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Original Research Article

Factors affecting consultation and intervention for sleep disordered breathing

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ABSTRACT

Background: This study was to investigate the general public's treatment preferences for sleep disordered breathing.
Methods: Anonymous online questionnaire distributed using Amazon Mechanical Turk and the Functional Outcomes of Sleep Questionnaire (FOSQ-10) responses were collected. The surveys of the respondents who met inclusion criteria were assessed in data analysis portion of the study. Descriptive statistics, paired t-tests, and Pearson's chi-squared tests were used to analyze data. This was a survey-based study conducted from October 2014 through June 2024.
Results: Of 3,259 participants, 931 (28.6%) are formally diagnosed with sleep disordered breathing (SDB). 891 (95.7%) sought intervention; 40 (4.3%) did not. Nasal appliance (50.8%), oral appliance (38.8%), and continuous positive airway pressure (CPAP) (32.8%) were the three most preferred treatment modalities. Respondents who have romantic partners who complain of their symptoms were more likely to seek otolaryngology consult (p=0.0001) and surgical intervention (p=0.0087). Most respondents with formal diagnosis had seen an otolaryngologist and done research on their condition.
Conclusions: This study describes the public's preferences related to sleep disorders and the factors that dictate these preferences. Factors that influence this desire to pursue treatment include sex assigned at birth, marital status, and romantic partners who complain of symptoms. Understanding these can help us better identify, understand, educate, intervene and improve the quality of life and health outcomes for patients.

Keywords: Sleep disordred breathing, Sleep medicine, Sleep surgery, Public interest

INTRODUCTION

Sleep disordered breathing (SDB) is a term used to describe a group of increasingly prevalent sleep disorders with a broad range of etiologies. The most common disorder that falls under this umbrella term is obstructive sleep apnea (OSA), a disorder that is characterized by transient decreases in airflow of at least 10 seconds while sleeping leading to daytime sleepiness.[1,2] Other forms of SBD include central sleep apnea, and sleep-related hypoventilation, each disorder having its own pathophysiology.[3] For example, OSA is due to obstruction of the upper airway, often due to obesity and airway fat deposition or excess tissue, whereas central sleep apnea is generally thought to be due to unstable respiratory centers in the central nervous system.[1,2] SDB, regardless of etiology, if left untreated, can be associated with significant cardiovascular, psychological, neurological, functional, and economic sequelae.[1,4-7] Due to the increase in the prevalence of obesity in western nations, among other factors, SDB is a growing public health concern. In fact, Yamagishi et al report a

prevalence of SDB the as high as 34.2% in males and 14.7% in females in their multi-national, multi-center study comparing differences in SBD prevalence between Minnesota, USA, and several communities in Japan.[8] The current literature also describes a disproportionate disorder burden on ethnic and racial minorities.[1,2,8]

Despite the prevalence and significant consequences associated with SDB, most patients remain undiagnosed and therefore untreated, leading to health burdens at not only on the individual, but also on the system level. The suggested reasoning for this possible under-recognition is due to variations in knowledge among primary care providers as well as patient-misinformation regarding the condition. Consequentially, the ability recognize the symptoms, among health care providers, but more broadly by the general public both in the United States and abroad is lacking.[2,9-12]

The FOSQ-30 is an instrument used measures daytime functional status in individuals with disorders of excessive sleepiness. This tool is used to discriminate between normal subjects and those who seek medical attention for their sleep disorders.[13] The FOSQ-10 is a validated study, that assess the same outcomes of the FOSQ-30 in a more concise manner. Due to the brevity of the FOSQ-10, it is easier to administer in a clinical setting and more convenient for subjects to respond to accurately giving it more utility for a study such as ours.[14]

The recognition, diagnosis, and subsequent treatment of SDB is dependent on individuals' ability to recognize signs and symptoms within themselves and to seek medical attention. In fact, Williams et al found that primary care physicians were ten times more likely to refer patients to a subspecialist for evaluation of OSA if the patient was aware and proactive about discussing their symptoms.[15] On the other hand, it is just as important for primary care providers as well as sleep surgeons to understand what patients with SDB pursue consultation from otolaryngologists, what interventions they are interested in, and what factors influence their decisions. For this reason, this study investigates the general public's interest in seeing otolaryngologists for SDB and the factors that influence their pursual of consultation and intervention.

