

Introduction

Sleep is central to healthy childhood development. Sleep breathing abnormalities such as sleep disordered breathing (SDB) and obstructive sleep apnea (OSA) cause an abnormal gaseous exchange, leading to intermittent arousals throughout the night and thus a poor night's sleep (1). SDB is defined as any abnormal breathing pattern that disrupts normal sleep wake cycles. All sleep breathing disorders can cause behavioral and physical health issues (5). OSA is characterized by partially reduced airflow (hypopnea) or complete upper airway obstruction (apnea) during sleep, resulting in pauses in breathing (1). OSA, the severe end of SDB, is the most common sleep disordered breathing condition and in children is reported to be 1-5%, with a peak at pre-school age and another peak during adolescence (2,4). Untreated sleep breathing disorders can have detrimental effects on neurocognitive development, cardiovascular function, and metabolic function of a growing child. Studies have shown a correlation between poor classroom performance and symptoms associated with sleep disorders such as snoring, hyperactivity, daytime sleepiness, attention deficit, headaches in the morning, bedwetting, and restlessness (8).

Early intervention and diagnosis of SDB is key for a developing child, especially when 92.6% of SDB symptoms do not self-correct and 30% will worsen with age (7). Dentists play an essential role in the multidisciplinary care of patients with sleep breathing disorders and are well positioned to identify patients at risk. In children, the dentist's recognition of adenotonsillar hypertrophy as well as abnormal skeletal and dental features (e.g. maxillary/mandibular crowding, high arch and narrow palate, excessive vertical growth, and maxillary and/or mandibular retrusion) may lead to medical referral and orthodontic/orthopedic intervention to treat the breathing disorder (2,6). Additionally, the dentist can also screen for oral myofunctional disorders (i.e. open mouth posture, incorrect swallow, or incorrect tongue placement during speech). Orthodontic treatment options include maxillary expansion, use of forward pull headgear, mandibular advancement appliances, or orthognathic surgeries. Orthodontic treatments that produce orthopedic changes are an option to address oral habits, establish proper oral rest posture, and promote the natural forward and downward growth of the jaws (3,7). Referral to ENT for lymphatic tissue evaluation (i.e. adenotonsillectomy, AT) may be indicated (9). Oral myofunctional therapy (OMT) has also proven to be beneficial in the treatment of sleep breathing disorders. OMT involves the re-education of facial and oral muscles to establish proper oral rest posture and nasal breathing. The use of OMT may prevent recurrence of OSA after AT and orthodontic treatment (2,10). It becomes apparent that often the patient requires a team approach, not only to identify the OSA but also to treat it with multiple treatment modalities (ENT intervention if indicated, orthopedic dental appliances, and OMT retraining of breathing, chewing, and swallowing). Thus, a patient's management plan must be personalized and often requires an involvement of a multidisciplinary team (2).

Objectives

- 1) Determine the most common screening tool utilized by pediatric dentists to screen for sleep disordered breathing or obstructive sleep apnea; and 2) Determine the most common solution offered to patients with sleep disordered breathing or obstructive sleep apnea.

Study Design and Methods

The study was conducted as a cross-sectional national survey. An 11-question survey was sent out via email to active American Academy of Pediatric Dentistry (AAPD) members via Survey Monkey. Data collection occurred over a 2 month period from February 2023-March 2023.

The descriptive data was analyzed to determine the most common screening approaches utilized for sleep disordered breathing / obstructive sleep apnea (SDB/OSA) and the most common solutions offered by active U.S. pediatric dentists.

Subjects

The target population was pediatric dentists in clinical practice. Recruitment included an explanation of the study via email. Recipients had the opportunity to opt out without further obligation. There were no exclusions based on age, gender, medical history, race, or ethnicity. Retired dentists, pre-doctoral students, and international AAPD members were excluded. Any respondent who indicated they do not routinely screen for sleep breathing disorders were excluded from completing the remainder of the survey.

Results

The 11-question survey was sent out to 6,654 active members of the AAPD. Two hundred and thirteen members voluntarily took the survey (3.2% response rate). Of these respondents, 211 were actively practicing dentists. Current residents, retired dentists and those not currently practicing were excluded. Not all participants completed each question of the survey.

