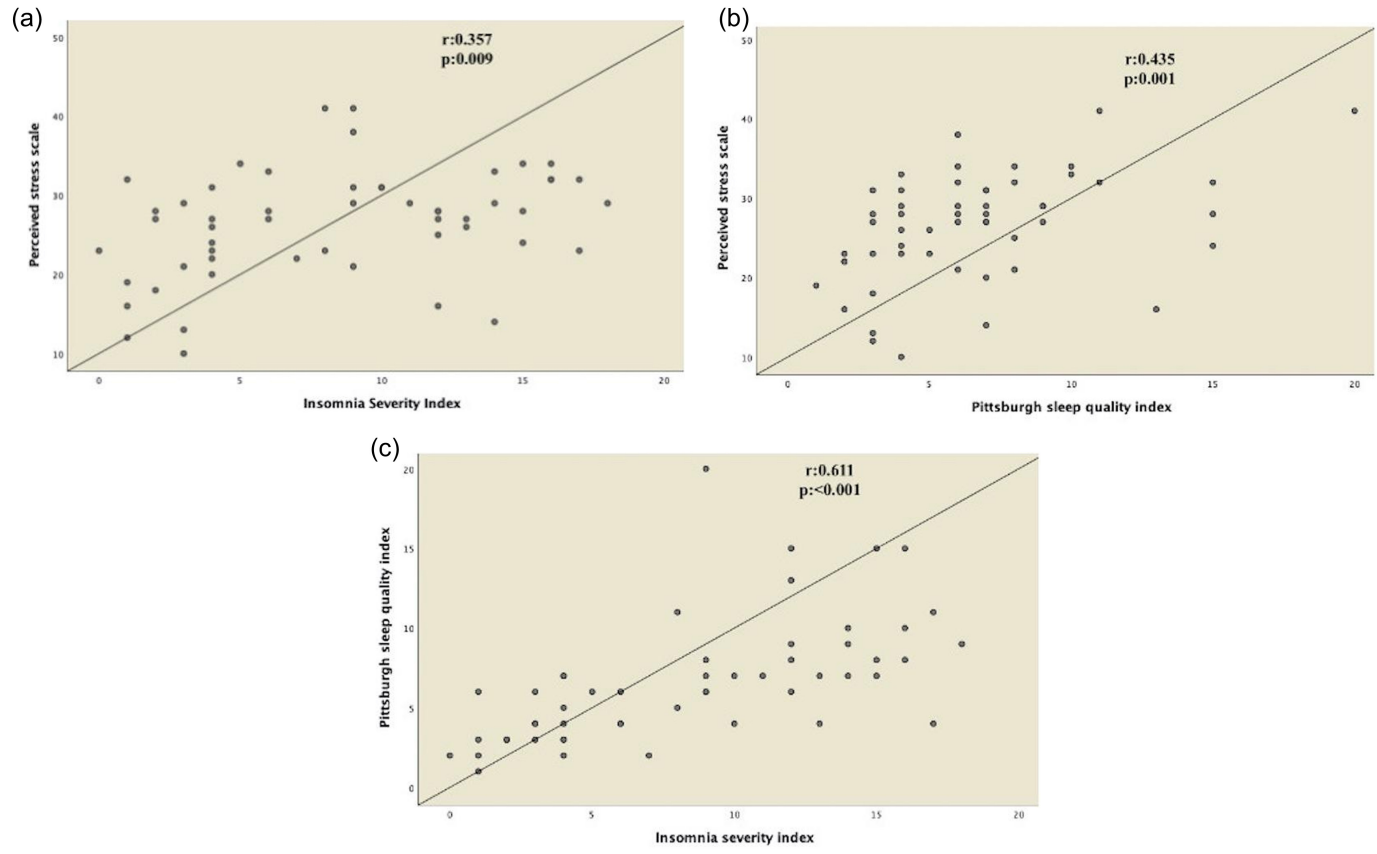

Figure 1. a) Correlation analysis between perceived stress and ISI score. b) Correlation analysis between perceived stress and PSQI. c) Correlation analysis between PSQI and ISI.