METHODS

This study was carried out via an anonymous online questionnaire developed using Qualtrics[XM], a web-based survey collection platform. This was a survey-based study conducted from October 2014 through June 2024. The survey was distributed by the crowd-sourcing market engine Amazon Mechanical Turk. Amazon Mechanical Turk is an incentivized crowd-sourcing platform that identified and recruited participants that were appropriate for our study. Once the anonymous participants fully completed the survey, they were distributed $0.10 through the platform. The survey contained questions including weight, height, sex, marital status, race, age, previous diagnosis of sleep disordered breathing, previous interventions for sleep disordered breathing, interest in pursuing certain interventions, satisfaction with previous interventions, parental status, romantic partner complaints, and previous experiences with otolaryngologists. This survey was a part of a larger study in which another arm explored the relationship of SARS-CoV2 infection and sleep disturbances. A shortened version of the functional outcomes of sleep questionnaire (FOSQ) was distributed to participants (FOSQ-10). The highest score attainable on this questionnaire was 40. Higher scores indicate better sleep.

Participants were eligible for inclusion in this study if they were aged 18 years or older at the time of survey completion, were residents of the United States of America at the time of participation, and completed the survey in its entirety. In line with standard practices for transactions conducted on this platform, participants received monetary compensation for their involvement in the study. Each participant was provided with a code that entitled them to a payment of $0.10 upon completion of the survey.

Descriptive statistics were used to collate and analyze demographic information. Additionally, paired t-tests and Pearson's chi-squared tests were used to compare subgroups within our data set.

This study was designated exempt by the Institutional Review Board at Albany Medical Center.

RESULTS

Of the 3,529 total respondents, 931 (28.6%) have been formally diagnosed with sleep disordered breathing. Of these, 891 (95.7%) responded that they were interested in exploring some sort of intervention, whereas 40 (4.3%) responded they would not want to receive any of the interventions listed in our survey.

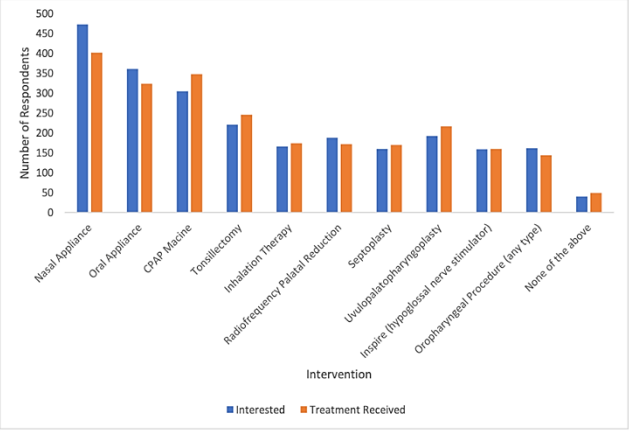

Figure 1: Respondent interest in receiving respective interventions vs. those treated with given interventions.

The most popular selections for intervention included conservative treatments, with nasal appliance (50.8%), oral appliance (38.8%), and continuous positive airway pressure (CPAP) machine (32.8%) being the three most popular selections (Figure 1).

Table 1: Chi-squared analysis of differences in the preference for surgery between subgroups among those in our study population with a diagnosis of sleep disordered breathing.

Variables	Total (n=931)	Desire surgery (n=479)	No surgery (n=452)	Desire surgery group expected values and (chi squared values)	No surgery group expected values and (chi squared values)	X2 sum	P value
Gender							
Male	509	263	246	261.9 (0.0048)	247.1 (0.0051)	0.0217	0.8828
Female	422	216	206	217.1 (0.0058)	204.9 (0.0061)		
Marital status							
In a relationship	43	17	26	22.12 (1.187)	20.88 (1.257)		
Married	752	400	352	386.9 (0.4432)	365.1 (0.4697)	15.19	0.0043
Single	125	62	63	64.31 (0.0832)	60.69 (0.0881)		
Divorced	8	0	8	4.116 (4.116)	3.884 (4.362)		
Other	3	0	3	1.544 (1.544)	1.456 (1.636)		
Ethnicity							
African American	87	47	40	44.76 (0.1119)	42.24 (0.1186)		
Asian American	196	102	94	100.8 (0.0133)	95.16 (0.0141)	2.306	0.6797
Caucasian	514	269	245	264.5 (0.0782)	249.5 (0.0828)		
Latinx	31	14	17	15.95 (0.2383)	15.05 (0.2525)		
Other	103	47	56	53.00 (0.6779)	50.01 (0.7184)		
Age (years)							
18-24	50	29	21	25.73 (0.4169)	24.27 (0.4418)		
25-34	426	233	193	219.2 (0.8718)	206.8 (0.9238)		
35-44	244	116	128	125.5 (0.7247)	118.5 (0.7680)	6.139	0.2929
45-54	129	65	64	66.37 (0.0283)	62.63 (0.0300)		
55-65	65	29	36	33.44 (0.5902)	31.56 (0.6254)		
65 +	17	7	10	8.747 (0.3487)	8.253 (0.3696)		
Complaint from partner							
Yes	693	374	319	356.5 (0.8541)	336.5 (0.9052)	6.882	0.0087
No	238	105	133	122.5 (2.487)	115.5 (2.636)		