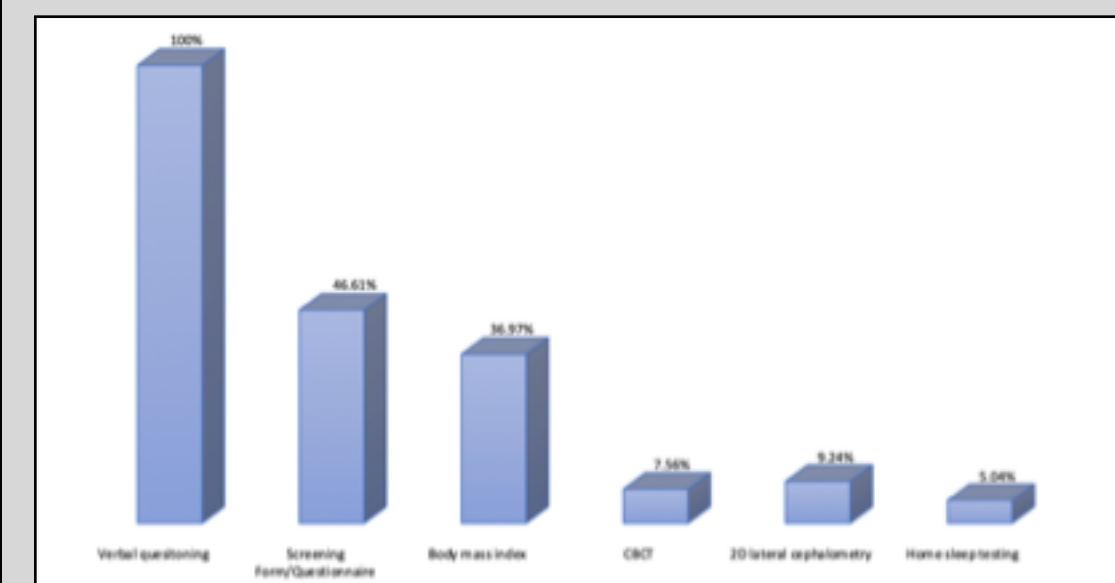


Figure 1: Most common sleep disordered breathing or obstructive sleep apnea screening modalities used by pediatric dentists.

The first phase focused on pediatric dentists' screening techniques for sleep breathing abnormalities during a typical examination. Respondents who indicated they routinely screened for SDB/OSA were asked to indicate the screening tools they commonly used. Figure 1 shows verbal questioning was the most common tool, used by 100% of the respondents, followed by a screening form or questionnaire (46.61%) and body mass index (36.97%). Cone-beam computed tomography (CBCT), 2D lateral cephalogram, and home sleep testing units were reported to be used less than 10% of the time. Figure 2 details the signs and symptoms of sleep breathing abnormalities most commonly identified by pediatric dentists during screening. In patients with sleep breathing abnormalities, the most common symptoms were snoring, gasping, or pauses in breathing while sleeping (100%), mouth breathing (96.64%), hyperactivity, inattention, or behavioral problems (86.55%) and Malampati and Brodsky score (85.71%).

