

# Barriers to acceptance and adherence to continuous positive airway pressure therapy in patients with obstructive sleep apnea: a report from Kermanshah province, western Iran

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**Purpose:** Continuous positive airway pressure (CPAP) is the gold standard treatment for obstructive sleep apnea (OSA). CPAP acceptance and adherence are critical issues for optimal treatment outcome. Identifying barriers to acceptance and adherence can improve intervention development and outcomes. This study aimed to investigate the barriers to CPAP acceptance/adherence in patients with OSA in western Iran.

**Patients and methods:** Patients with OSA, who had been prescribed CPAP by the Sleep Disorders Research Center of Kermanshah University of Medical Sciences, were recruited. They were interviewed via telephone regarding acceptance (ie, CPAP use during the first 2 weeks) and adherence (ie, CPAP use 4 h/d for 70% of the nights per week). Barriers to acceptance and adherence were solicited.

**Results:** Out of a possible sample of 101, 97 patients (79 male) were reached and included in the study. They had a mean age of 48.76 years (SD =12.04) and mean apnea/hypopnea index score of 36.06 (SD =1.87). Patients were categorized into the following acceptance/adherence groups: nonacceptance (CPAP not purchased; 72.2%), poor adherence (5.2%), and adherent (22.7%). Inability to afford a CPAP device, perception of symptom reduction/no need for treatment, and dissatisfaction with treatment were among the most common reasons for nonacceptance and poor adherence.

**Conclusion:** CPAP acceptance and adherence in western Iran are low. Approximately 70% of the patients did not accept CPAP treatment (due to not obtaining the device) and 5% did not adhere. To improve acceptance/adherence, increased access (ie, reduced cost or increased insurance coverage) and enhanced education about the benefits of the treatment are recommended. Treatment monitoring via regular follow-ups may also prove beneficial.

**Keywords:** CPAP, acceptance, adherence, barriers, obstructive sleep apnea, Iran

## Introduction

Obstructive sleep apnea (OSA) is a common sleep disorder that is characterized by repetitive episodes of upper airway collapse resulting in apnea and/or hypopnea and sleep fragmentation.<sup>1,2</sup> Daytime symptoms of OSA include headache, excessive fatigue, and cognitive impairments, which may lead to occupational and vehicular accidents.<sup>3-5</sup> OSA is frequently comorbid with a wide range of conditions associated with increased mortality and reduced quality of life, including hypertension, diabetes mellitus, congestive heart failure, and cerebrovascular accident.<sup>6-11</sup> Epidemiological data indicate that OSA affects approximately 13% of men and 6% of women,<sup>1,2</sup> and the

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social cost of untreated OSA is significant. OSA's prevalence and related economic burden highlight the need for effective and available treatments.

Continuous positive airway pressure (CPAP) is the gold standard treatment for symptomatic patients with an apnea/hypopnea index (AHI)  $\geq 5$  and nonsymptomatic patients with an AHI  $\geq 15$ .<sup>12</sup> Researchers have demonstrated that CPAP treatment is associated with significant improvements in daytime fatigue, mood disturbances, and functional and neuropsychological performance.<sup>13,14</sup> CPAP has also proven efficacious in decreasing comorbid hypertension and cardiovascular disease.<sup>15,16</sup>

Despite its efficacy, CPAP acceptance, commonly defined as CPAP use during the first 2 weeks following prescription,<sup>17</sup> and adherence, commonly defined as use of CPAP for 4 h/night during 70% of nights,<sup>18</sup> are poor among multiple patient populations. Reported acceptance rates can be as low as 4%,<sup>19</sup> and adherence rates range from 5% to 89% over the first 6 months.<sup>20</sup> Importantly, acceptance has been reported as a predictor of long-term CPAP adherence.<sup>21</sup> Adherence, in particular, may be influenced by a myriad of factors,<sup>22</sup> including OSA severity, preexisting hypertension,<sup>23</sup> level of functioning (ie, daytime and nocturnal) at time of diagnosis,<sup>24</sup> spousal involvement in treatment,<sup>25</sup> problems with device use (eg, mask fit), psychological disposition, nasal stuffiness, claustrophobia, reticence toward treatment, disturbance of bed partner,<sup>26</sup> and financial cost.<sup>27</sup> With regard to the latter, patients with low socioeconomic status or those experiencing financial crisis have lower rates of adherence and reduced access to treatment.<sup>27</sup>

Specific research on this topic in Iran is limited at this time. In a brief report, Khazaie, and Maroufi<sup>19</sup> followed public transport drivers in western Iran who were prescribed CPAP for treatment of OSA. Acceptance was remarkably low, with only 2 of 50 drivers agreeing to use the device. The authors emphasized poor acceptance and the potential risk of untreated OSA among this patient cohort.<sup>19</sup> A second study was conducted at Baqiyatallah Hospital in Tehran.<sup>28</sup> Here, the long-term adherence rate among CPAP users ( $n=49$ ) was 59.2%. The researchers recommended improved insurance coverage for CPAP devices, enhanced patient education, and follow-up services to improve CPAP adherence. These reports highlight the need for region-specific research in Iran. Specifically, the Tehran study highlighted nonadherence as the primary issue, while the western Iran study emphasized issues relating to CPAP nonacceptance. As such, additional research is needed to understand regional issues impacting CPAP acceptance/adherence. The present study addresses this empirical gap by investigating the barriers to CPAP acceptance/adherence in

patients with OSA who are living in Kermanshah province, a less wealthy province of western Iran.