Of the respondents with SDB, 882 (94.7%) have received treatment for snoring or sleep-related breathing disorders in the past. The most utilized treatments were nasal appliance (43.2%), CPAP machine (37.4%), and oral appliance (34.8%). The most common procedure that respondents had received was tonsillectomy (26.4%), with other invasive procedures including uvulopalatopharyngoplasty (23.3%), radiofrequency palate reduction (18.4%), septoplasty (18.3%), and inspire (hypoglossal nerve stimulator) (17.2%) (Figure 1). Satisfaction scores were almost equivocal between the various surgical and non-surgical interventions included. On a 1-10 scale (1 being least satisfied, 10 being most satisfied) the difference between least satisfied and most satisfied was a mere 0.4 points on the scale (CPAP and preferences; the first group were those that desire surgical intervention (n=479,51.5%), which includes tonsillectomy, uvulopalatopharyngoplasty, septoplasty, radiofrequency palate reduction, inspire (hypoglossal nerve stimulator), or a combination of these procedures. The other group included those that do not desire surgical intervention or were willing to try conservative treatments (n=452,48.5%) including nasal appliance, oral appliance, CPAP machine, inhalation therapy (i.e., nebulizer or inhaler) or a combination of these. There was no difference in gender (p=0.8828), ethnicity (p=0.6797), age group (p=0.2929), or FOSQ-10 score (difference of 0.030 points, 95% CI:0.8137-0.7537) when comparing those that desire surgery and those that do not (Table 1). There was a statistically significant difference in marital status (p=0.0043) and complaint of a romantic partner (0.0087).

Table 2: Chi-squared analysis of differences in the preference for ENT consultation between subgroups among those in our study population with a diagnosis of sleep disordered breathing.

Variables	Total (n=412)	Desire ENT (n=327)	No ENT (n=85)	Desire ENT group expected values and (chi squared values)	No ENT group expected values and (chi squared values)	X2 sum	P value
Gender							
Male	228	193	35	181.0 (0.8009)	47.04 (3.081)	8.692	0.0032
Female	184	134	50	146.0 (0.9924)	37.96 (3.818)		
Marital status							
In a relationship	25	12	13	19.84 (3.099)	5.158 (11.92)		
Married	324	271	53	257.2 (0.7454)	66.84 (2.867)	28.30	1.083e-05
Single	57	41	16	45.24 (0.3974)	11.76 (1.529)		
Divorced	4	1	3	3.175 (1.490)	0.8252 (5.731)		
Other	2	2	0	1.587 (0.1073)	0.4216 (0.4216)		
Ethnicity							
African American	38	27	11	30.16 (0.3311)	7.840 (1.274)		
Asian American	93	78	15	73.81 (0.2375)	19.19 (0.9136)	3.793	0.4348
Caucasian	224	179	45	177.8 (0.0083)	46.21 (0.0319)		
Latinx	16	13	3	12.70 (0.0071)	3.301 (0.0274)		
Other	41	30	11	32.54 (0.1985)	8.459 (0.7635)		
Age (years)							
18-24	27	19	8	21.43 (0.2755)	5.570 (1.060)		
25-34	183	147	36	145.2 (0.0212)	37.75 (0.0816)		
35-44	107	87	20	84.92 (0.0507)	22.08 (0.1951)	3.607	0.6073
45-54	54	40	14	42.86 (0.1907)	11.14 (0.7338)		
55-65	34	29	5	26.99 (0.1504)	7.015 (0.5786)		
65 +	7	5	2	5.556 (0.0556	1.444 (0.2139)		
Complaint of partner							
Yes	316	264	52	250.8 (0.6941)	65.19 (2.670)	14.44	0.0001
No	96	63	33	76.19 (2.285)	19.81 (8.790)		