Results

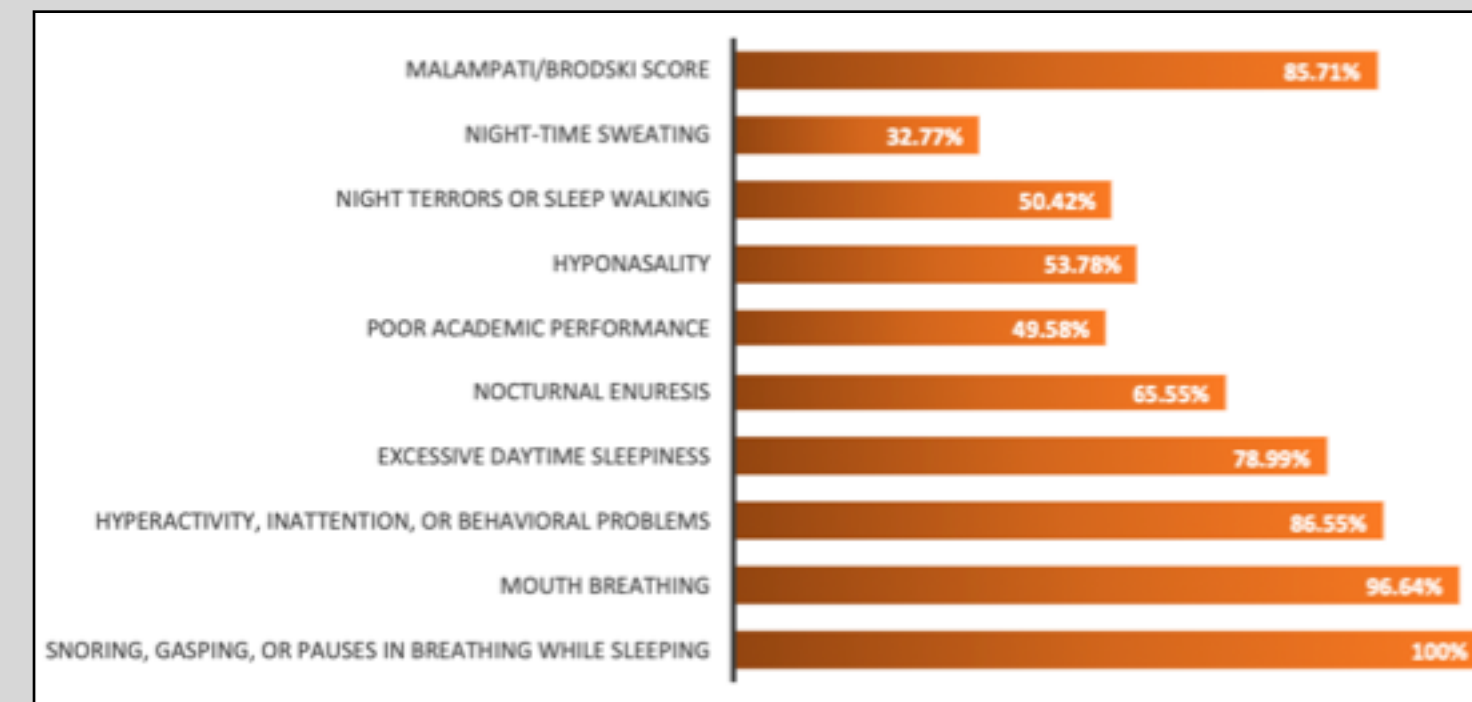


Figure 2: Sleep breathing abnormalities signs and symptoms most commonly screened for by providers.

The next component of the study focused on how likely the pediatric dentist was to refer if their pediatric patient had one or more of the signs and symptoms of sleep breathing abnormalities listed in Figure 2. Respondents reported always (51.26%), sometimes (47.06%) and never (2%) referring a patient with the listed signs and symptoms. Over half (57.26%) of respondents reported they had an existing referral relationship for pediatric sleep breathing abnormalities and reported referring to ENT (94.03%), pediatrician (77.61%), and/or a board certified sleep physician (22.39%).

In the final component of the survey, participants were asked whether or not they provide any forms of treatment to pediatric patients with sleep breathing abnormalities. Of the 26.50% pediatric dentists who responded that they provide treatment in their practice, 87.10% reported frenectomy, 74.19% reported palatal expansion, 64.52% reported fixed orthodontic appliance, and 48.39% reported myofunctional therapy.

Treatment	Percent Pediatric Dentists	Referral	Percent Pediatric Dentists
Palatal expansion	74.19%	ENT/otolaryngology	94.03%
Fixed orthodontic appliance	64.52%	Pediatrician	77.61%
Frenectomy	87.10%	Board certified sleep physician	22.39%
Myofunctional therapy	48.39%		

Table 3a (left): Most common treatments provided by pediatric dentists for sleep breathing abnormalities. Table 3b (right): Most common referrals made for sleep breathing abnormalities

Discussion

With the pediatric dentist in an excellent position to identify and initiate treatment of sleep breathing disorders, it is important to recognize how many providers are utilizing this opportunity to positively influence a child's growth and development. If we can first establish the methods already in use, in the future we can target the gaps in current practice models to educate and implement those who may not currently screen, treat or even diagnose sleep breathing abnormalities. It is imperative to remember that treatment often requires a multidisciplinary approach. Educating pediatric dentists is just part of the movement to set the standard for early recognition and intervention of pediatric sleep breathing abnormalities.