## Patients and methods

### Study population and design

We employed a prospective follow-up design to determine acceptance, adherence, and associated barriers among a specific patient population in Kermanshah, Iran. Patients were recruited from the Sleep Disorders Research Center of Kermanshah University of Medical Sciences located in Kermanshah, Iran. The center's mission is the diagnosis, treatment, and empirical analysis of sleep disorders. All patients referred to this center from 2012 to 2017 who received a diagnosis of moderate to severe OSA were recruited. Additionally, all participants had undergone overnight polysomnography and were prescribed CPAP treatment based on the results.<sup>12</sup> Per the center's standard practice, these patients received education on OSA symptoms and consequences, and comprehensive CPAP training (ie, video training, group education, oral presentations from providers, and educational literature). Patients commonly received additional education and support by the medical equipment company from which they procured their CPAP device.

### Data collection

The medical records of 101 patients were retrieved and reviewed. All eligible patients were contacted by telephone by a single trained staff member and were asked to participate in an interview regarding CPAP use. After providing informed consent, each patient completed a semi-structured interview lasting at least 15 minutes. At the Sleep Disorders Research Center, all patients prescribed CPAP are expected to purchase the device themselves. As such, patients were first asked whether or not they purchased a CPAP device, and were subsequently categorized as "nonpurchasers" or "purchasers." Explicitly, nonpurchasers are patients who did not accept CPAP treatment (ie, lack of CPAP use during the first 2 weeks following prescription<sup>17</sup>). For each of these patients, the interviewer attempted to gather in-depth information about their reasons for nonacceptance. For "purchasers," information was gathered about their adherence (ie, CPAP usage for a minimum 4 h/d for at least 70% of the nights each week<sup>18</sup>). If they did not use their CPAP or were minimally adherent, their reasons were explored. Three groups emerged based on this process: a group who did not purchase and had never used CPAP (nonacceptance), a group who used CPAP but with poor adherence (poor adherence), and a group who adhered to their proscribed CPAP treatment (adherent). Baseline variables were systematically retrieved from preexisting medical records

of these patients. These included age, gender, body mass index (BMI), Epworth Sleepiness Scale (ESS), and AHI.

## Statistical analysis

Baseline characteristics are presented as descriptive statistics (ie, mean, SD). Between-group comparisons were conducted using 1-way analysis of variance. Analyses were conducted using SPSS software version 18 (SPSS Inc., Chicago, IL, USA). An  $\alpha$  coefficient of 0.05 was utilized across all analyses.

## Ethical approval

The study was approved by the ethical committee of Kermanshah University of Medical Sciences. All procedures performed in studies involving human participants were in accordance with the ethical standards of the committee and based on the 1964 Helsinki declaration and its later amendments or comparable ethical standards. Informed consent was obtained from all individual participants included in the study.

## Results

Patient baseline characteristics are presented in Table 1. On average, patients had been prescribed CPAP treatment 30.54 (SD = 1.56) months prior to study recruitment. In total, 101 patients were deemed study eligible, though 4 patients could not be contacted. The remaining 97 eligible patients participated in the study. Patients were categorized as nonacceptance (did not purchase), poor adherence, and adherent based on the aforementioned criteria. Table 2 presents group means and analysis of variance results based on age, gender, BMI, ESS score, AHI, follow-up month (ie, latency between CPAP prescription and study recruitment), and CPAP use duration. There were no statistically significant differences. Table 3 specifies the stated reasons for nonacceptance/poor adherence with associated frequencies.

## Discussion

The present study aimed to investigate the barriers to CPAP acceptance/adherence among patients receiving treatment

at the Sleep Disorders Research Center of Kermanshah University of Medical Sciences, Kermanshah, Iran: a unique sleep center in western Iran. This is the third study of its kind in Iran. The first study was a preliminary report from western Iran,<sup>19</sup> and the second was conducted in Teheran, the capital city of Iran.<sup>28</sup> Results indicate that CPAP acceptance/adherence among Kermanshah patients falls into 1 of 3 patterns: Nonacceptance (72.2%), poor adherence (5.2%), and adherent (22.7%). Between-group comparisons found no significant differences among these patient groups in regard to sex, age, BMI, EES score, AHI score, follow-up month, and CPAP use duration. The finding that approximately 77% patients did not accept/poorly adhered to CPAP treatment is consistent with previous research.<sup>19,20,28</sup> However, the absence of significant differences between-group predictors was unexpected,<sup>23</sup> though it may be attributed to the small sample size and low number of participants in the poor adherence group.

