

# **The Prevalence of General Dentists Who Screen for Obstructive Sleep Apnea**

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## **ABSTRACT**

### Study Objectives:

To determine the prevalence of general dentists screening for obstructive sleep apnea (OSA).

### Methods:

A brief, 12-item questionnaire consisting of a demographic section and questions regarding OSA screening methods, parameters, and preferences was sent to one-thousand general dentists across the United States using REDcap.

### Results:

71 general dentists responded. Based on demographic results, it may be concluded that study participants represent a broad range of general dentists practicing in the United States.

Participants were asked to select which screening modalities they utilize, and specifics regarding each modality to provide validity to responses.

76% of participants report screening for OSA. The majority utilize more than one modality. Of participants responding affirmatively, 60% do not routinely screen more than 70% of patients.

37% of participants ranked themselves a 3 or less (1-uncomfortable, 5-confident) regarding confidence in screening for OSA.

72% of participants reported using a patient interview, 52% identify anatomical parameters, and 39% utilize patient questionnaires or tiredness surveys. Also, 41% of screening dentists have patients perform a home sleep test. 87% of participants suspecting OSA refer patients to physicians for evaluation. Dentists with less than 30 years of experience were significantly more likely to screen for OSA than those with more than 30 years (87% vs 63%,  $p=0.0459$ ).

### Conclusions:

The majority of general dentists screen for OSA, however, most screening dentists lack confidence in performing accurate routine screenings and do so on less than 70% of patients.

Key Words: obstructive sleep apnea; OSA; general dentist; screening; prevalence

## **INTRODUCTION**

Obstructive sleep apnea (OSA) is a condition caused by upper airway obstruction during sleep, characterized by recurrent breathing interferences, episodes of shallow breathing, and respiratory effort-related arousals, which can last up to more than 30 seconds.<sup>1,2</sup> Immediate effects of the disrupted breathing cycle, associated with OSA, are usually associated with decreased blood oxygen levels.<sup>3</sup> Among the most serious consequences of untreated OSA are highly increased risks of cardiovascular conditions such coronary artery disease, hypertension, congestive heart failure, and stroke.<sup>4</sup> Furthermore, sleep deprivation is a common symptom reported by those with OSA, contributing to clinical depression, excessive daytime sleepiness, daytime fatigue accidents, and obesity.<sup>5-7</sup>

OSA is a common condition involving up to 24% of adult males and 9% of adult females, many of which go undiagnosed for prolonged amounts of time.<sup>8,9</sup> It has been estimated that 82% to 93% of adults with OSA remain undiagnosed.<sup>10</sup>

The majority of Americans visit the dentist on a yearly basis.<sup>11</sup> In order to provide greater awareness and improved outcomes of sleep apnea, a knowledge of general dentist involvement of OSA detection is imperative in aiding diagnosis, which may lead to multiple effective treatment options available to reduce negative effects associated with the disease.<sup>12</sup> There are reports of the limited knowledge and training general dentists receive in detecting and treating OSA.<sup>13</sup> However, there appears to be no data indicating the prevalence of dentists who screen for OSA. Therefore, this study is the first of its kind in representing the general dentist participation in screening for this serious condition.

## **METHODS**

## **Patients**

This study was approved as exempt by an Institutional Review Board (IRB: #HM20003463). An email invitation was sent by a third-year dental student as a part of the research project in April 2015 to approximately one-thousand members of a national association of independent general dentists who were asked to participate in a survey using the REDcap (Research Electronic Data Capture) survey software. The email invitation asked recipients if they had practiced dentistry within the past year and that participation would be greatly appreciated, but is completely voluntary and will remain anonymous. No compensation was provided for participation. A respondent was required to be a practicing general dentist to be eligible for inclusion in the analyses.

## **Questionnaire**

The questionnaire consisted of a demographic section (years in practice, dental school, practice specialty, practice setting, practice location) followed by a series of questions regarding screening methods, preferences, referrals, and treatment modalities. Three primary screening modalities were considered (medical history, sleep questionnaire, and anatomic parameters) as well as three additional modalities (cone beam computed tomography, home sleep test, two-dimensional lateral cephalogram) and other modalities. The preferred modality was recorded, as was the percentage of patients routinely screened and the level of confidence in screening. Referral behavior and treatment services were recorded in the final portion of the questionnaire. The primary outcome variable was whether any screening for OSA was reported. A positive answer or “Yes” was accepted if any of the primary or additional modalities were reported.