Notably, fewer respondents desired surgery if they did not have a complaint from the romantic partner about snoring and (observed=105, expected=122.5, X2=2.587) (Table 1). Of the 931 respondents formally diagnosed with sleep disordered breathing, we analyzed respondents who had strong preferences to seek ENT consultation (interest score 8-10) or had a strong preference of not seeking ENT consultation (interest score 1-3). There was a total of 412 (44.3%) that fell into one of these categories, with 327 (79.4%) strongly desiring ENT consultation, and 85 (20.6%) not. There was no difference in ethnicity (p=0.4348), age group (p=0.6073), or FOSQ-10 score (difference of 0.680 points, 95% CI:0.9859-2.3459) when comparing those that strongly desire ENT and those that do not (Table 2).

There was a statistically significant difference in gender (p=0.0032) with more women not interested in seeking ENT consultation than what would be expected (observed=50, expected=37.96, X2=3.818). There was also a statistically significant difference in marital status (p=1.083E-05) and complaint from the romantic partner about snoring (p=0.0001). Notably, more respondents do not desire ENT consultation if they did not have a complaint from a romantic partner about snoring (observed=33, expected=19.81, X2=8.790). Conversely, less respondents desire ENT if they do not have a complaint from a romantic partner about snoring (observed=63, expected=76.19, X2=2.285) (Table 2).

DISCUSSION

This study used the Amazon Mechanical Turk crowd-sourcing platform to identify and recruit participants that were appropriate for our study and subsequently administer our survey. This service has been piloted in past works and has been verified as a reliable engine for survey distribution and collection within current medical and scientific literature.[16-18] This analysis assessed broadly what treatments and/or procedures individuals have had or would be interested in pursuing to help their sleep disordered breathing in addition to some of the factors that may influence the defined preferences. Much of the published literature on this topic focuses on the lack of awareness and miseducation about sleep disordered breathing among the population and health

care system.[1,2,4] In fact, of those with a formal SDB diagnosis, 67.7% respondents endorsed researching their symptoms and condition on the internet (Figure 2). This analysis stresses the importance of increasing awareness of these disorders and their consequences, as well as the important role otolaryngologists play in educating about and managing these diagnoses. These results also suggest that the development of an easily accessible and the user-friendly internet resource with reliable educational materials may be of use to this population. Most of the participants in this study who did receive formal diagnoses had an interest in being treated, so rather than a lack of distress from symptoms, perhaps the undertreatment of individuals with SDB is due to a lack of awareness of the medical diagnosis associated with their symptoms and the availability of interventions that can improve quality of life and health outcomes.

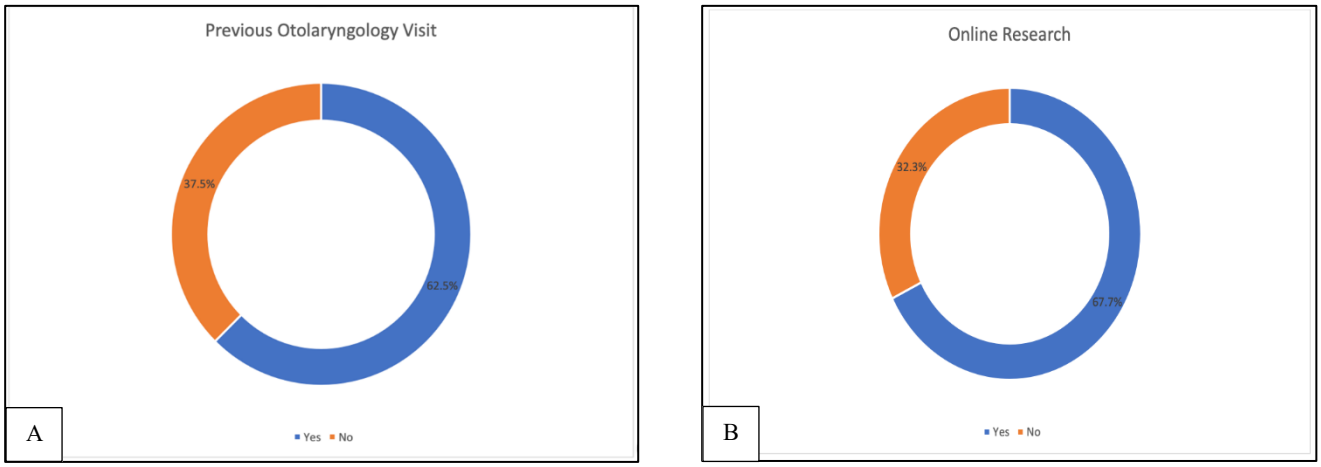

Figure 2: Respondents with a sleep-related breathing disorder who have seen an otolaryngologist regarding this issue or engaged in independent online research: (A) respectively vs. (B) those who have not.

