



Sleep Status During the COVID-19 Pandemic: Sleep Characteristics May Not Be Similar in Individuals with and without a History of COVID-19 Infection

COVID-19 Pandemisi Sırasında Uyku Durumu: COVID-19 Enfeksiyonu Geçiren ve Geçirmeyen Kişilerde Uyku Özellikleri Benzer Olmayabilir

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Abstract

Objective: Sleep disturbances may occur more frequently during pandemics due to socioeconomic and psychological factors. Infections may also cause a number of long-lasting complications that can be easily overlooked. In this study, we aimed to examine whether the sleep status of the patients who recovered from coronavirus disease-2019 (COVID-19) infection differs from the individual who lived in the same sociocultural environment but did not have any COVID-19 infection in the same period, or not.

Materials and Methods: Two hundred forty-three patients with COVID-19 disease who recovered at least one month before the study enrollment (patient group) and 132 individuals without a history of COVID-19 in the same period (control group) were included. Sociodemographic and medical characteristics of two groups were recorded and a self-assessment form consisting of 17 items was used for sleep evaluation in both groups.

Results: Self-assessment scores for the quality of sleep status were lower in patient group ($p<0.001$). Moreover, subtitle scorings revealed some significant differences between patient and control groups. Patient group reported significantly higher prevalence of sweating at night, waking up tired with headache in the morning, severe snoring, restlessness in legs, and anxiety of not being able to sleep (respectively; $p<0.001$, $p=0.003$, $p=0.016$, $p=0.016$, $p=0.032$).

Conclusion: Sleep was significantly disturbed in patients even after one month following recovery from COVID-19 infection. This may be related to the disease itself, to aggravated stress factors, or both.

Keywords: Subjective sleep disturbances, post-COVID-19 infection, pandemics

Öz

Amaç: Sosyoekonomik ve psikolojik faktörler nedeniyle pandemi dönemlerinde uyku bozuklukları daha sık ortaya çıkabilir. Bununla birlikte, enfeksiyonun kendisi de kolayca gözden kaçabilecek bir dizi uzun süreli komplikasyona neden olabilir. Bu çalışma, koronavirus hastalığı-2019 (COVID-19) enfeksiyonundan iyileşen olguların uyku durumlarının aynı sosyokültürel ortamda yaşayan ancak aynı dönemde COVID-19 enfeksiyonu geçirmemiş olgulardan farklı olup olmadığını incelemeyi amaçlamıştır.

Gereç ve Yöntem: Çalışmaya alınmadan en az bir ay önce iyileşen koronavirüs hastalığı-2019 (COVID-19) hastalığı tanısı olan 243 olgu (hasta grubu) ve aynı dönemde COVID-19 öyküsü olmayan 132 kişi (kontrol grubu) bu çalışmaya dahil edildi. Her iki grubun sosyodemografik ve tıbbi özellikleri kaydedildi ve her iki grupta uyku değerlendirmesi için Türk Uyku Tıbbi Derneği tarafından hazırlanan 17 maddeden oluşan öz değerlendirme formu kullanıldı.

Bulgular: Hasta grubunda toplam uyku kalitesinin öz değerlendirme puanları daha düşüktü ($p<0,001$). Ayrıca alt başlık puanlamaları da hasta ve kontrol grupları arasında bazı önemli farklılıkları ortaya çıkardı. Hasta grubu, önemli ölçüde daha fazla geceleri terleme; sabahları baş ağrısıyla yorgun uyanma; şiddetli horlama; bacaklarda huzursuzluk hissi ve uyuyamama kaygısı (sırasıyla; $p<0,001$, $p=0,003$, $p=0,016$, $p=0,016$, $p=0,032$) bildirdi.

Sonuç: COVID-19 olgularında iyileşmeden 1 ay sonra bile uyku, hastalığın kendisine veya hastalık nedeniyle artmış stres faktörlerine veya her ikisine bağlı olabilecek şekilde önemli ölçüde bozulmuştur.

