The influence of obstructive sleep apnea on self-perceived dental aesthetics and need for orthodontic treatment among the general population in Makkah, Saudi Arabia

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Abstract

OBJECTIVE: To assess the influence of obstructive sleep apnea on self-perceived dental appearance and need for orthodontic treatment.

MATERIALS AND METHODS: A self-administered questionnaire was used in a random sample of a general adult population in Makkah region, Saudi Arabia. A total of 1014 participants completed the questionnaires, which included the STOP-BANG questionnaire, Oral Aesthetics Subjective Impact Score questionnaire, and Aesthetic Component of Index of Orthodontic Treatment Need questionnaire. Descriptive statistics and Chi-square tests were used to compare differences between the groups.

RESULTS: Overall, 6.5% (66/1014) of the participants were classified as being at high risk of OSA of which 71.2% were males and 28.8% were females (\( P < 0.001 \)), 57.6% were >50 years of age, 90.9% had obesity, and 81.8% had an enlarged neck circumference. But only 10.1% of the participants reported that they snore loudly. A positive self-perception of dental esthetics was found in 42 (6.2%) and 518 (76.6%) participants at high and low risk of OSA, respectively. Furthermore, of the participants in the high- and low-risk groups, 4.2% and 66.7% considered themselves in need of orthodontic treatment, respectively.

CONCLUSIONS: The prevalence rate of people at intermediate to high risk of OSA was 26% of the general population and being at high risk of OSA had no influence on self-perceived dental esthetics and need for orthodontic treatment.

Keywords:
Dental, esthetics, obstructive sleep apnea, orthodontics

Introduction

Obstructive sleep apnea (OSA) is clinically defined as a disorder associated with daytime sleepiness, interrupted breathing, loud snoring, and awakening because of choking or gasping accompanied by at least five obstructive respiratory events per hour of sleep.¹ Snoring is one of the most common cardinal symptoms of OSA.² Obesity is recognized as the main predisposing factor for OSA.³ OSA is also associated with older age, smoking, and orofacial anatomical abnormalities, such as mandibular retrognathia, macroglossia, enlarged uvula, and hypertrophy of the palatine tonsils.⁴ Previous studies conducted by Bahammam and colleagues in the Saudi Arabian population showed that the prevalence

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The evaluation of OSA requires a comprehensive diagnostic strategy, which includes full sleep history taking, physical examination, and objective testing. Polysomnography is the gold standard screening tool for the detection of sleep-related problems. However, owing to its high cost and limited availability, mostly only in specialized sleep clinics, it is not frequently used. Thus, several screening questionnaires for OSA have been developed and recommended. The most commonly used questionnaires are the Epworth Sleepiness Scale (ESS), Berlin questionnaire, and STOP-BANG questionnaire (SBQ). These questionnaires offer a wide range of specificity and sensitivity in various populations and races. For instance, in the Persian population, the SBQ is more sensitive and accurate than ESS for OSA screening. The SBQ is a simple and easy-to-use self-reported questionnaire. A meta-analysis confirmed that the SBQ has high sensitivity, performance, and accuracy in determining the severity of OSA in sleep clinics and for OSA screening in surgical populations. The Arabic version of the SBQ proved its validity and reliability in identifying OSA in Arabic-speaking patients. Therefore, orthodontists can use the SBQ in orthodontic clinical practice for screening patients with snoring and OSA.

Several studies have shown that craniofacial and skeletal abnormalities are predisposing factors for OSA. From the orthodontic perspective, the dental features frequently reported in patients with OSA are class II malocclusion, crowding in the mandibular arch, and increased overjet. Alqahtani et al. observed that among non-obese adult Saudi patients, nearly 94.1% of patients with severe OSA had a class II division 1 incisor relationship. A recent study in a Saudi university population reported that participants who had snoring were less confident about their smile esthetics and sought orthodontic treatment more than the non-snoring participants.

Al-Dekhel and Banabilh concluded that snoring and OSA impair patients’ self-esteem, oral health-related quality of life, and thus should be considered in orthodontic treatment planning. This study aimed to assess the prevalence of people at high risk of OSA and the influence of OSA on self-perceived dental appearance and need for orthodontic treatment in general adult population in Makkah region, Saudi Arabia.

Materials and Methods

This descriptive cross-sectional study used a self-administered questionnaire in a random sample of the general population. The inclusion criteria were residents of Makkah region, Saudi Arabia, either male or female, and aged between 18 and 60 years. Participants with craniofacial deformities or psychological diseases were excluded.