## Statistical Methods

Responses were summarized using frequencies, percentages, and corresponding 95% confidence intervals. Association between demographic factors and screening for OSA was determined first using univariate logistic regression. Overall association with OSA was assessed using multivariable logistic regression and post-hoc Tukey's adjustment for multiple comparisons. A significance level of 0.05 and SAS EG v6.1 was used for all analyses.

## RESULTS

71 dentists responded to the questionnaire, resulting in a 7% response rate. Although this percentage is low, participants received training from more than 33 unique dental schools in the United States, practice in 28 different states in various communities ranging for less than 20,000 people to more than 500,000 people (**Table 1**). 76% of dentists reported screening for OSA. Participants were asked to select which screening modalities they utilize, and subsequently, specifics regarding each modality, aiming to provide some validity to their responses. 61% reported utilizing more than one screening modality (**Table 2, Figure 1**).

The patient interview is most frequently used (72% of responders) and is the most preferred screening method with nearly all dentists identifying snoring (96%) and daytime fatigue (84%). Next, 51% reported identifying anatomical parameters, such as tonsils/adenoids (94%) and neck circumference (92%). Lastly, 39% utilize a patient questionnaire or tiredness survey, the Epworth Sleepiness Scale being most widely used (86%), followed by the STOP-Bang questionnaire (18%). Important to note: 41% of screening dentists have patients perform a home sleep test. Furthermore, 87% of dentists that identify a positive screening refer to a physician for further evaluation.

60% of dentists that screen for OSA are doing so on less than 70% of their patients (**Table 3**). 37% of responders reported themselves a three or lower on a confidence scale (1-uncomfortable, 5-confident) in regards to screening for OSA (**Figure 2**).

In order to determine if any demographic factor is associated with the prevalence of OSA screening, the chi-square test was used to test for an association with all of the factors described in Table 1. After collapsing years of practice into less than 30 years and 30 or more (due to low number of practitioners with less experience), there was a significant association between years in practice and whether a provider screens ( $p = 0.0317$ ). There was also marginal evidence of an association between screening for OSA and practice location ( $p = 0.0571$ ). No other factors were significantly associated with screening for OSA ( $p > 0.5720$ ). A multivariable logistic regression confirmed that there was a significant association between whether or not a provider reported screening for OSA and years of practice ( $p = 0.0459$ ), but practice location was not statistically significant in the overall model ( $p = 0.1376$ , **Table 4** and **Figure 3**). Tukey post hoc test was used to identify the group differences and, compared to general dentists in practice more than 30 years, those in practice fewer than 30 years are significantly more likely to report screening for OSA (87% versus 63%, relative risk = 1.38).

## **DISCUSSION**

The parameters for diagnosing OSA are fairly straight forward. The gold standard is a polysomnography (PSG) performed at a sleep study center. This comprehensive test monitors heart rhythm, skeletal muscle activity, brain function, eye movement, pulse oximetry, and respiratory activity.<sup>14</sup> In addition, home oximetry has become increasingly prevalent and is found to play an important role in screening for OSA. This test and is easily performed in the comfort of a patient's own home but should only be used in conjunction with a PSG.<sup>14</sup> One might discuss

the role dentists play in screening patients for OSA, a role that is not well defined in the dental community.

A dentist's education and training regarding oro-pharyngeal anatomy and physiology is often more extensive than many practicing physicians. Not only are they trained to perform head, neck, and oral exams, oftentimes in today's society the general population will visit a general dentist more frequently than a physician. The prevalence of general dentists screening for OSA is generally unknown in today's literature. A plethora of research has been done in the dental field concerning treatment effectiveness and even diagnostic tools, but none can be found on screening prevalence and frequency.<sup>15</sup>

Dental screenings for OSA may be found using one, or a combination, of three tools. First, a simple questionnaire that may be included in a health history form during new patient exams or yearly health updates. The "STOP-Bang questionnaire" or "Epworth Sleepiness Scale" (ESS) are commonly used to gather information such as tiredness, snoring, fatigue, blood pressure, BMI (Body Mass Index), etc.<sup>16</sup> These has proven to be an effective screening tool by deeming patients low to high risk and in predicting those with airway obstruction.<sup>16</sup> Although both demonstrate significant positive association with OSA, it should be noted that the ESS has been shown to yield a weak significant correlation.<sup>17</sup> Second, closely related to the questionnaire, is an interview between patient and doctor. Similar data, as previously stated, is collected and a risk assessment is made. Dentists may find more accurate information during a personal interview as opposed to a questionnaire, and therefore may be a preferred method of screening. Lastly, a physical examination of head, neck, and oro-pharyngeal anatomy may be performed to evaluate specific structures and risk of OSA. This screening method is difficult to perform and is best used as an adjunct with patient reported information. Dentists may assess BMI, neck



circumference, mandible position, soft palate features, pharyngeal musculature, and Mallampati score in order to evaluate any signs of airway obstruction.<sup>18</sup>

This study reported a relatively low response rate for a REDcap survey of 7% in which 41% of the 76% of respondents who screen for OSA utilize a home sleep test. As this ratio seems comparatively high in the overall general dentist population, self-selection bias may have occurred in this sample size.