Anahtar Kelimeler: Subjektif uyku bozukluğu, COVID-19 enfeksiyonu sonrası, pandemi

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Introduction

Sleep is very important for physical and mental health, as well as for a healthy immune system. Sleep can be disrupted for many reasons, with the most common being the feeling of restlessness, anxiety, disruptions in work and private life.¹ Under normal conditions, sleep disorders are already a common condition in society. Pandemics, due to their nature, may lead to the development of sleep disorders in individuals who have not experienced them previously or exacerbate existing conditions in those with a history of sleep disorders.

Coronavirus disease-2019 (COVID-19), that was declared a pandemic by the World Health Organization, has created an unexpected situation full of uncertainties, fear, and anxiety, affecting millions of people around the world in recent years. In this process, work and social life routines have been interrupted, and daily life activities have been altered to a great extent.²

The agent causing the pandemic or drugs that are used in the treatment of the infection may also be responsible for the occurrence of sleep disorders.^{2,3} Few studies have also hypothesized that the severe acute respiratory syndrome-coronavirus-2 (SARS-CoV-2) infection, itself, may lead to sleep disorders⁴⁻⁶ and they may easily be overlooked in situations with severe clinical consequences, such as COVID-19 pandemic. Therefore we planned to evaluate whether there were any differences in the sleep status of individuals with and without a history of SARS-CoV-2 infection in the same period.

Materials and Methods

The sleep status of 243 adult patients diagnosed with COVID-19 using current testing methods and who had completed treatment at least one month before the study, was compared to a control group of 132 adult individuals who did not have COVID-19 and lived in the same sociocultural environment during the same period.

Age, gender, marital status, educational status, occupation, height, weight, body mass index (BMI), presence of comorbidities, and medication use were recorded in a prepared form for both the patient and control groups. The patient group was additionally asked for the detailed clinical features of the COVID-19 disease, and their current health status.

A questioner, based on 17 items self-assessment survey that is prepared by the Turkish Sleep Medicine Society, was used to assess the sleep status of both groups (<http://www.tutd.org.tr/?p=uykunuzu-test-edin>) (Table 1). All participants were asked to score their sleep characteristics during the COVID-19 period from 1 (not affected at all) to 5 (totally and negatively changed). The results of the patient and control groups were compared for each item.

Since cases in a wide range of age were included in the patient and the control groups, considering that aging and gender may have an impact on sleep disorders, both groups were rerandomized to age and gender matched 19-40, 41-60 and 61-80 age subgroups. We also evaluated the impact of BMI and comorbid diseases in both groups and impact of hospitalization

as well as the severity of the disease in the patient group. Patients were grouped as normal (BMI <25), overweight (BMI =25-29.9) and obese (BMI ≥30).

The study was carried out in accordance with the principles of the Declaration of Helsinki following the approval of the Local Ethics Committee (SANKO University Faculty of Medicine Clinical Research Ethics Committee, decision number: 03, date: 17.09.2020). Informed consent was obtained from all individual participants included in this study.

Statistical Analysis

IBM SPSS Statistics v.23 software package was used for data analyses. As descriptive statistics, mean and standard deviation (SD) values were given for quantitative data, and number and percentage values for qualitative data. The conformity of the data to the normal distribution was evaluated with the Kolmogorov-Smirnov test. In the comparison of groups, the independent-samples t-test was used for quantitative data and the chi-square test for qualitative data, with p<0.05 being considered statistically significant. Additionally, chi-square in multiway contingency tables were performed for comparing the patient and control groups that were classified according to age, BMI and having comorbid diseases in terms of sleep parameters.