This point is further underscored by the finding that respondents who have romantic partners that complain of their sleep-related breathing disorders were more likely to seek otolaryngology consult as well as surgical intervention. This once again cites awareness and patient proactiveness as major factors influencing who seeks specialist consultation and treatment. Despite almost equivocal satisfaction scores between interventions, Figure 1 demonstrates that patients prefer less aggressive management when it comes to treating their sleep-related breathing disorders as evidence by greater interest in conservative management such oral appliances, nasal appliances, an CPAP as opposed to surgical interventions such as tonsillectomies and vagal nerve stimulators. Additionally, only about half of the respondents in this survey wanted treatment for their SDB. Participants with romantic partners, however, were more likely to be interested in treatment for their condition. This point underscores the importance of patient-centered decision making with the involvement of family and support systems.

Previous studies written in both the primary care and otolaryngologic literature document the under-recognition of SDB by the general public and by primary care providers both in the United States and abroad.[2,4,10,12,24] These missed diagnoses consequentially lead to the undertreatment of these increasingly prevalent sleep disorders, exacerbating the development of serious health effects.[1,5-7] Not surprisingly, patients are more likely to be referred to a sleep surgeon for evaluation and subsequently treatment for their SDB if they are aware of their symptoms and ask their primary care provider about them.[15] The data presented here within this article helps elucidate the general public's interest in seeking consultation from otolaryngologists, interventions, surgical and non-surgical, as well as some of the factors that may drive these preferences. Understanding these interests is imperative as consultants and counsellors in that we can then refine our communication to these patients during our screening and treatment processes with regard to these disorders.

Our study has several limitations. The first limitation is inherent in the study design. Of course, all survey studies are subject to potential recall bias as well as dependent on participants to give truthful and accurate information; both factors may affect the validity of some of the data collected in this study.

Additionally, the wording of questions and answer choices on our form could have led participants to respond one way or another based upon their understanding of our inquiry and answer choices. For example, we used specific medical terms for intervention choices such as 'uvulopalatopharyngoplasty' anticipating that participants would be familiar with these terms if they had been offered or undergone this treatment. Our study design minimized the influence of these potential biases by writing a neutrally worded survey collected by

a third party, ensuring inclusion criteria was met for each participant, and including a large and diverse sample size.

CONCLUSION

The results presented here within demonstrated the factors that influence desire to pursue consultation and treatment for SBD are sex assigned at birth, marital status, and romantic partners who complains of symptoms. Overall, this study informs our medical community about the general public's preferences for their health concerns related to snoring and sleep disorders as well as some of the factors that dictate these preferences and can help us better identify, understand, educate, and intervene thereby improving the quality of life for our patients and reduce future negative outcomes associated with sleep disordered breathing.

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Conflict of interest: None declared
Ethical approval: The study was approved by the Institutional Ethics Committee and with the 1964 Helsinki declaration and its later amendments or comparable ethical standards

