Original Article

Prevalence of obstructive sleep apnea in a sample of patients with oral diseases - A cross-sectional survey

ABSTRACT

Introduction: Obstructive sleep apnea (OSA) syndrome or snoring is a life-threatening disorder affecting patients and its associated dental problems. The disease is associated with dynamic collapse of the upper airway involving several underlying factors such as decrease in oxygen saturation, loud disruptive snoring, abrupt awakening, insomnia, and excessive daytime sleepiness. It is essential to take proper steps in time for the diagnosis of this common-seeming disease. Furthermore, dentists themselves should be aware of this disorder, only then they can provide necessary treatment to the needy patients.

Objective: This study aimed to determine the prevalence of OSA and the awareness of OSA-related oral diseases by a self-administered questionnaire among its patients.

Materials and Methods: A total of 500 individuals were screened through a cross-sectional single-center analytical study to assess the presence of comorbidities and other dental diseases in each individual attending a dental outpatient department over the age of 20 years with complaints of nocturnal snoring.

Results: The present authors observed that the prevalence of OSA increases with increasing age and obesity, and in some senior groups it is as high as 43.80% in men (37%–90% in previous published epidemiological studies) and 41.20% in women (in previous published epidemiological studies 50%–78%) in this epidemiological survey. High blood pressure, stress, poor oral hygiene, smoking and alcohol consumption have also been suggested as risk factors, but results are conflicting.

Conclusion: The dentist must have the proper knowledge, management, and ability to treat patients at risk of OSA. Therefore starting with a dedicated section of the sleep questionnaire asking questions for sleep disorders, questionnaires for early diagnosis (such as the STOP-BANG questionnaire), a multidisciplinary approach, and pneumological examination can support this. Furthermore, the medical factors have to be addressed well to obtain successful treatment. These results may be related to a relationship between several dental diseases/factors (periodontitis, gingivitis, and hypertension) associated with mild OSA. Its difficult diagnosis, and the absence of a dedicated section on sleep disorders in the medical/dental record, can make its treatment more difficult.

Keywords: Dentists, obstructive sleep apnea, obstructive sleep apnea syndrome, sleep-disordered breathing, snoring

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INTRODUCTION

Obstructive sleep apnea syndrome (OSA) is a prevalent sleep breathing (cessation or shallow breathing) disorder, affecting approximately 4%–24% of men and 2%–9% of women (nearly one billion people worldwide)[1,2] of the general adult population, characterized by complete apnea or hypopnea (partial collapse),[3] frequent oxyhemoglobin desaturation, and increased transcription of tumor necrosis factor- , and also enhances cytokine production resulting in systemic inflammation.[4] Many acute and chronic disorders

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are common nowadays, with one of the most significant being "OSA," which is a leading cause of morbidity and mortality. It contributes to the onset and progression of neurocognitive, cardiovascular, metabolic, and oncological disorders, as well as losses in workplace productivity, public safety, and health-care expenditures.[2]

Individuals with decreased upper airway space, craniofacial abnormalities, and obesity are at a higher risk of OSA. Dentists can discover the less obvious indications of sleep apnea by having a candid conversation with a patient regarding the patient's recent pains and discomforts, as well as recognizing the oral signs and symptoms. Primary care has a critical role in identifying OSA cases in the community. A recent study on OSA by Khokhrina *et al*. in 2020 indicated that 48.9% of 38,000 Russian citizens (aged 30–70 years) 48.9% suffered who had Apnea– Hypopnea Index (AHI) ≥ 5, 18.1% from an AHI ≥ 15 and 4.5% from an AHI ≥ 30. Saldías Peñafiel *et al*. studied 205 persons (aged 18–84 years) performing nocturnal pulmonary polygraphy in a 2020 study and discovered a prevalence of 49% AHI 5 and 16% AHI 15.[5,6] A recent study on 1642 Southern Italian children (aged 6–12 years) revealed a 10.47% probability of developing OSA.[7] The most common causes of OSA in adults are obesity, male sex hormones and aging, along with involving anatomic factors like micrognathia, retrognathia, facial elongation, mandibular hypoplasia, adenoids, tonsillar hypertrophy, inferior displacement of the hyoid,[8] enlargement of the soft palate[9,10] and increased uvula size.[9,10] The severity of OSA is determined by an index – AHI or Respiratory Disturbance Index (RDI), if PSG is performed, or Respiratory Event Index (REI) if out-of-center sleep testing (OCST) is performed:[11]

- AHI = Number of apneas + hypopneas/total sleep time
- RDI = Number of apneas + hypopneas + RERAs/total sleep time
- REI = Number of apneas + hypopneas/monitoring time
- AHI or REI <5/h = Normal (for adults), 5–14.9/h = mild OSA, 15–29.9/h = moderate OSA, and ≥30/h = severe OSA.