The sample size was calculated using OpenEpi version 2. A minimum sample size of 385 participants was required for this study, based on the population of 6 million in the western province, an estimated prevalence of 50%, precision level of 5%, and confidence interval of 95%. However, more than 1050 invitations were sent to overcome the expected 40% dropout rate.

The Arabic versions of the SBQ, Aesthetic Component of the Index of Orthodontic Treatment Need (AC-IOTN) questionnaire, and Oral Aesthetic Subjective Impact Score (OASIS) questionnaire were sent in Google forms. In addition, demographic questions were added, including age, sex, marital status, city of residence, weight (kg), and height (cm). The survey questionnaire was sent through social media platforms, with recipients being asked to share the survey questionnaire with their connections. All the participants signed a consent form before completing the questionnaire, and participation was voluntary and anonymous.

The SBQ includes eight questions related to the clinical aspect of sleep apnea (the presence of snoring, tiredness, observed apnea, high blood pressure, BMI, age, neck circumference, and male sex). These questions were scored according to Yes/No answers (scored as 1/0), and the total score ranged from 0 to 8. A participant score of 0–2 indicates a low risk of OSA; 3 or 4, an intermediate risk of OSA; and 5–8, a high risk of OSA. The Arabic version of the SBQ was validated with a Cronbach’s alpha of 0.7.

The OASIS questionnaire is an independent self-evaluation tool that contains five questions on the self-perception and satisfaction of one’s dental esthetics. Each question was scored from 1 to 7 on a Likert scale, with a score of 1 indicating the best perception of oral esthetics and a score of 7 indicating the poorest perception. The OASIS were dichotomized into 0 = positive perception (OASIS <14) and 1 = negative self-perception (OASIS >14).

The AC-IOTN questionnaire contains 10 black-and-white photographs showing advanced degrees of esthetic problems and varying degrees of malocclusion. The scores range from 1 to 10, from the most attractive to the least attractive. Each participant was asked to indicate which photograph most closely resembled their real smile. Scores of 1–4, 5–7, and 8–10 represent little or no
need, borderline need, and definite need for orthodontic treatment, respectively.

Statistical methods
Data analysis was performed using Stata v. 23 (Stata Corp LP, College Station, TX, USA). We used descriptive statistics and Chi-square tests to compare differences between the groups. The significance level was set at $P < 0.05$.

Results
A total of 1014 participants completed the questionnaire. The results showed that 543 (53.6%) of the respondents were from Makkah, 293 (28.9%) were from Jeddah, 144 (14.2%) were from Taif, and only 34 (3.4%) were from other cities in Makkah region. The participants’ mean (SD) weight was 70.57 (18.89) kg and mean (SD) height was 159.82 (17.56) cm. Table 1 presents the response percentages for the other demographic variables.

In this study, only 10.1% of the respondents reported that they snored loudly, 64.2% felt tired during the day, and only 8.78% were receiving treatment for high blood pressure [Table 2]. Table 3 presents the risk stratification of the study sample, of whom 26% were at an intermediate to high risk of OSA ($n = 267$). Among the 6.5% of the participants who were at high risk of OSA, 57.6% were >50 years of age, 71.2% were male, 90.9% had obesity, and 81.8% had an enlarged neck circumference [Table 4].

Regarding self-perceived dental esthetics, 42 (6.2%) participants at high risk of OSA had a positive self-perception of esthetics compared with the 518 (76.6%) low-risk participants ($P = 0.003$) [Table 5]. With regard to the need for orthodontic treatment compared with 66.7% of the low-risk participants ($P = 0.013$) [Table 6].

Discussion
This study was aimed to assess the prevalence of people at high risk of OSA in the general adult population and the influence of OSA on self-perceived dental appearance and need for orthodontic treatment. The key findings of this study were as follows: First, the estimated prevalence of people at high risk of OSA was 6.51%, and the prevalence rate was 71.2% in men and 28.8% in women. Second, 6.2% of the participants who were at high risk of OSA had a positive self-perception of esthetics compared with 76.6% of the low-risk participants ($P = 0.003$). Third, 4.2% of the participants at high risk of sleep apnea thought they needed orthodontic treatment compared with 66.7% of the low-risk participants ($P = 0.013$).