Results

A total of 243 individuals aged between 19 and 80 years (mean ± SD; 37.8±12.9 years) were included in the study as

Table 1. Sleep status inquiry survey prepared by the Turkish Sleep Medicine Society
Item 1. I feel tired and sleepy during the day despite getting enough sleep at night.
Item 2. I have trouble falling asleep two to three nights a week.
Item 3. In the evening or when I go to bed, I feel restlessness in my legs that I can not define.
Item 4. The thought that I will not be able to sleep worries me from the evening hours.
Item 5. I have to constantly move my legs in bed.
Item 6. I wake up at night with the feeling of not being able to breathe.
Item 7. I have been told that I snore so strongly that it can be heard it from adjacent rooms.
Item 8. I have been told that I stop breathing during sleep.
Item 9. I wake up to urinate at least once a night.
Item 10. I have sweating on my head, neck, or chest at night.
Item 11. I wake up tired and with a headache in the morning.
Item 12. I get cramps in my legs at night.
Item 13. I fall asleep during meetings or when reading something or watching TV.
Item 14. I can't drive for as long as I used to because of sleepiness.
Item 15. I experience episodes of unbearable sleepiness from time to time during the day.
Item 16. I dream very often.
Item 17. I have been told that I wake up at night screaming and terrified.

the patient group. Of these patients, 96 (39.5%) were men and 147 (60.5%) were women. The control group consisted of 132 people, 47 men (35.6%) and 85 women (64.4%), aged between 19 and 79 years (mean \pm SD; 35.7 \pm 13.3 years) (Table 2).

Comorbid diseases were present in 86 participants (35.4%) in the patient group and 31 participants (23.5%) in the control

group. Some cases had more than one comorbid disease. The patient and control groups were similar in terms of hypertension, coronary artery, lung, heart and cerebrovascular diseases, whereas diabetes mellitus was more common in the patient group. BMI was significantly higher in the patient group ($p < 0.001$) (Table 2). Groups were similar in terms of using sleep medication before or during the pandemic ($p = 0.573$ and $p = 0.115$, respectively).

In the patient group, 63 individuals (25.9%) were hospitalized due to COVID-19 infection. Three people (1.2%) were followed up in the intensive care unit, two of them (0.8%) required a respiratory support during hospitalization. At the time of the survey, 210 individuals in the patient group evaluated their health status as good (86.4%), 32 as moderate (13.2%), and one person as poor (0.4%). Fifty-nine cases in the control group (44.7%), had at least one person in the close circle that had a history of COVID-19.

The sleep status of patient group was significantly worse ($p < 0.001$). We presented the survey results of both groups in Table 3; impact of hospitalization in Table 4 and impact of disease severity in Table 5 for the patient group. During the pandemic, the patient group experienced "the anxiety of not being able to sleep" more intensely than the control group ($p = 0.032$). Patient and control groups were similar in terms of unbearable daytime sleepiness in the form of sleep attacks; need to take a nap during the day; being tired and sleepy during the day despite getting enough sleep at night; stop breathing during sleep and having increased leg cramps and dream frequency during sleep ($p = 0.617$, $p = 0.833$, $p = 0.110$, $p = 0.528$, $p = 0.508$ and $p = 0.398$, respectively) (Table 3). The patient and control groups were similar in having difficulty falling asleep two to three nights a week ($p = 0.063$). However cases with comorbid diseases in the patient group significantly complained of more difficulty falling asleep ($p = 0.001$). Patient and control groups were similar in regard to restlessness symptoms in the pre-pandemic period. However, the participants with a history of COVID-19 were significantly more likely to complain of a feeling of restlessness in their legs at rest ($p = 0.016$), that was also common in those who had severe and moderate disease course ($p = 0.043$). Also, urge to constantly move their legs in bed was more prevalent in the patient group ($p = 0.033$).

The incidence of severe snoring was significantly higher in the patient group ($p = 0.016$) compared to the control group, and that was related to the age range of 41-60 years ($p = 0.010$), to having comorbid diseases ($p = 0.027$) and to hospitalization ($p = 0.013$) in the patient group. Additionally, snoring was reported significantly more in overweight ($p = 0.042$) but not in obese cases ($p = 0.701$) in the patient group according to the controls. However intergroup evaluation of the patients revealed that snoring were significantly higher in obese cases ($p < 0.001$).

The incidence of sweating in the head, neck, or chest at night was significantly higher in the patient group ($p < 0.001$), that was related to the age ranges 19-40 ($p = 0.013$) and 61-80 years ($p = 0.007$), to having comorbid diseases ($p = 0.008$) and to hospitalization ($p = 0.002$).