Modified diagnosis of OSA as per the International Classification of Sleep Disorders – Third Edition (ICSD-3)[5] (A and B) or C satisfies the criteria:[11]

1. The patient complains of sleepiness, nonrestorative sleep, fatigue, or insomnia
2. The patient wakes with breath holding, gasping, or choking
3. The bed partner or an observer reports habitual snoring or breathing interruptions in sleep
4. The patient has hypertension, a mood disorder, cognitive dysfunction, coronary artery disease, stroke, congestive heart failure, atrial fibrillation, or type 2 diabetes mellitus.

Objective

The objective of this study was to determine the prevalence of OSA in dental patients in different age groups, gender, disease, and its link to dental health, and also to find out how patients experienced OSA, their awareness of dental treatment options and dental providers, whether they knew the types of OSA, and if their partner had informed them about it.

MATERIALS AND METHODS

A cross-sectional epidemiological study on the definition of a sleep-related disorder was conducted on 500 patients over the age of 20 years with OSA (and confirmed by polysomnography). In this study, patients with acute oral disease aged more than 20 years had at least one initial dental examination, general medical history, dental history, and intra- and extraoral examination at a hospital in Lucknow, so that the above tests can be used to analyze the contributing factors that play a significant role in the increase of sleep-related disorders. The Institutional Ethical and Review Committee board authorized the study protocol CPGIDSH/IEC - 1/0012/2012. After explaining the purpose of the study, all respondents gave written informed consent. This cross-sectional study was based on a questionnaire that took less than 10 minutes to complete and consisted of specially designed and self-administered sections on demographics and knowledge with questions from previous research. It comprised simple questions regarding patients' knowledge and prevalence in the subject. It was distributed personally to respondents who indicated their willingness to do so. They completed the questionnaire completely, and their participation was entirely voluntary.

The knowledge section was about whether they acknowledged the disease OSA, whether they were aware of the association of OSA with dental disorders and general health, whether they were aware of alternatives to dental treatment, or if in the past a dentist had treated them. If the knowledge provider was a specialized Dentist, was the management of OSA explained, and whether they were aware that dentists (undergraduate or post-graduate) can treat and manage OSA? In addition, whether they were aware of the types of OSA and whether their partner had told them about it or if the respondents had previously been screened for OSA. Also if they had any undergone any dental treatment, history of any previous medical condition if they had dry mouth, open mouth, any other abnormality, history of any habit of alcohol, smoking, inflammation, cavity or ulcers. One mark was awarded for the correct answer and none for the incorrect/do not know option to reduce the effect of guessing. Only willing healthy respondents above the age of 20 years were included in this study. Mentally handicapped and unwilling patients were excluded from the study. In the cover letter, it was made clear

in writing that their participation in the study was completely voluntary and that the patient could refuse to respond without consequences for their continued medical or dental care.

RESULTS

A total of 500 respondents participated in the study as shown in Table 1 of the final result, of whom 259 (51.8%) were urban patients and 241 (48.2%) rural patients.

The maximum number of respondents (49%) belonged to lower socioeconomic status, and while 36% of the participants belonged to upper-middle socioeconomic status. Among the respondents, 15% belonged to the upper socioeconomic status.

Table 2 shows the number of respondents by age and gender. There were 75 respondents between the ages of 20 and 24, 40 men and 35 women. 180 respondents between the ages of 40 and 60 years took part, including 99 men and 81 women. A total of 245 respondents took part in the over 60 category, 120 men and 125 women.

Table 3 demonstrate respondent's knowledge and understanding of OSA, When asked how they knew they snore at night questions on testimony from a spouse: 115 responded that this was true, 253 respondents said No, and 132 respondents said they were unaware of the disease. When asked if respondents knew about OSA and associated dental therapy, 63 answered "true," 201 responded "false" and 236 respondents did not respond.

From Table 4, it can be seen that the correlation coefficient (r) equals 0.447, indicating a low relationship, as surmised earlier. $P < 0.05$, and indicates that the coefficient is not significantly different from zero. We can conclude that there is no relation between gender and age ($r = 0.44$, $P > 0.001$).