REFERENCES

1. Colten HR, Altevogt BM. Sleep Disorders and Sleep Deprivation: An Unmet Public Health Problem. Washington (DC): National Academies Press. 2006.
2. Shaw R, McKenzie S, Taylor TN, Olafiranye O, Boutin-Foster C, Ogedegbe G, et al. Beliefs and attitudes toward obstructive sleep apnea evaluation and treatment among Blacks. J Natl Med Assoc. 2012;104(12):510-9.
3. Lin J, Suurna MV. Sleep apnea and sleep-disordered breathing. Otolaryngol Clin North Am. 2018;51(4):827-33.
4. Devaraj NK. Knowledge, attitude, and practice regarding obstructive sleep apnea among primary care physicians. Sleep Breath. 2020;24(4):1581-90.
5. Yoshihisa A, Takeishi Y. Sleep disordered breathing and cardiovascular diseases. J Atheroscler Thromb. 2019;26(4):315-27.
6. Lichtblau M, Bratton D, Giroud P, Weiler T, Bloch KE, Brack T. Risk of sleepiness-related accidents in Switzerland: Results of an online sleep apnea risk questionnaire and awareness campaigns. Front Med (Lausanne). 2017;4:34.
7. Watach AJ, Radcliffe J, Xanthopoulos MS, Novick MB, Sawyer AM. Executive function impairments in adolescents with obesity and obstructive sleep apnea syndrome. Biol Res Nurs. 2019;21(4):377-83.
8. Yamagishi K, Ohira T, Nakano H, Bielinski SJ, Sakurai S, Imano H. Cross-cultural comparison of sleep-disordered breathing prevalence among Americans and Japanese. Eur Respir J. 2010;36(2):379-384.
9. Alshehri AM, Alshehri MS, Alamri OM, Alshehri FS, Alshahrani MM, Alflan MA, et al. Knowledge, awareness, and attitudes toward obstructive sleep apnea among the population of the Asir region of Saudi Arabia in 2019. Cureus. 2020;12(3):e7254.
10. Sia CH, Hong Y, Tan LWL, Van Dam RM, Lee CH, Tan A. Awareness and knowledge of obstructive sleep apnea among the general population. Sleep Med. 2017;36:10-7.
11. Arous F, Boivin JM, Chaouat A, Rumeau C, Jankowski R, Nguyen DT. Awareness of obstructive sleep apnea-hypopnea syndrome among the general population of the Lorraine region of France. Eur Ann Otorhinolaryngol Head Neck Dis. 2017;134(5):303-8.
12. Lee J, Ban WH, Park HK, Kim MJ, Lee SY, Choi DW, et al. Accuracy and reliability of internet resources providing information on obstructive sleep apnea. J Clin Sleep Med. 2018;14(10):1717-23.
13. Weaver TE, Laizner AM, Evans LK, Maislin G, Pack AI, Hoffman D, et al. An instrument to measure functional status outcomes for disorders of excessive sleepiness. Sleep. 1997;20(10):835-43.
14. Chasens ER, Ratcliffe SJ, Weaver TE. Development of the FOSQ-10: a short version of the Functional Outcomes of Sleep Questionnaire. Sleep. 2009;32(7):915-9.
15. Williams NJ, Nunes JV, Zizi F, Jean-Louis G, McFarlane SI, Ogedegbe G. Factors associated with referrals for obstructive sleep apnea evaluation among community physicians. J Clin Sleep Med. 2015;11(1):23-6.
16. Abdelhamid M. The role of health concerns in phishing susceptibility: a survey design study. J Med Internet Res. 2020;22(5):e17358.
17. Strickland JC, Stoops WW. The use of crowdsourcing in addiction science research: Amazon Mechanical Turk. Exp Clin Psychopharmacol. 2019;27(1):1-18.
18. Arditte KA, Çek D, Shaw AM, Timpano KR. The importance of assessing clinical phenomena in Mechanical Turk research. Psychol Assess. 2016;28(6):684-91.
19. Patil SP, Ayappa IA, Caples SM, Kimoff RJ, Patel SR, Harrod CG. Treatment of adult obstructive sleep apnea with positive airway pressure: an American Academy of Sleep Medicine systematic review, meta-analysis, and GRADE assessment. J Clin Sleep Med. 2019;15(2):301-34.
20. Liu T, Li W, Zhou H, Wang Z. Verifying the relative efficacy between continuous positive airway pressure therapy and its alternatives for obstructive sleep apnea: a network meta-analysis. Front Neurol. 2017;8:186.
21. Jehan S, Zizi F, Pandi-Perumal SR, Wall S, Auguste E, Myers AK, et al. Obstructive sleep apnea and obesity: implications for public health. Sleep Med Disord. 2017;1(3):1-7.

22. Yaggi HK, Mohsenin V. Sleep-disordered breathing and cardiovascular disease: cross-sectional results of the Sleep Heart Health Study. Am J Respir Crit Care Med. 2001;163(1):19-25.
23. Saber KM, Lam DJ, Sli S. Sleep apnea and sleep disorders. Cummings Otolaryngology: Head and Neck Surgery. 7th ed. Philadelphia: Elsevier. 2021.
24. Desalu OO, Onyedum CC, Sanya EO, Fawibe AE, Salami AK, Abdur-Rahman LO. Prevalence, awareness and reporting of symptoms of obstructive sleep apnoea among hospitalized adult patients in Nigeria: a multicenter study. Ethiop J Health Sci. 2016;26(4):321-30.

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