Table 2. Sociodemographic data of the patient and control groups

	Individuals with a COVID-19 history (n=243)	Individuals without a COVID-19 history (n=132)	
Demographic characteristics	Mean \pm SD	Mean \pm SD	p
Age	37.8 \pm 12.9	35.7 \pm 13.3	0.138
BMI	26.4 \pm 4.8	24.6 \pm 3.9	<0.001
	n (%)	n (%)	
BMI <25 (normal)	96 (39.5)	85 (64.4)	
BMI 25-29.9 (overweight)	99 (40.7)	32 (24.2)	
BMI \geq 30 (obese)	48 (19.8)	15 (11.4)	
Age groups			
19-40 years	163 (67.1)	97 (73.5)	0.118
41-60 years	60 (24.7)	25 (18.9)	0.160
61-80 years	20 (8.2)	10 (7.6)	0.144
Gender			
Male	96 (39.5)	47 (35.6)	0.458
Female	147 (60.5)	85 (64.4)	
Marital status			
Married	166 (68.3)	87 (65.9)	0.635
Single	77 (31.7)	45 (34.1)	
Educational status			
None	6 (2.5)	2 (1.5)	0.009
Literate	4 (1.6)	1 (0.8)	
Primary school	29 (11.9)	5 (3.8)	
Middle school	18 (7.4)	2 (1.5)	
High school	41 (16.9)	26 (19.7)	
University	145 (59.7)	96 (72.7)	
Comorbidity			
Absent	157 (64.6)	101 (76.5)	
Hypertension	25 (10.3)	7 (5.3)	0.099
Coronary artery disease	10 (4.1)	2 (1.5)	0.172
Lung disease	14 (5.8)	2 (1.5)	0.052
Diabetes mellitus	24 (9.9)	3 (2.3)	0.007
Heart valve disease	5 (2.1)	5 (3.8)	0.332
Cerebrovascular disease	4 (1.6)	1 (0.8)	0.661
Others (hyperlipidemia, thyroid diseases etc.)	57 (23.5)	19 (14.4)	0.037
n: Number, SD: Standard deviation, BMI: Body mass index, COVID-19: Coronavirus disease-2019 (significant at $p < 0.05$)			

The participants with a history of COVID-19 were significantly more likely to complain of waking up tired and with a headache in the morning ($p=0.003$), and that was related to the age range of 19-40 years ($p=0.020$), to having comorbid diseases ($p=0.022$), and to having severe disease course ($p=0.005$). Feeling tired and sleepy during the day despite getting enough sleep at night was more prevalent in the cases younger than 60 years in the patient group ($p=0.026$). Severe snoring; waking

Table 3. Comparison of the survey responses of the patient and control groups

Questions	Individuals with a COVID-19 history (n=243)		Individuals without a COVID-19 history (n=132)		p
	Sometimes (%)	Always (%)	Sometimes (%)	Always (%)	
Item 1	49.4	28.8	56.8	18.9	0.110
Item 2	35.4	22.2	30.3	15.2	0.063
Item 3	32.1	17.3	21.2	12.9	0.016
Item 4	15.6	9.5	17.4	2.3	0.032
Item 5	21.4	16.9	20.5	7.6	0.033
Item 6	18.1	4.1	12.1	1.5	0.105
Item 7	11.5	10.7	6.8	3.8	0.016
Item 8	8.2	0.8	6.8	0.0	0.508
Item 9	32.9	30.5	33.3	24.2	0.384
Item 10	31.3	12.8	22.7	2.3	<0.001
Item 11	43.2	14.8	37.9	5.3	0.003
Item 12	31.3	6.6	28.0	4.5	0.528
Item 13	34.6	6.2	35.6	7.6	0.833
Item 14	12.3	0.4	9.1	0.8	0.582
Item 15	34.2	6.6	29.5	6.1	0.617
Item 16	33.7	16.5	37.1	11.4	0.398
Item 17	13.6	0.4	6.8	0.8	0.130