Table 1: Demographic profile of respondents

	Number of respondents (%)
Demographic profile	
Urban	259 (51.8)
Rural	241 (48.2)
Socioeconomic	
Upper	75 (15)
Upper-middle	180 (36)
Lower	245 (49)

Table 2: Baseline respondent's characteristics (gender and age)

Age (years)	Male (*n*)	Female (*n*)	Total (*n*)
20–24	40	35	75
40–60	99	81	180
>60	120	125	245
Total	259	241	500
Chi-square test, *P* value	0.45, 0.50		

Table 3: Knowledge and general findings

Question	True	False	Don't know
Screening/partnered	115	253	132
Dental treatment	63	201	236
Types of OSA/conditions	57	267	178
Xerostomia/mouth breathing	95	175	230
Alcohol/smoking	112	190	198
Swelling/cavity/ulcers	68	158	274
Drowsy driving	300	189	11

OSA: Obstructive sleep apnea

Table 4: Pearson correlation of gender and knowledge

Analyses	Results
Coefficient	0.447901273
Count	500
T statistics	11.17941609
DF	498
P value	4.83836

DF: Degrees of freedom

DISCUSSION

Growing evidence links cognitive decline and various types of dental disease to various sleep disorders, including OSA. With increasing age, there are substantial differences in the prevalence of OSA, associated comorbidities, and phenotypic presentation. A significant concern for sleep and dental researchers is whether OSA heterogeneity affects cognitive outcomes differently in middle-aged people than in older adults.[12] The third edition of the ICSD[12] helps provide a standardized classification of sleep breathing disorders and specifically includes OSA that disrupts regular sleep cycles.[13,14] The upper airway of the patients diagnosed with OSA will have a blockage, which may be caused by a variety of anatomic or pathologic conditions such as snoring, daytime sleepiness, waking up choking or gasping, restless sleep, frequent arousals, nocturia, early morning headaches, lack of energy, poor concentration, bad mood, and erectile dysfunction.[11,15] When many of these patients rest and fall asleep, further posterior retraction of the tongue results in a decrease in the retroglossal diameter and an increase in the oscillation of the soft palate and redundant pharyngeal tissue, with narrowing of the pharyngeal lumen.[16] Nasal breathing performs significant physiological tasks, including humidification, heating, and filtration, and accounts for more than 50% of the total resistance of the upper airway.[13] The Starling resistor model, unstable oral airway motion, the nasal ventilatory reflex, and nitric oxide are among the physiological explanations for the link between nasal airflow and breathing during sleep.[16] It is a clinical disorder that induces recurrent episodes of complete or partial obstruction (oxygen desaturation of at least 4%) and a decrease of at least 30% for more than 10 seconds despite the persistent respiratory effort of the upper airways.[14] The dentist's role

in treating sleep disorders is becoming more important, especially when co-managing patients with mild-to-severe OSA and simple snoring. The practicing dental professional can help patients with sleep disorders at several levels, starting with identifying the sleep disorder and related risk factors (e.g. retrognathia, high-arched palate, enlarged tonsils or tongue, enlarged tori, high Mallampati score, poor sleep, supine sleep position, obesity, hypertension, morning headache or orofacial pain, and bruxism), referring them to an appropriate health professional for evaluation,[17] and aid in the management of sleep disorders, especially when fitting oral appliances. Almost every discipline in dentistry needs to be aware of sleep disorders and their potential impact.[15] In rural populations in India, OSA is underdiagnosed and undertreated.[18] Dentists are often the first-contact healthcare providers who assist in detecting, referring, and managing (by providing oral appliances followed by regular dental and medical sleep follow-up) numerous undiagnosed OSA cases.[18] A patient's routine dental visits and the dentist's accessibility to examine the upper airway facilitate screening patients for OSA. Thus, dentists' suboptimal education in dental school regarding OSA may contribute to the increased number of undiagnosed cases and associated risks.[18] Research indicates that early recognition of OSA will not only reduce morbidity but also will lead to a significant reduction in healthcare costs for other conditions.[19,20]