The present study identified multiple distinct CPAP acceptance/adherence barriers, which are listed in Table 3. Inability to purchase CPAP was reported by more than half of the patients (55.3%). Patients specified that high unit cost and limited insurance coverage were major factors in opting out of CPAP treatment. As expected, this reason was only cited by patients in the nonacceptance group. Similar findings have been reported across diverse communities,<sup>19,27</sup> indicating that improved insurance coverage or subsidized cost (eg, charity or government funding) may be key factors in CPAP acceptance in Iran and beyond.

Nonacceptance of CPAP should also be considered in light of sleep science's status in Iran. Sleep assessment and treatment is relatively new in Iran. As such, knowledge of sleep disorders and associated treatment technologies are very limited. The general public is unlikely to prioritize sleep as a part of basic health care. Disseminating information about the importance of treating sleep disorders, including OSA, via public health initiatives may significantly improve cultural awareness and acceptance of sleep-related interventions.

Sixteen percent of patients reported that symptom improvement without using CPAP contributed to nonacceptance and poor adherence. Researchers have reported similar findings,<sup>28</sup> but these claims should be critically analyzed. While symptom reduction may have occurred in some patients, it is also possible that patients have overlooked their symptoms and the importance of treatment. In a similar vein, researchers have determined that psychological variables impact patient perception of symptoms and treatment. Poulet et al<sup>29</sup> discovered that emotional state (eg, beliefs

**Table 1** Participant baseline characteristics

| Variable                   | M (SD)        |
|----------------------------|---------------|
| Age (years)                | 48.76 (12.04) |
| Gender (female)            | 18.6%         |
| BMI (kg/m <sup>2</sup> )   | 30.96 (5.07)  |
| ESS                        | 9.09 (4.84)   |
| AHI                        | 36.06 (1.87)  |
| Follow-up (months)         | 30.54 (1.56)  |
| CPAP use duration (months) | 24.66 (1.68)  |

**Abbreviations:** AHI, apnea/hypopnea index; BMI, body mass index; CPAP, continuous positive airway pressure; ESS, Epworth Sleepiness Scale.

**Table 2** Group characteristics and between-group differences

| Variable                   | Nonacceptance | Poor adherence | Adherent      | P-values |
|----------------------------|---------------|----------------|---------------|----------|
| Number of patients, n (%)  | 70 (72.2)     | 5 (5.2)        | 22 (22.7)     | N/A      |
| Gender (male/female), n    | 57/13         | 5/0            | 17/5          | 0.498    |
| Age (years)                | 48.71 (12.33) | 50.40 (17.14)  | 51.14 (5.35)  | 0.673    |
| BMI (kg/m <sup>2</sup> )   | 30.71 (4.91)  | 31.08 (5.0)    | 31.70 (5.91)  | 0.729    |
| ESS                        | 9.26 (4.85)   | 8.0 (6.48)     | 8.71 (4.74)   | 0.815    |
| AHI                        | 35.72 (18.13) | 42.98 (10.62)  | 37.96 (20.09) | 0.659    |
| Follow-up month            | 25.87 (13.70) | 31.20 (18.19)  | 28.0 (15.52)  | 0.638    |
| CPAP use duration (months) | 0             | 19.80 (20.0)   | 25.94 (16.34) | 0.481    |

**Note:** Data shown as mean (SD) unless indicated otherwise.

**Abbreviations:** AHI, apnea/hypopnea index; BMI, body mass index; CPAP, continuous positive airway pressure; ESS, Epworth Sleepiness Scale; N/A, not applicable.

about subjective health status) and beliefs about treatment efficacy predict CPAP acceptance. Evidence that psychological states moderate subjective experience suggests that addressing these variables may have a significant impact on CPAP adherence. As such, the inclusion of behavioral health specialists in treatment, which is common for many patient populations, is recommended.

A significant proportion of patients (10.66%) reported that they were instructed not to utilize their CPAP device by another physician, especially ear-nose-throat specialists. This phenomenon has not been reported elsewhere and is concerning. More research is needed to understand the nature of this barrier among the present sample. Nonetheless, collaborative care models should be utilized to ensure that patients' various providers are working in conjunction, rather than at odds, with one another. Whether through integrated care teams or informal consultation, physicians are advised to collaborate to ensure that their patients receive a unified, coherent understanding of their treatment needs. Undermining the treatment recommendations of fellow physicians may erode patient confidence in treatment and negatively impact acceptance across other treatment settings.

