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Original Article

Assessment of PAP Device Usage and COVID-19 Related Anxiety in Patients with OSAS During COVID-19 Pandemics

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Abstract

OBJECTIVE: In this study, we aimed to determine the positive airway pressure (PAP) device usage and pandemic-related anxiety in obstructive sleep apnea syndrome (OSAS) patients during the pandemic.

MATERIAL AND METHODS: Five hundred twenty-seven OSAS patients were recruited into the study. A questionnaire consisting of 7 questions was filled to find out their Coronavirus disease-2019 (COVID-19)-related anxiety levels and PAP device usage.

RESULTS: The mean age of the patients was 53.3 years (±11.9). One hundred forty-one 141 (27%) of the participants were female and 382 (73%) were male. Two hundred sixteen (41%) patients reported using the PAP device regularly [PAP (+) group); 307 (59%) patients reported not using it at all or using it irregularly (PAP (-) group]. Forty-nine (23%) PAP (+) patients and 91 (29%) PAP (-) patients had COVID-19. The use of a PAP device was not significantly associated with an increased risk of COVID-19 infection ($P = 0.077$). The most common symptom was myalgia without a between-group difference, ($P = 0.967$). There was no significant difference between the PAP (+) and PAP (-) groups in the hospitalization rates for COVID-19 ($P = 0.252$). The presence of apnea was not considered as a cause of a higher level of COVID-19-related anxiety in patients with the PAP (+) group compared to the PAP (-) group ($P = 0.095$).

CONCLUSION: There was no evidence that the use of PAP devices in OSAS patients influenced the risk of getting COVID-19 and the clinical course of the disease. PAP device usage did not affect the level of anxiety associated with the pandemic in patients.

KEYWORDS: Obstructive sleep apnea syndrome, COVID-19, positive airway pressure, sleep disorder, anxiety

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INTRODUCTION

Coronavirus disease-2019 (COVID-19) is a disease caused by Severe acute respiratory syndrome-Coronavirus-2 that presents with shortness of breath, headache, fever, loss of smell and taste, cough, myalgia, and sore throat.[1] The initial instances of COVID-19-related pneumonia emerged in Turkey during March 2020. Obstructive sleep apnea syndrome (OSAS) is characterized by disrupted breathing patterns and cessation of breathing during sleep, particularly prevalent in obese individuals; it is clinically identified through a polysomnography-detected apnea-hypopnea index of ≥5 and has an average prevalence of 22% among men and 17% among women.[2,3] Elderly individuals who are diagnosed with hypertension, diabetes, cardiac conditions, and obesity encounter an increased susceptibility to mortality upon contracting COVID-19; these are also recognized as established risk factors for OSAS.[4,5] Amidst the global COVID-19 pandemic, patients' non-emergency access to medical facilities, including hospitals, was notably curtailed. This trend encompassed the closure of sleep laboratories and outpatient clinics specializing in sleep disorders within Turkey as well as on a global scale, as part of comprehensive quarantine directives.

Several risk factors have been identified as potentially contributing to increased morbidity from COVID-19 in adults, including advanced age, male gender, and pre-existing comorbidities.[6] A potential association between the presence of OSAS and heightened susceptibility to COVID-19 infection is suspected and it is suggested that individuals with

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OSAS who contract COVID-19 may encounter exacerbated respiratory complications, potentially leading to increased mortality rates and the management of these patients poses distinctive challenges amid the pandemic and finally, the impact of pandemic conditions on the utilization of positive airway pressure (PAP) devices, recognized as the gold standard therapeutic modality for OSAS, remains uncertain.[7-9]

This study aims (1) to elucidate the frequency and clinical progression of COVID-19 in OSAS patients during the pandemic period, (2) to discern whether the adoption of PAP therapy has undergone alterations since the pandemic's start and (3) to ascertain the potential heightened vulnerability of individuals with sleep apnea to COVID-19 contraction, as well as (4) to explore their apprehensions regarding potential exacerbation of complications upon COVID-19 infection.