From the demographic profile of respondents in our study, Table 1, the gender-wise distribution of respondents was out of a total of 500 respondents, 259 (51.8%) were men, and 241 (48.2%) were women, and the epidemiological survey on OSA shows that the disease is not isolated around the world but is more common in developing countries. As much as it is in Western societies, its prevalence is estimated to be much higher. In the age-wise distribution in Tables 2 and 3, between 20 and 40 years, the number of respondents was 75 (40 males and 35 females), between 40 and 60 years, the number of respondents was 180 (99 males and 81 females), and The number of respondents above 60 years was 245 (120 men and 125 women). The first study to demonstrate how accurately couples report night snoring and whether the patient's perception of night snoring is accurate is shown in Table 4. As can be seen in Table 4, the patient's partner stated in the questionnaire that 115 respondents had told the truth, 253 had lied, and 132 had not known.[21] When asked if the respondents knew about any role of dental treatment in OSA, 63 respondents said true, 201 respondents said false, and 236 respondents did not know about it at all. When asked about their knowledge of the types of OSA and their association with diseases (diabetes, hypertension, stroke), 57 respondents answered "true", 267 respondents "false" and 178 respondents "don't know". When asked if they experienced xerostomia (dry mouth), open-mouth sleeping/mouth breathing, or jaw/pharyngeal anomalies, 95 respondents replied yes (true), 175 respondents said no (false), and 230 respondents claimed they didn't know, 95 respondents said true, 175 respondents said false, and 230 respondents did not know about it.[22] On being asked about habits of alcohol consumption with hypoxia[23] and smoking being related to OSA, true was said by 112 respondents, false by 190 respondents, and 198 respondents did not know about it. When asked about possible swelling of the gums (gingivitis)/periodontal disease, tooth decay and mouth ulcers, 68 respondents answered yes, 158 respondents answered false and 274 respondents did not know.

Upper airway constriction due to several craniofacial factors may have an impact on OSA development. Dentists typically use an adequate screening approach for new OSA cases, followed by appropriate referral to sleep specialists for sleep testing and therapy. Therefore, the significant frequency of undetected OSA is mostly due to inadequate education and training of dentists. According to the American Academy of Dental Sleep Medicine and the American Dental Association, a dentist's role in OSA care is to identify OSA cases, refer at-risk patients, and provide oral appliances such as mandibular advancement devices.

CONCLUSION

OSA is a perilous disorder that affects humans. Its dental consequences necessitate meticulous care and attention, as well as education and awareness campaigns at both the urban and rural levels. It can be controlled quickly if diagnosed early. To combat this, the government should launch marketing, and programs. This should involve a number of medical and dental specialists. It is curable and will soon be eradicated from society if properly handled.

Obstructive sleep apnea therapies that are cutting edge

Although CPAP (continuous positive airway pressure) is quite effective, a quarter to a half of people with OSA have difficulty tolerating the treatment, according to several published studies. The necessity of treating OSA has led to the development of a number of novel therapies. These include upper airway stimulation, nasal expiratory positive airway pressure, and oral pressure therapy.

Limitation of the study

The results of this study showed that after reviewing complete medical and dental records with a small sample size, 425 out of 500 patients with OSAS reported having dental problems (periodontal disease, gingivitis, tooth decay, bleeding gums, and dry mouth). Respiratory diseases and body mass index cannot be identified as significant risk factors either. This was due to the small number of respondents, and the study was conducted in an environment with the listed risk factors so involved researchers are not responsible for the scientific

accuracy or reliability of data or conclusions published herein. Survey published is only for education, research and reference purpose. First, because this is a cross-sectional study with fewer respondents, it is not-possible to correlate the effectiveness of additional diagnostic tools in the same patients. Furthermore, this is a self-report study subject to a systemic bias system.

What this study adds to knowledge

Partner involvement and motivation (couple-oriented approach), a better understanding of OSA, and the severity of OSA with dental disorders vary from person to person due to demographics, lifestyle transformations, and increasing age can have important implications for understanding diagnosis and treatment.

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Conflicts of interest

There are no conflicts of interest.