Just over 75% of general dentists screening for OSA seems like a very high percentage, however, the questions regarding screening confidence and percentage of patients screened may provide additional insights. From the data gathered, it appears there is a significant number of providers (76%) are performing routine screenings, however, of those who report screening, only 14% are screening every patient. Furthermore, only 45% of dentists are screening at least seven out of every ten patients, resulting in the majority of the patient population not being screened. In addition, dentists report a lack of confidence in performing accurate routine screenings. The majority of responders (52%) rated themselves a three or less (1-uncomfortable, 5-confident) on a confidence scale in screening for OSA. Therefore, most general dentists may report screening for OSA, but they are not screening every patient, and there is a lack of confidence in their ability to screen.

More dentists need to be educated and trained on proper and accurate screening methods for OSA so patients may receive proper care and treatment. With increased screening prevalence by general dentists more patients with this condition will be identified early and hopefully prevent complications and improve existing conditions. This study aims to raise awareness of the need for general dentists to routinely and accurately screen for obstructive sleep apnea so patients with this condition may receive proper treatment and improved quality of life.

## **DISCLOSURE STATEMENT**

Study data were collected and managed using REDCap (Research Electronic Data Capture) electronic data capture tools hosted at Virginia Commonwealth University (Harris et al. Research electronic data capture (REDCap) - a metadata-driven methodology and workflow process for providing translational research informatics support. *J Biomed Inform.* 2009;42(2):377–381.).

REDCap is a secure, web-based application designed to support data capture for research studies.

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## **ABBREVIATIONS**

BMI: Body Mass Index

ESS: Epworth Sleepiness Scale

IRB: Internal Review Board

OSA: Obstructive Sleep Apnea

PSG: Polysomnography

REDCap: Research Electronic Data Capture

**Table 1.** Demographic characteristics of dentists (n=71)

| Demographic Factor   | N  | Percent |
|--|----|---------|
| <b>How many years have you practiced dentistry?</b>                |    |         |
| Less than 5  | 4  | 5.6%    |
| 5-10   | 3  | 4.2%    |
| 11-20  | 6  | 8.5%    |
| 21-30  | 24 | 33.8%   |
| More than 30   | 34 | 47.9%   |
| <b>In which setting are you primarily involved with dentistry?</b> |    |         |
| Private Practice   | 70 | 98.6%   |
| Military   | 1  | 1.4%    |
| <b>How would you describe your practice setting?</b>               |    |         |
| Metropolitan (more than 50,000)                                    | 18 | 26.5%   |
| Large City (50,000-50,000)   | 21 | 30.9%   |
| Small City (20,000-50,000)   | 17 | 25.0%   |
| Rural (less than 20,000)   | 12 | 17.6%   |
| <b>Practice Location</b>   |    |         |
| NC   | 8  | 11.9%   |
| NE   | 21 | 31.3%   |
| SE   | 14 | 20.9%   |
| SW   | 10 | 14.9%   |
| W  | 14 | 20.9%   |
| <b>Dental School Location (DDS/DMD)</b>                            |    |         |
| NC   | 12 | 22.6%   |
| NE   | 16 | 30.2%   |
| SE   | 14 | 26.4%   |
| SW   | 7  | 13.2%   |
| W  | 7  | 13.2%   |
| Other  | 9  | 17.0%   |

Not every respondent replied to every question. The percentages were based on those responding to a given question. Practice and dental school location identified by collapsing the state into a grouping into districts NC = North Central, NE = North East, SE = South East, SW= South West, W = West.