MATERIAL AND METHODS

Study Design

The study was conducted between 13 December 2020 and 29 May 2021. Patients diagnosed with OSAS according to the International Classification of Sleep Disorders-3 diagnostic criteria and followed up in the sleep outpatient clinic at the Neurology Department of the Marmara University Faculty of Medicine were identified. They were telephoned and informed about the study. Five hundred fifty-eight patients who underwent titration procedures at the sleep laboratory of Marmara University Faculty of Medicine, were called. Five hundred twenty-three patients who gave verbal consent to participate in this study were included, and the remaining 35 patients could not be reached. Using a telephone-based method, patients were contacted and administered a 12-question survey (Table 1). The survey focused on PAP device usage during the pandemic, concerns about the potential worsening of COVID-19 due to OSAS (Question 9), and levels of anxiety (Question 11) (Table 1). Drawing inspiration from the research conducted by Thorpy et al.[10] in the context of patients afflicted with OSAS, this inquiry encompassed the assessment of pandemic-related anxiety and the utilization status of PAP devices. The study included all individuals aged 18 or above, diagnosed with OSAS, who provided informed consent for their participation. Exclusion criteria encompassed patients unable to respond to the complete questionnaire. Patients who reported consistent use of the PAP device were categorized into the PAP (+) group, while those who reported no use or irregular use were placed in the PAP (-) group.

Main Points

- Obstructive sleep apnea syndrome (OSAS) patients were largely non-compliant with the treatment in terms of device use, regardless of the pandemic period.
- The use of positive airway pressure (PAP) devices in OSAS patients had no effect on the risk of getting Coronavirus disease-2019 and the clinical course of the disease.
- PAP device usage did not affect the level of anxiety associated with the pandemic in patients.

This study was approved on 03.12.2021 by Marmara University Faculty of Medicine's Clinical Research Ethics Committee with the protocol code of 03.12.2021.1399.

Statistical Analysis

All statistical analyses were performed using Statistical Package for the Social Sciences (SPSS) 26.0 for Windows (SPSS Inc., Chicago, IL, USA). The normality assumptions for all variables were tested using the Shapiro-Wilk test. Continuous variables were reported as means with standard deviations, or medians with interquartile ranges, and categorical variables were reported as percentages. Categorical variables were compared with Pearson's chi-square test or, when appropriate, Fisher's exact test. The Mann-Whitney U test was used when evaluating non-normally distributed (non-parametric) variables between two groups. The Spearman's correlation test was used to analyze the relationships between measurement datasets. All statistical tests were two-sided, and a P value <0.05 was considered significant.

RESULTS

Patients diagnosed with OSAS based on the International Classification of Sleep Disorders-3 diagnostic criteria and followed in the sleep outpatient clinic of the neurology department at Marmara University Faculty of Medicine, were identified. A total of 523 patients were included in the study, comprising 141 females (27%) and 382 males (73%), with a mean age of 53.3 years (standard deviation: 11.9, range: 23-90). Among these, 216 patients (41%) reported regular use of the PAP device, while 307 (59%) either did not use the device or used it irregularly.

Among regular PAP users, 49 patients (23%) contracted COVID-19 (Table 2), with myalgia being the most common symptom (76%, n = 37). Other symptoms frequently reported in this subgroup included fatigue (71%, n = 35), headache (51%, n = 25), fever (47%, n = 23), loss of smell (43%, n = 21), loss of taste (41%, n = 20), cough (39%, n = 19), and sore throat (8%, n = 4). In contrast, among the 307 non-users or irregular users of PAP devices, 91 patients (29%) were diagnosed with COVID-19 (P = 0.08) (Table 2). Symptom frequencies between COVID-19-positive PAP users and non-users were similar, with no statistically significant differences observed.

Hospitalization rates among COVID-19-positive patients also showed no significant differences based on PAP device usage, with 25 PAP users (12%) and 46 non-users (15%) requiring hospitalization (P = 0.25) (Table 2).

In the PAP user group, 31% (n = 67) were smokers, compared to 30% (n = 95) in the non-user group. Comorbidities such as diabetes (37%, n = 79), hypertension (44%, n = 96), and cardiovascular disease (8%, n = 18) were similarly distributed between the two groups, with no significant differences.