REFERENCES

1. Lechat B, Naik G, Reynolds A, Aishah A, Scott H, Loffler KA, *et al.* Multinight prevalence, variability, and diagnostic misclassification of obstructive sleep apnea. Am J Respir Crit Care Med 2022;205:563-9.
2. Schwartz AR, Jacobowitz O, Eisele DW, Mickelson SA, Miller MB, Oliven A, *et al*. Targeted hypoglossal nerve stimulation for patients with obstructive sleep apnea: A randomized clinical trial. JAMA Otolaryngol Head Neck Surg 2023;149:512-20.
3. Slowik JM, Sankari A, Collen JF. Obstructive sleep apnea. In: StatPearls. Treasure Island (FL): StatPearls Publishing; USA. 2022.
4. Latorre C, Escobar F, Velosa J, Rubiano D, Hidalgo-Martinez P, Otero L. Association between obstructive sleep apnea and comorbidities with periodontal disease in adults. J Indian Soc Periodontol 2018;22:215-20.
5. Khokhrina A, Andreeva E, Degryse JM. The prevalence of sleep disordered breathing in Northwest Russia: The ARKHsleep study. Chron Respir Dis 2020;17:1479973120928103.
6. Saldías Peñafiel F, Brockmann Veloso P, Santín Martínez J, Fuentes-López E, Leiva Rodríguez I, Valdivia Cabrera G. Prevalence of obstructive sleep apnea syndrome in Chilean adults. A sub-study of the national health survey, 2016/17. Rev Med Chil 2020;148:895-905.
7. Paduano S, Paduano FP, Aiello D, Barbara L, Zampogna S, Pujia R, *et al.* OSAS in developing age: Screening of a Southern Italy population. Eur J Paediatr Dent 2019;20:302-5.
8. Slowik JM, Sankari A, Collen JF. Obstructive sleep apnea. In: StatPearls. Treasure Island (FL): StatPearls Publishing; 2023. Available from: https://www.ncbi.nlm.nih.gov/books/NBK459252/. [Last updated on 2022 Dec 11].
9. Ashraf A, Menon I, Gupta R, Arora V, Ahsan I, Das D. Oral findings as predictors of obstructive sleep apnea – A case-control study. J Family Med Prim Care 2022;11:5263-7.
10. Ruangsri S, Jorns TP, Puasiri S, Luecha T, Chaithap C, Sawanyawisuth K. Which oropharyngeal factors are significant risk factors for obstructive sleep apnea? An age-matched study and dentist perspectives. Nat Sci Sleep 2016;8:215-9.
11. Goyal M, Johnson J. Obstructive sleep apnea diagnosis and management. Mo Med 2017;114:120-4.
12. Medicine AAOS. International Classification of Sleep Disorders. 3rd ed. (ICSD-3). Darien, Illinois: Medicine AAOS; 2014.
13. Bubu OM, Andrade AG, Umasabor-Bubu OQ, Hogan MM, Turner AD, de Leon MJ, *et al.* Obstructive sleep apnea, cognition and Alzheimer's disease: A systematic review integrating three decades of multidisciplinary research. Sleep Med Rev 2020;50:101250.
14. Gauld C, Lopez R, Geoffroy PA, Morin CM, Guichard K, Giroux É, *et al*. A systematic analysis of ICSD-3 diagnostic criteria and proposal for further structured iteration. Sleep Med Rev 2021;58:101439.
15. Karimi M, Hedner J, Häbel H, Nerman O, Grote L. Sleep apnea-related risk of motor vehicle accidents is reduced by continuous positive airway pressure: Swedish traffic accident registry data. Sleep 2015;38:341-9.
16. Georgalas C. The role of the nose in snoring and obstructive sleep apnoea: An update. Eur Arch Otorhinolaryngol 2011;268:1365-73.
17. Lavigne GJ, Herrero Babiloni A, Beetz G, Dal Fabbro C, Sutherland K, Huynh N, *et al.* Critical issues in dental and medical management of obstructive sleep apnea. J Dent Res 2020;99:26-35.
18. Pinto AM, Devaraj U, Ramachandran P, Joseph B, D'Souza GA. Obstructive sleep apnea in a rural population in South India: Feasibility of health care workers to administer level III sleep study. Lung India 2018;35:301-6.
19. Maurer JT. Early diagnosis of sleep related breathing disorders. GMS Curr Top Otorhinolaryngol Head Neck Surg 2008;7:Doc03.
20. Young T, Peppard PE, Gottlieb DJ. Epidemiology of obstructive sleep apnea: A population health perspective. Am J Respir Crit Care Med 2002;165:1217-39.
21. Luyster FS, Dunbar-Jacob J, Aloia MS, Martire LM, Buysse DJ, Strollo PJ. Patient and partner experiences with obstructive sleep apnea and CPAP treatment: A qualitative analysis. Behav Sleep Med 2016;14:67-84.
22. Garvey JF, Pengo MF, Drakatos P, Kent BD. Epidemiological aspects of obstructive sleep apnea. J Thorac Dis 2015;7:920-9.
23. Yang S, Guo X, Liu W, Li Y, Liu Y. Alcohol as an independent risk factor for obstructive sleep apnea. Ir J Med Sci 2022;191:1325-30.