COVID-19: Coronavirus disease-2019, n: Number (significant at $p<0.05$)

Table 4. Comparison of the survey responses of hospitalized and non-hospitalized COVID-19 patients

Questions	Hospitalized COVID-19 patients (n=66)		Non-hospitalized COVID-19 patients (n=184)		p
	Sometimes (%)	Always (%)	Sometimes (%)	Always (%)	
Item 1	30.2	36.5	56.1	26.1	0.001
Item 2	33.3	23.8	36.1	21.7	0.904
Item 3	38.1	15.9	30.0	17.8	0.496
Item 4	15.9	12.7	15.6	8.3	0.583
Item 5	20.6	20.6	21.7	15.6	0.650
Item 6	25.4	4.8	15.6	3.9	0.195
Item 7	15.9	19.0	10.0	7.8	0.013
Item 8	12.7	3.2	6.7	0.0	0.016
Item 9	31.7	46.0	33.3	25.0	0.003
Item 10	36.5	23.8	29.4	8.9	0.002
Item 11	42.9	19.0	43.3	13.3	0.513
Item 12	38.1	9.5	28.9	5.6	0.158
Item 13	41.3	12.7	32.2	3.9	0.009
Item 14	12.7	0.0	12.2	0.6	0.836
Item 15	33.3	7.9	34.4	6.1	0.879
Item 16	33.3	15.9	33.9	16.7	0.981
Item 17	14.3	0.0	13.3	0.6	0.826

COVID-19: Coronavirus disease-2019, n: Number (significant at $p<0.05$)

up to urinate at least once a night; sweating in the head, neck and chest at night; and falling asleep in meetings, reading or watching TV was also found to be significantly more in the cases over 40 years of age ($p<0.001$, $p=0.007$, $p=0.016$, $p=0.043$, respectively).

The results of the statistical analysis performed to evaluate if age has an impact on sleep parameters revealed some differences related with age were present. Sweating on head, neck, or chest at night, waking up tired with a headache in the morning and waking up at night screaming and terrified were more prevalent in the younger cases in the patient group ($p=0.013$, $p=0.020$ and $p=0.016$; respectively). Middle aged cases had severe snoring ($p=0.010$), and older case were complained of sweating on head, neck, or chest at night ($p=0.007$) more than the controls. Significant results are shown in Table 6.

However, when chi-square test for multiway contingency tables

were performed to compare the patient and control groups in terms of sleep parameters; snoring, daytime fatigue and daytime sleepiness did not show any relation with age groups, BMI or having comorbid diseases ($p<0.05$).

Discussion

In the present study, self-assessment scores for the quality of sleep status were lower in the patient group. Moreover, subtitle scorings also revealed some significant differences between patient and control groups. The patient group had significantly more fear about not being able to sleep, restlessness in the legs, waking up tired with a headache in the morning, severe snoring, and night sweats compared to the controls. Taking into consideration that the control group lived in the same sociocultural milieu in the same period, these findings may not be due to the changing condition during pandemic but rather

Table 5. Comparison of the survey responses by disease severity in COVID-19 patients

Questions	Severe (n=28)		Moderate (n=133)		Mild (n=89)		p
	Sometimes (%)	Always (%)	Sometimes (%)	Always (%)	Sometimes (%)	Always (%)	
Item 1	38.5	38.5	47.7	34.6	55.2	17.2	0.039
Item 2	23.1	34.6	40.0	23.1	32.2	17.2	0.123
Item 3	23.1	26.9	38.5	18.5	25.3	12.6	0.043
Item 4	11.5	15.4	20.0	9.2	10.3	8.0	0.248
Item 5	15.4	23.1	23.8	17.7	19.5	13.8	0.619
Item 6	26.9	3.8	21.5	3.8	10.3	4.6	0.204
Item 7	15.4	23.1	13.1	8.5	8.0	10.3	0.140
Item 8	15.4	0.0	6.9	1.5	8.0	0.0	0.440
Item 9	30.8	46.2	36.2	30.8	28.7	25.3	0.107
Item 10	42.3	15.4	31.5	16.2	27.6	6.9	0.105
Item 11	50.0	26.9	46.9	16.9	35.6	8.0	0.005
Item 12	42.3	15.4	34.6	8.5	23.0	1.1	0.003
Item 13	50.0	15.4	33.8	6.9	31.0	2.3	0.022
Item 14	19.2	0.0	15.4	0.8	5.7	0.0	0.153
Item 15	42.3	7.7	41.5	7.7	20.7	4.6	0.009
Item 16	34.6	19.2	32.3	20.8	35.6	9.2	0.254
Item 17	11.5	0.0	15.4	0.0	11.5	1.1	0.639