The analysis showed that concerns about COVID-19 exacerbation due to OSAS (Question 9) and levels of anxiety (Question 11) were comparable between PAP users and non-users who contracted COVID-19, with no statistically significant differences in either concern (P = 0.1 for both) (Table 2).

Of the COVID-19-positive PAP users, 45% (n = 22) discontinued PAP device usage during their illness (Question 7), while 19% (n = 27) of the 140 COVID-19-positive patients continued using the device throughout their illness (Question 12).

DISCUSSION

Obstructive sleep apnea is reported to have an average prevalence as high as 22% among men and 17% among women.[2,3] Patients who do not receive appropriate treatment for OSAS, such as PAP, face a greater risk for serious diseases such as hypertension, increased insulin resistance, ischemic cerebrovascular events, pulmonary hypertension, and metabolic syndrome.[11] With the emergence of the COVID-19 pandemic, the admission of non-urgent cases to medical facilities underwent stringent limitations. Consequently, the operations of sleep laboratories and sleep outpatient clinics

Table 1. COVID-19 and sleep apnea survey

1. Have you had COVID-19 disease?	Yes	No
2. What symptoms did you have?		
Headache		
Cough		
Sputum		
Fatigue		
Loss of smell		
Loss of taste		
Sore throat		
Muscle pain		
Fever		
3. Were you hospitalized?	Yes	No
4. Do you have any additional disease?		
Cardiovascular disease		
Obesity		
Hypertension		
Cardiac arrhythmia		
Kidney failure	Yes	No
Diabetes mellitus		
Asthma		
Chronic obstructive pulmonary disease		
Coronary artery disease		
Congenital heart disease		
Liver failure		
5. Do you smoke?	Yes	No
6. Are you using a PAP device?	Yes	No
7. Have you stopped using PAP due to COVID-19?	Yes	No
8. Do you use it more often after the COVID-19 pandemic?	Yes	No
9. Are you more worried about COVID-19 because you have apnea?	Yes	No
10. Do you think the main risk of contracting COVID-19 is apnea?	Yes	No
11. If you get COVID-19, do you think you will have a worse disease course because you have apnea?	Yes	No
12. Did you feel the need to use a PAP device when you got sick with COVID-19?	Yes	No

COVID-19: Coronavirus disease-2019, PAP: positive airway pressure, OSAS: obstructive sleep apnea syndrome

Table 2. COVID-19 infection incidence and related data according to PAP device use

	PAP (+) (n, %)	**PAP (-) (n, %)**	***P***
COVID-19 (+)	49 (23%)	91 (29%)	0.08
Hospitalization	25 (12%)	46 (15%)	0.25
Concerns about COVID-19 exacerbation (Question 9)	134 (62%)	212 (70%)	0.1
Level of anxiety (Question 11)	132 (61%)	209 (69%)	0.1

n: number, COVID-19: Coronavirus disease-2019, PAP: positive airway pressure, PAP (+): using the PAP device regularly, PAP (-): using the PAP device irregularly

were similarly curtailed, stemming from a combination of quarantine directives and the reassignment of clinical staff to COVID-19-related patient care. Given the restricted access of OSAS patients to medical services and the existing studies indicating an elevated risk of mortality and morbidity for OSAS patients in the context of COVID-19 infection, an imperative emerged to assess patients' adherence to PAP therapy.[7] Guided by the research conducted by Thorpy et al.,[10] we undertook this study.

While some studies advise OSAS patients to discontinue PAP device usage at home during the COVID-19 pandemic, other studies suggest the continuation of PAP treatment.[7,13] In a study investigating the changes of behavior in PAP device users during the COVID-19 pandemic, it was indicated that an increase in the viral load spreading to the environment with the use of PAP devices in patients infected with COVID-19 and the higher risk of transmission to people sharing the same environment are believed to increase.[14] In our study, it was observed that 45% of OSAS patients who were regular users of PAP and had a COVID-19 infection stopped using the device once infected. This behavior be attributed to the patients' perceptions of an augmented risk of virus transmission, heightened discomfort, issues with compliance, and amplified side effects, which may have been more clearly by the patients during infection. Additionally, patients may have faced increased challenges in addressing these concerns during the pandemic, because of restricted access or inability to access healthcare professionals or institutions.