The prevalence rate of people at high risk of OSA was lower than that previously reported by Bahammam et al.,[5,6] Netzer et al.[16] also found that the prevalence of patients at high risk of OSA in the primary healthcare system was 35.8% in the United States and 26.3% in Europe. In a similar study in the UAE, nearly 21% of participants were considered at high risk of OSA.[17] Approximately, 6.51% of the participants in this study were categorized as at high risk of OSA. The discrepancies in results between this study and the earlier studies can be explained by the difference in the screening questionnaires used. This study used the SBQ whose predictive value is superior than the Berlin questionnaire that was used in the previous studies.[18] In addition, the SBQ has high performance for OSA screening in sleep clinics and surgical populations, as confirmed by a meta-analysis.[19] Furthermore, the differences might
also be related to the age of our participants who were mostly <50 years old, the predominance of female participants (72.7%), and the fairly well-established higher prevalence of people at high risk of OSA among older participants, males, and obese subjects. Bixler et al. found that the incidence of OSA was three times higher in men than in premenopausal women and two times higher in males than in postmenopausal women.

This study data revealed that 10.1% of the participants reported that they snore loudly. Other studies have also reported rates similar to findings of this study from Sweden, Japan, Yemen, and Saudi Arabia. In a large-scale population-based study, Silverforsen et al. showed that 16% of their participants were habitual snorers. The prevalence of snoring was 20% among Japanese workers. In addition, another study assessed the prevalence of snoring in a university population in Saudi Arabia and found that 19.2% of the participants snore. However, the prevalence of snoring does not necessarily indicate the development of obstructive complications, but these findings emphasize the need for awareness about the possible complications of snoring.

The comparison between participants at high and low risk of OSA in terms of their self-perceived dental esthetics showed that 6.2% of the high-risk participants had a positive self-perception of esthetics compared with 76.6% of the low-risk participants. This important finding indicates no association between being at high risk of OSA and having a negative self-perception of dental esthetics. Furthermore, only 4.2% of the participants at high risk of OSA considered themselves in need of orthodontic treatment compared with 66.7% of the low-risk participants. On the contrary, Al-Dekhel et al., who assessed the influence of habitual snoring on self-perceived dental esthetics, reported that 12.3% of snoring participants thought they needed orthodontic treatment compared with 6.3% of non-snoring participants. This indicates that the snoring participants were less confident of their dental esthetics. Therefore, snoring and subsequent OSA affect quality of life. The difference in results between this study and the previous study might be related to the difference in the mean age of the participants, which was 23.05 years in the previous study, and the fact that 90.8% of the participants in the previous study were students. In this study, 45.8% and 9.1% of the participants at low and high risk of OSA, respectively, were aged between 18 and 29 years. Thus, the reason could be related to the orthodontic treatment itself, as it can cause a significant increase in the self-esteem of young adults and lead them to seek further orthodontic treatment.

However, this study has several limitations. First, our sample only included participants from one region in Saudi Arabia, which might not accurately reflect the general population of the kingdom. Therefore, future research may be extended to include many regions to obtain more-generalized results. Second, the proportion of the male participants in this study sample was lower than that of the female participants (27.3% vs. 72.7%). Males have been suggested to be at higher risk of OSA than females. More balanced samples are warranted in future research.
future research. Third, this study used a self-reported questionnaire and the responses were returned through Google forms, so some individuals might have been omitted owing to a lack of Internet access or other similar reasons. However, this study included a relatively large sample size and used a validated questionnaire. Fourth, for accurate diagnosis of OSA, overnight polysomnography is important to confirm the severity and prevalence of OSA. However, the SBQ can still be considered an effective and inexpensive screening method for OSA. Fifth, even though the study found that being at high risk of OSA had no influence on self-perceived dental esthetics and need for orthodontic treatment, further clinical studies are essential to explore this topic.

Conclusions

The prevalence rate of adults at intermediate to high risk of OSA was 26%. Furthermore, being at high risk of OSA had no influence on self-perceived dental esthetics and need for orthodontic treatment.

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Nil.

Conflicts of interest

There are no conflicts of interest.

Ethical approval

Ethical approval was obtained from the institutional review board (IRB) of Umm Al-Qura University, Faculty of Dentistry, with IRB No. 186-20.

Author contributions

Shahad Dh. Alotaibi and Amjad S. Alotaibi were responsible for the literature search, questionnaire construction, data collection, discussion, and drafting of the manuscript. Mona T. Rajeh was responsible for the data analysis, data interpretation, and writing of the Results section. Mohammed A. Barashi, Maysaa Z. Khojaj, and Mona T. Rajeh conceived the idea for the study, corrected the manuscript, participated in the study design and coordination, provided feedback on the manuscript revisions, and read and approved the final manuscript.

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