Five patients who never used their CPAP device cited that the device was intolerable. Given that these individuals never actually used their CPAP, it may be that psychological variables (eg, negative perception of treatment or prognosis) influenced perception of tolerability. Lack of sufficient education may also explain this barrier. Video education, which is common, may be insufficient. Providing patients with experiential learning opportunities, such as monitored use, may significantly enhance patient efficacy and perceived tolerability.

One patient reported that nightly use was too difficult, and 4 participants reported lack of information impacted use. Again, sufficient education and experiential learning may prove effective in addressing these barriers. Employing psychological principles to increase motivation (eg, evaluating pros and cons) and the use of self-monitoring (eg, recording sleep quality) may help patients recognize the benefits of CPAP use and increase acceptance/adherence. Researchers have also found that spousal involvement can enhance CPAP adherence,<sup>22</sup> indicating that spousal inclusion in treatment education may prove vital.

Improved treatment education may also address the "lack of satisfaction" barrier, which has been previously reported.<sup>30</sup>

**Table 3** Reasons for non-/poor adherence

| Reason                                 | N             |                | N  | Percentage |
|--|---------------|----------------|----|------------|
|  | Nonacceptance | Poor adherence |    |            |
| Unable to afford CPAP                  | 40            | 0              | 40 | 53.33      |
| Symptom improvement without CPAP       | 10            | 2              | 12 | 16.00      |
| Advised by other physicians not to use | 8             | 0              | 8  | 10.66      |
| Unable to tolerate device              | 5             | 0              | 5  | 6.66       |
| Nightly use too frequent               | 1             | 0              | 1  | 1.33       |
| Unsure how to use device               | 3             | 1              | 4  | 5.33       |
| Not satisfied with CPAP treatment      | 0             | 2              | 2  | 2.66       |
| Plan to undergo surgery                | 1             | 0              | 1  | 1.33       |
| Fear of social judgment                | 2             | 0              | 2  | 2.66       |

**Abbreviation:** CPAP, continuous positive airway pressure.



Patients (n=2) shared that device noise and side effects (eg, dry nose) discouraged use. Helping patients recognize the long-term benefits of CPAP treatment may help them reevaluate these costs. So too, improved in-home technical support to reduce noise and to devise a convenient configuration may improve satisfaction and the viability of adherence.

One patient reported nonacceptance because he elected to undergo surgery. Given the multitude of possible treatments, it is imperative that patients are provided with clear information about the pros and cons of the various options. Again, integrated/collaborative treatment models help ensure that patients receive comprehensive, patient-focused care.

Finally, concern about judgment was a barrier (n=2) that has not been previously reported. Patients expressed worry of ridicule or being stigmatized as a “patient.” Again, behavioral health psychologists capable of addressing such concerns, while being sensitive to sociocultural context, may significantly enhance acceptance. Future research is needed to understand the prevalence and nature of treatment stigma among this patient population.

## Strengths and limitations

The present study is only the third of its kind in Iran and provides unique information about barriers to care among patients in less affluent communities. Multiple barriers were highlighted that may prove helpful in treatment planning and policy making both within and outside Iran. Furthermore, this study highlights unique barriers, such as physician disagreement and stigma, that should be considered by future researchers.

The main limitation was the lack of device titration information, which is carried by sales companies. We relied on subjective report of CPAP usage and did not quantify duration of use. Given that participants frequently overestimate health behaviors, adherence may actually be less than what was reported. Lack of access to exact incomes of our patients was another limitation. Research suggests that socioeconomic status is a common barrier to acceptance. Future research, should attempt to gather and analyze this data. Finally, the study's small sample size suggests that findings should be generalized with caution. Additional research is needed to determine accurate usage rates and the nature/prevalence of barriers.

## Conclusion

Acceptance and/or adherence to CPAP are poor among patients in Kermanshah, Iran. Approximately three-fourths of study patients either never initiated treatment or discontinued treatment. While many barriers were articulated, a

significant proportion of patients never used CPAP due to economic reasons, suggesting that reduced cost, increased insurance coverage, and/or subsidization may be the most effective step to increase acceptance. Beyond this, improved community awareness about the importance of sleep disorders treatment is necessary.

Improved patient education and attention to psychological factors would also address multiple barriers impeding adherence. Physicians are encouraged to expand patient education to include experiential learning and to involve other providers in the treatment planning and implementation process. Unified, collaborative treatment will empower clients to achieve treatment success and ensure that they are adequately educated and motivated. Furthermore, provider involvement should span the course of treatment, including in-person follow-ups and phone consultations.

## Author contributions

All authors contributed toward data analysis, drafting and revising the paper and agree to be accountable for all aspects of the work.

## Disclosure

The authors report no conflicts of interest in this work.

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