COVID-19: Coronavirus disease-2019, n: Number (significant at $p<0.05$)

Table 6. Comparison of the survey responses by age subgroups in COVID-19 patients

Individuals with a COVID-19 history (n=243)	Age 19-40	Age 41-60	Age 61-80	p
Questions	Sometimes-always (%)			
Item 1	(52.8-28.8) ^a	(48.3-30.0) ^a	(25.0-25.0) ^b	0.026
Item 7	(6.1-3.7) ^a	(18.3-25.0) ^b	(35.0-25.0) ^b	<0.001
Item 8	(4.9-0) ^a	(15.0-0) ^a	(15.0-10.0) ^b	<0.001
Item 9	(33.7-23.3) ^a	(31.7-43.3) ^b	(30.0-50.0) ^b	0.007
Item 10	(31.3-8.0) ^a	(31.7-20.0) ^b	(30.0-30.0) ^b	0.016
Item 13	(29.4-4.9) ^a	(41.7-8.3) ^b	(55.0-10.0) ^b	0.043

COVID-19: Coronavirus disease-2019, n: Number (significant at $p<0.05$), ^{a,b}: Values with the same letter are not significantly different

may be related to the infection or an additional psychological burden of being diseased.

Snoring was more common in the patient group but stop breathing was similar in patient and control groups. Although both, snoring and stop breathing were more prevalent in the hospitalized patient group, they did not seem as effected by the severity of the disease course according to the self-assessment of the patients. Snoring was more common in the cases that were in the age of 41-60 years and with comorbid diseases in the patient group. Additionally, BMI mean was higher in the patient group. Taking these results together, snoring may not be a symptom of obstructive sleep apnea, rather it may be related to the viral disease itself or to some other features in the patient group.

Our results revealed that, patient and control groups were similar in terms of feeling tired and sleepy during the daytime despite sleeping for a sufficient time in the nighttime and dreaming more frequently. Consistent with these results, previous studies conducted during the pandemic reported that daytime drowsiness and sleepiness were frequently seen in both individuals with and without a history of COVID-19.^{5,6} A survey study investigating dreaming during the COVID-19 quarantine in Italy also found that people's dreams were significantly affected during the quarantine period.⁷

In the present study the patient and control groups were similar in terms of feeling tired and sleepy whole day where waking up tired with a headache in the morning was more prevalent in the patient group. A previous study evaluating fatigue at 1.5-6 months after active infection in non-hospitalized COVID-19 cases, reported persistent complaint of fatigue in 46% of the patients.⁸ Headache has also been identified as one of the most common complaints in COVID-19 patients, both during and after active infection. In a meta-analysis, the prevalence of headache was determined as 47.1% in the acute phase of the disease while it was 10.2% on day 30, 16.5% on day 60, 10.6% on day 90, and 8.4% on 180 day after recovery.⁹ The discrepancy of these two findings suggests that waking up tired with a headache in the morning and feeling tired all the time during the day are not the two faces of the same sleep problem and should be evaluated separately in relation with COVID-19 pandemic.

When the cases with comorbid disease of the patient and control groups were compared with each other; difficulty falling asleep 2-3 nights a week, snoring that can be heard from the next room, sweating in the head, neck or chest at night, and waking up with headache and tiredness in the morning was more common in the patient group. However, all of these complaints can be seen in relation with viral infections rather than various comorbid diseases.