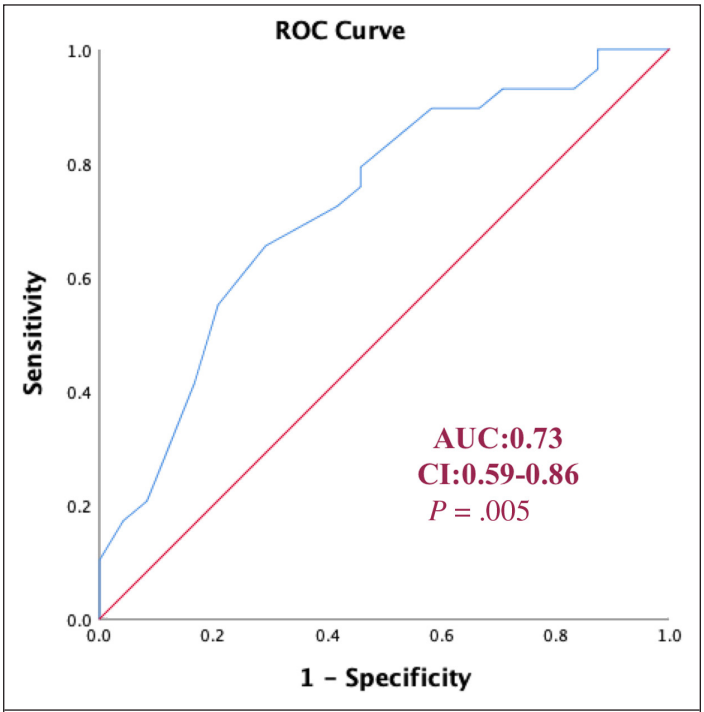

Figure 2. ROC curve analyses showed that PSS > 27.5 predicted insomnia with 66% sensitivity and 71% specificity.
AUC, area under the curve; CI: confidence interval.

hand, one-fifth of the participants, interestingly, stated that they were positively affected by the COVID-19 outbreak. Since no additional questions were asked about what kind of positive impact the pandemic might have in this study, we are not able to understand the reason for these questionable positive effects. Cornell et al investigated the positive effects of COVID 19 pandemic in 1370 participants with a national survey and they demonstrated that 906 (70%) of participants experienced at least 1 positive effect during the pandemic. The reported positive effects in their study were as follows: more time with family, work flexibility, calmer life, taking up a new hobby, financial benefit, and improved self care/exercise/home cooking.[23] Nevertheless, we think that even this finding alone deserves further investigation in HD patients.

Limitations

The small sample size and its cross-sectional nature are the main limitations. It is difficult to make causal inferences, and we do not know patients' psychological and sleep conditions before the outbreak. Re-evaluation in short and long-term follow-up of our study subjects during and after the COVID-19 pandemic will better reflect the association between sleep quality and stress levels. Moreover, we could not distinguish the effect of non-COVID-19 factors on perceived high stress, poor sleep quality, and insomnia. Despite these limitations, we

Table 3. Comparison of Baseline Characteristics According to Insomnia Severity Index (ISI).

	Low ISI Score (n = 24)	Mild or Moderate ISI Score (n = 29)	*P*
Age (years)	63.0 ± 12.2	66.0 ± 13.4	.396
Sex (male)	16 (66.7%)	12 (41.4)	.066
Smoking (n)	5 (20.8%)	3 (10.3)	.288
Alcohol (n)	1 (4.2%)	1 (3.4)	.891
Perceived Stress Scale score	23.5 ± 6.6	28.8 ± 6.2	.004
Pittsburgh Sleep Quality Index score	3.9 ± 1.7	8.8 ± 3.8	<.001
Body mass index	26.9 ± 8.1	25.8 ± 4.2	.537
Duration of hemodialysis (years)	6.2 ± 7.2	8.3 ± 7.7	.313
Duration of chronic kidney disease (years)	11.0 ± 8.0	12.1 ± 7.2	.606
Marital status (single)	5 (20.8)	11 (37.9)	.177
Education status (illiterate)	4 (16.7)	9 (31.0)	.226
Economic status (low)	2 (8.3)	7 (24.1)	.160
Working (n)	5 (20.8)	1 (3.4)	.080
Family status (nuclear family)	18 (75.0)	22 (75.9)	.942
History of renal transplantation (n)	3 (12.5)	1 (3.4)	.318
History of peritoneum dialysis (n)	1 (4.2)	2 (6.9)	.572
Dialysis access problem (n)	9 (37.5)	12 (41.4)	.774
Dialysis access site (catheter)	5 (20.8)	7 (24.1)	.775

The cut-off point was 0-7 for low ISI score and 8-21 for mild to moderate ISI score.

think our study results would help to understand the association between perceived stress with sleep quality and insomnia severity during COVID-19 pandemic.

Table 4. Logistic Regression Analysis Was Performed to Reveal Predictors of Insomnia

	Odds Ratio	95% CI	*P*
Perceived stress level > 27.5	5.123	1.424-18.438	.012
Gender (female)	2.754	0.778-9.752	.116
Age	0.985	0.937-1.0431	.854
Working	0.136	0.10-1.772	.126

Enter multivariate logistic regression analysis was used, and covariates that were *P* values less than .1 in the univariate analyses were added into the model.

In conclusion, this study demonstrated that perceived stress positively correlated with poor sleep quality and insomnia in HD patients during the lockdown of COVID-19. As the COVID-19 pandemic is still spreading worldwide quickly, early diagnosis of poor sleep quality and insomnia is essential to improve the quality of life in the patients receiving dialysis.

Ethics Committee Approval: Ethics committee approval was received for this study from the Ethics Committee of Yeditepe University (Approval Date: June 17, 2020; Approval Number: 1236).

Informed Consent: Written informed consent was obtained from the participants of this study.

Peer Review: Externally peer-reviewed.

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Data Availability Statement: All relevant data were presented in the manuscript.

Conflict of Interest: The authors have no conflict of interest to declare.

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