**Table 2.** Prevalence of screening for obstructive sleep Apnea (OSA)

| Do you screen for OSA ...                                    | N  | Percent |
|--|----|---------|
| <b>Primary Screening Modalities</b>                          |    |         |
| While obtaining medical history through a patient interview? |    |         |
| No   | 20 | 28.2%   |
| Yes  | 51 | 71.8%   |
| Through a written sleep questionnaire?                       |    |         |
| No   | 43 | 60.6%   |
| Yes  | 28 | 39.4%   |
| By specifically identifying anatomic parameters?             |    |         |
| No   | 34 | 48.6%   |
| Yes  | 36 | 51.4%   |
| <b>Other Screening Modalities</b>                            |    |         |
| Cone beam computed tomography                                |    |         |
| No   | 61 | 85.9%   |
| Yes  | 10 | 14.1%   |
| Home sleep test  |    |         |
| No   | 42 | 59.2%   |
| Yes  | 29 | 40.8%   |
| 2D lateral cephalogram                                       |    |         |
| No   | 70 | 98.6%   |
| Yes  | 1  | 1.4%    |
| Other methods  |    |         |
| No   | 68 | 95.8%   |
| Yes  | 3  | 4.2%    |
| <b>Any OSA screening</b>                                     |    |         |
| No   | 17 | 23.9%   |
| Yes  | 54 | 76.1%   |
| 1 Modality   | 11 | 15.5%   |
| 2 Modalities   | 9  | 12.7%   |
| 3 or More Modalities   | 34 | 47.9%   |

**Table 3.** "What percentage of patients do you routinely screen for OSA?"

| Dentist Response      | Percentage |
|-----------------------|------------|
| ≤7 out of 10 patients | 60%        |
| 8 out of 10 patients  | 9%         |
| 9 out of 10 patients  | 11%        |
| 10 out of 10 patients | 19%        |

**Table 4.** Relationships between demographic factors and screening for Obstructive Sleep Apnea (OSA)

| Demographics   | Any OSA Screening |                |
|--|-------------------|----------------|
|  | Percent           | 95% CI         |
| <b>How many years have you practiced dentistry?</b>  |                   |                |
| Less than 30   | 87.1 <sup>a</sup> | (70.2 to 95.1) |
| More than 30   | 62.9 <sup>b</sup> | (40.7 to 80.7) |
| <b>Practice and dental school location identified by collapsing the state into a grouping into districts</b> |                   |                |
| NC   | 85.1 <sup>a</sup> | (39.9 to 98.0) |
| NE   | 77.7 <sup>a</sup> | (53.5 to 91.4) |
| SE   | 83.0 <sup>a</sup> | (50.7 to 95.9) |
| SW   | 38.8 <sup>a</sup> | (14.2 to 70.8) |
| W  | 87.6 <sup>a</sup> | (59.7 to 97.1) |