According to our results, sweating on head, neck, or chest at night, waking up tired with a headache in the morning and waking up at night screaming and terrified were more prevalent in the younger cases in the patient group. Middle aged cases had severe snoring, and older case were complained of sweating on

head, neck, or chest at night more than the controls. However, advanced analyses that were done to compare the patient and control groups in terms of sleep parameters according to age groups, BMI or having comorbid diseases did not show any statistically significant relation. These results give the impression that disturbed sleep parameters depend mostly to COVID-19 infection.

One of the remarkable findings of this study is that approximately half of the patients with a history of COVID-19 reported feeling restlessness in their legs in the evening hours when they went to bed that is more prevalent in patients with moderate or severe disease course. Newly developed cases of restless legs syndrome (RLS) after the COVID-19 infection^{10,11} and behavioral changes caused by COVID-19 worsening or triggering RLS symptoms in susceptible individuals¹² was reported previously. The high rates found in our study, suggest that RLS symptoms may be seen more frequently than expected after the COVID-19 infection, and patients should be questioned in detail in this respect.

Although it has not been clarified yet, the SARS-CoV-2 virus or the disease process may cause sleep disorders,⁵ a meta-analysis reported the prevalence of the sleep disorders in general population as 35.7% during COVID-19 pandemic and the incidence of sleep disorders as 74.8% in those who recovered from the COVID-19 infection.⁶ Previously, sleep-related problems were reported to be more frequent in COVID-19 cases even after the recovery of the acute infection.^{13,14} However, many conditions in pandemic, such as lockdown, fear and anxiety in the society, modified conditions of home and work life, changes in daily routines, socioeconomic changes, and difficulties in accessing health services may also lead to sleep problems.^{15,16} In the present study we believe that, simultaneously questioning the cases with and without a history of COVID-19 infection, that are from similar sociocultural environment in the same city, gave an opportunity to have some clues if the disease itself has an additional burden on sleep disorders during pandemic.

Study Limitations

Our study has certain limitations. Most participants in the patient group had a history of mild to moderate illness. Although these rates are similar to the observations in the general population, experiencing the COVID-19 infection in a particularly severe form may cause more severe anxiety and fear. Another limitation of our study is that the survey was conducted at least one month after the patients had recovered from COVID-19. Although the majority of our patients reported that they felt well in general at the time of the survey, character traits may cause health threats to be perceived at varying degrees and it is not possible to claim that a period of one month is sufficient to reduce the psychological effects of the disease. Lastly, although a telephone survey is a method that has been used in many different follow-up studies to ensure safety during the pandemic, it is necessary to consider the possibility that the results obtained using this method may not be sufficiently descriptive and reliable.

Conclusion

It is especially important to recognize and treat sleep disorders that may develop due to many factors during times of social stress, such as the COVID-19 pandemic. According to the results of our study, sleep problems were found to be significantly higher in the group with a history of COVID-19 infection than in the control group. Among these, the prominent findings were sweating at night, waking up tired with headache in the morning, severe snoring, restlessness legs symptoms and anxiety of not being able to sleep. These findings may be related to the COVID-19 infection, stress factors, or both.

Ethics

Ethics Committee Approval: The study was carried out in accordance with the principles of the Declaration of Helsinki following the approval of the Local Ethics Committee (SANKO University Faculty of Medicine Clinical Research Ethics Committee, decision number: 03, date: 17.09.2020).

Informed Consent: Informed consent was obtained from all individual participants included in this study.

Authorship Contributions

Concept: Y.E.F., E.K.C., A.N., P.G.K., D.A.Y., H.D., A.M.N., Design: Y.E.F., E.K.C., A.N., P.G.K., D.A.Y., A.M.N., Data Collection or Processing: Y.E.F., E.K.C., A.N., D.A.Y., Analysis or Interpretation: Y.E.F., E.K.C., A.N., P.G.K., D.A.Y., H.D., A.M.N., Literature Search: Y.E.F., E.K.C., A.N., D.A.Y., A.M.N., Writing: Y.E.F., E.K.C., A.N., P.G.K., D.A.Y., H.D., A.M.N.

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