The examination into the impact of the COVID-19 pandemic on PAP device usage in New York city revealed that 21% of participants increased their device usage, while 11% discontinued usage.[10] Additionally, an assertion was made suggesting that extended utilization of the PAP device is clinically safe.[10] 59% of the participants in our study reported that they used a PAP device irregularly or not at all. Regardless of the pandemic period, patients were found to be non-compliant with treatment, in terms of device use. Despite OSAS patients being categorized within the high-risk group due to comorbidities such as hypertension, obesity, and diabetes mellitus in relation to COVID-19 infection, their adherence to treatment was observed to be low. Additionally, there was a notable level of anxiety.

Previous investigations indicated that the prevalence of OSAS among COVID-19 cases requiring intensive care unit monitoring ranges from 8% to 28%, with OSAS potentially acting as a facilitator for COVID-19 infection, and linked to unfavorable outcomes in infected individuals.[15] Moreover, sleep deprivation has been proposed to contribute to the intensification of the pulmonary inflammatory process in COVID-19.[16] However, our study yielded results indicating no significant disparities in terms of disease contraction rates, symptoms, or hospitalization frequencies when comparing patients who used the PAP device with those who did not when infected with COVID-19. This could be attributed to the methodology involving telephone-based interactions with patients. Notably, data could not be gathered from individuals affected by COVID-19 with severe clinical courses, thus potentially introducing a bias. Moreover, patients' perceptions and recollections of the disease could have introduced variability in the results.

Thorpy et al.[10] reported that their patients were adherent to treatment and concerned about COVID-19-related complications even though they did not think they were subject to increased susceptibility to the infection. A French study showed that 33% of their study population discontinued PAP treatment without medical advice due to fear of increased virus transmission.[14] In our study population, differing from the previously mentioned studies, no notable distinction was found in the perception of susceptibility to severe infection due to OSAS between patients who had COVID-19 and utilized PAP devices and those who did not. This might be because of cultural and educational differences. Furthermore, it was ascertained that PAP device utilization did not influence the level of anxiety experienced during the pandemic in both our study group, and the study group of Thorpy et al.[10]

The main limitations of this study include its patient-centered assessment approach, the potential influence of sociocultural factors on responses to the anxiety scale, and its single-center design. Furthermore, the lack of evaluation of PAP device use and compliance in the pre-COVID-19 period for the same participant groups, as well as the assessment of anxiety levels using only a single question, represents additional constraints.

We investigated the impact of the COVID-19 pandemic and the infection on PAP device user behaviors through telemonitoring, and showed low device usage rates. This emphasizes the importance of creating health management plans and coordinating patient education in terms of possible health crises. Telehealth can be considered an effective way of facilitating patient care and avoiding unnecessary patient visits, especially for people at higher risk of contracting airborne diseases such as COVID-19 due to underlying health conditions or for those facing challenges in accessing physical sleep laboratory and outpatient clinic services due to geographic constraints or health-related limitations.

CONCLUSION

In conclusion, in this study, it was determined that during the COVID-19 pandemic, patients were largely non-compliant with the treatment in terms of device use. Even though OSAS patients were in the risk group for COVID-19, their anxiety levels were not high, and PAP device use did not affect the anxiety level during the pandemic period.

Ethics

Ethics Committee Approval: This study was approved by Ankara University Faculty of Medicine, Clinical Research Ethics Committee (registration number: İ2-80-20, date: 13.02.2020).

Informed Consent: Participants and their relatives were given clear information about the study and asked to read and sign the informed consent.

Footnotes

Authorship Contributions

Concept: G.S., Design: G.S., Data Collection or Processing: H.I., B.A., Analysis or Interpretation: H.I., B.A., E.V., Literature Search: H.I., B.A., E.V., B.B., K.A., Writing: E.V.

Conflict of Interest: No conflict of interest was declared by the authors.

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