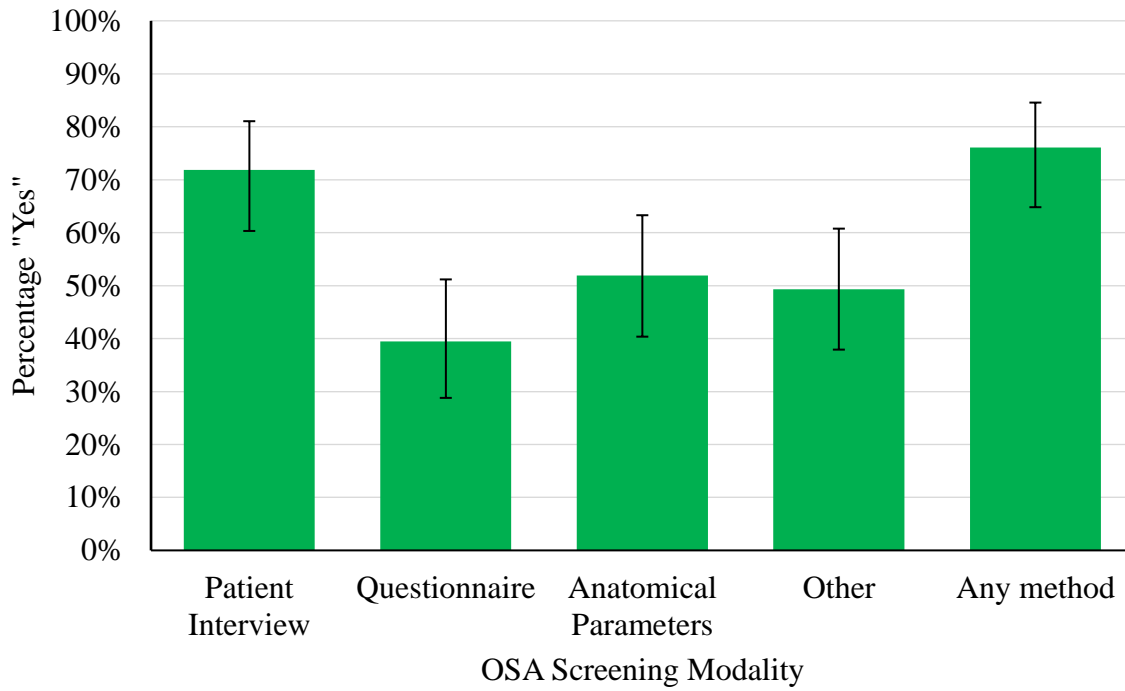
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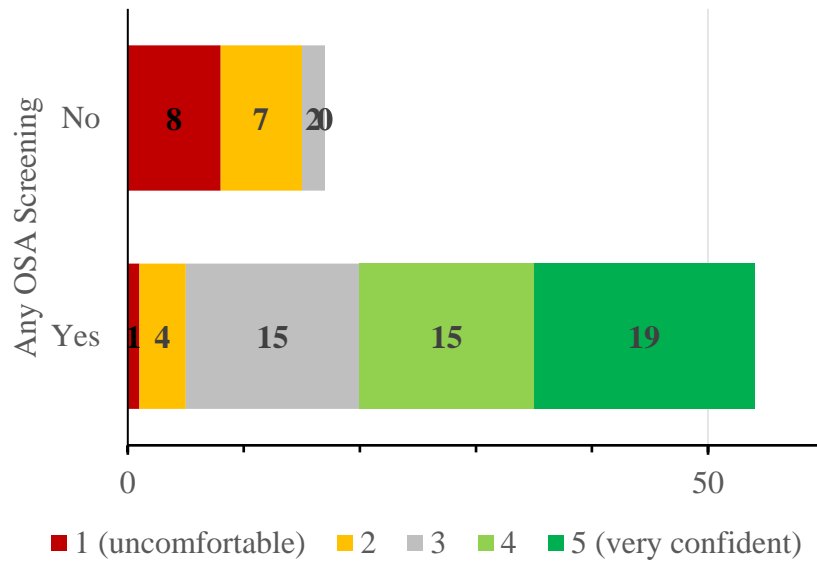
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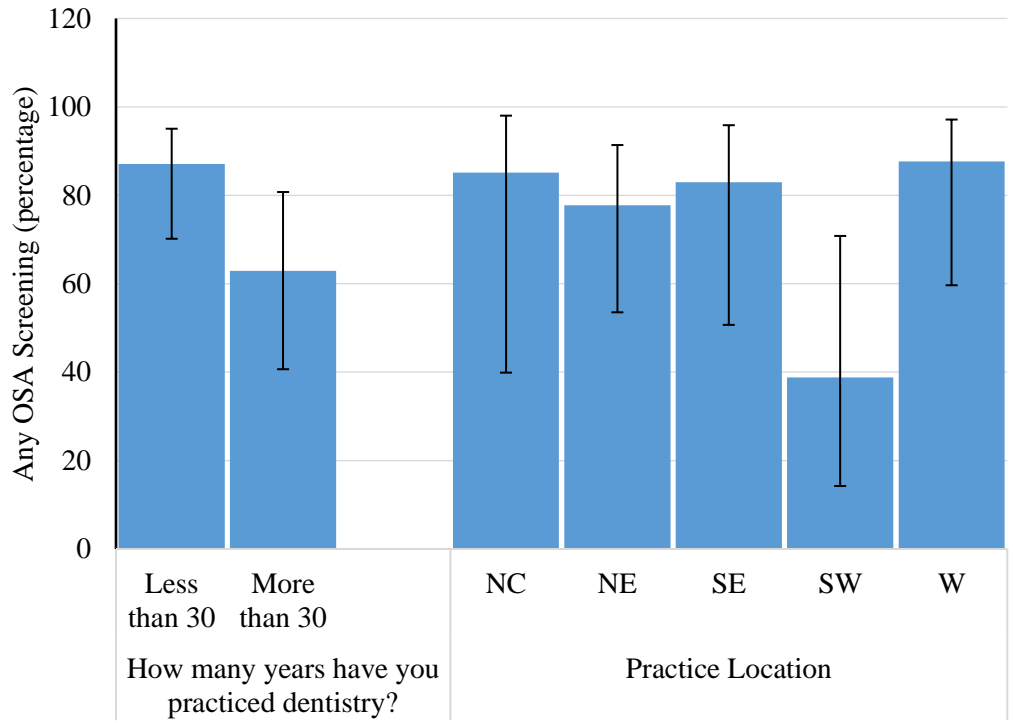
**Figure 1.** Obstructive sleep apnea (OSA) screening modalities



**Figure 2.** "Please characterize your confidence in screening for OSA." (1-uncomfortable, 5-confident)



**Figure 3.** Self-reported percentage screening for obstructive sleep apnea (OSA) by years in practice and practice location.



The percentage of “Do you screen for any OSA?” were estimated from logistic regression. NC = North Central; NE = North East; SE = South East; SW = South West; W = West.