Discussion

The results indicate that pediatric dentists who screen, treat, and refer for sleep breathing abnormalities use a multimodal approach, which include subjective and objective approaches. While verbal questioning was reported by every respondent, this only represents a fraction of those who in fact routinely screen for sleep breathing disorders. Additionally, while referral to ENT in nearly 95% of the cases is promising, roughly half of the participating pediatric dentists reported referring only sometimes. Additionally, treatment solutions were predominated by frenectomy and palatal expansion. While improvements have been made in all phases of sleep breathing disorder management, there is still much work to be done to assimilate, standardize and clearly first characterize pediatric dentist practice models.

Conclusions

1. The most common screening tool utilized by pediatric dentists to screen for SDB/OSA is verbal questioning.
2. The common signs and symptoms of SDB/OSA screened for by pediatric dentists are snoring, gasping, or pauses in breathing while sleeping, mouth breathing, and Malampati and Brodsky score.
3. The most common referral for sleep breathing abnormalities is to ENT.
4. The most common solution offered to patients with SDB/OSA is frenectomy.

References

1. American Academy of Pediatric Dentistry. Policy on obstructive sleep apnea (OSA). The Reference Manual of Pediatric Dentistry. Chicago, Ill.: American Academy of Pediatric Dentistry; 2021:123-6.
2. Leung TNH, Cheng JWCH, Chan AKC. Paediatrics: how to manage obstructive sleep apnoea syndrome. *Drugs in Context* 2021; 10: 2020-12-5. DOI: 10.7573/dic.2020-12-5
3. Keating J, Park JH. Evaluation of Current Screening and Treatment Patterns for Pediatric Obstructive Sleep Apnea Among Practicing Pediatric Dentists in the United States: A Pilot Study. *Pediatr Dent*. 2016 Oct 15;38(5):393-397. PMID: 28206895.
4. Capua M, Ahmadi N, Shapiro C. Overview of obstructive sleep apnea in children: exploring the role of dentists in diagnosis and treatment. *J Can Dent Assoc*. 2009 May;75(4):285-9. PMID: 19422752.
5. Gipson K, Lu M, Kinane TB. Sleep-Disordered Breathing in Children. *Pediatr Rev*. 2019 Jan;40(1):3-13. doi: 10.1542/pir.2018-0142. Erratum in: *Pediatr Rev*. 2019 May;40(5):261. PMID: 30600274; PMCID: PMC6557418.
6. ADA Policy. The Role of Dentistry in the Treatment of Sleep-Related Breathing Disorders. American Dental Association. Adopted 2019 (2019: 270). Retrieved from https://www.ada.org/-/media/project/ada-organization/ada/ada-org/files/resources/research/oral-health-topics/ada_2019_policy_role_of_dentistry_sleep_related_breathing_disorders.pdf?rev=a6b7d4ff667c4325bd1cc402882e0235&hash=1FF15BB2D17D9EA639120DBB78D660E3
7. Bray, C. (2022). Pediatric Airway SOS - Our role in interdisciplinary management. *Inside Dental Hygiene*, Volume 16(Issue 4). Retrieved from <https://www.aegisdentalnetwork.com/idh/2020/08/pediatric-airway-sos>.
8. Bergersen EO. A Review of Research Studies on Sleep-Disordered Breathing in Children Relevant to Dental Professionals. *Compend Contin Educ Dent*. 2020 Jun;41(6):e1-e13. PMID: 32551711.
9. Huang YS, Guilleminault C. Pediatric obstructive sleep apnea and the critical role of oral-facial growth: evidences. *Front Neurol*. 2013 Jan 22;3:184. doi: 10.3389/fneur.2012.00184. PMID: 23346072; PMCID: PMC3551039.
10. Lee, SY., Guilleminault, C., Chiu, HY. *et al*. Mouth breathing, "nasal disuse," and pediatric sleep-disordered breathing. *Sleep Breath* 19, 1257–1264 (2015). <https://doi.org/10.1007/s11325-015-1154-6>