CHILDHOOD OBSTRUCTIVE SLEEP APNEA SYNDROME: A LITERATURE REVIEW

SÍNDROME DA APNEIA OBSTRUTIVA DO SONO INFANTIL: UMA REVISÃO DA LITERATURA

ALISSON CARLOS COSTA DE **SANTANA**[1], NAYANE CHAGAS CARVALHO **ALVES**[2*]

1. Dentist by Faculdade Ages, Jacobina, Bahia, Brazil; **2.** Professor and Specialist in Endodontics by FACSETE - IDENT, MSc in Dentistry by the Federal University of Sergipe (UFS), Ph.D. in Restorative Dentistry/Endodontics by the School of Dentistry of the University of Pernambuco (FOP/UPE).

* R. Doutor Lúcio Prado, n. 20, Farolândia. Aracaju, Sergipe, Brazil, ZIP CODE: 49032-250. nayanecc@gmail.com

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ABSTRACT

This study was developed with a literature review addressing childhood obstructive sleep apnea syndrome (OSAS). The descriptors searched were "Síndrome de Apneia Obstrutiva do Sono", "distúrbios do sono", and "apneia do sono na infância" (indexed in the Descriptors in Health Science - DeCs) and "Obstructive Sleep Apnea Syndrome", "sleep disorders", and "childhood sleep apnea" (indexed in the Medical Subject Heading Terms - MeshTerms/MeSH), in publications from the SciELO and PubMed databases of the last 10 years. Twenty-seven articles were selected for full-text analyses. Not treating this syndrome may have negative consequences such as growth deficit and developmental delay. The treatments may vary according to the needs of each patient and may be surgical or not but combining both may be an effective strategy to improve symptoms aiming at a better quality of life. The diagnosis and treatment of OSAS should involve a multidisciplinary team of qualified professionals, including pediatricians, otorhinolaryngologists, pediatric dentists/orthodontists, and speech therapists. Acknowledging this problem with a detailed and early diagnosis and an adequate treatment referral drastically reduces after-effects and improves the quality of life for patients.

KEYWORDS: Obstructive sleep apnea; Diagnosis; Sleep disorder; Treatment.

RESUMO

Este estudo foi desenvolvido com uma revisão de literatura abordando a síndrome da apneia obstrutiva do sono na infância (SAOS). Os descritores pesquisados foram "Síndrome de Apneia Obstrutiva do Sono", "distúrbios do sono" e "apneia do sono na infância" (indexados nos Descritores em Ciências da Saúde - DeCs) e "Síndrome da Apneia Obstrutiva do Sono", "distúrbios do sono" e "apneia do sono na infância" (indexada no *Medical Subject Heading Terms - MeshTerms*/ MeSH), em publicações das bases de dados SciELO e PubMed dos últimos 10 anos. Vinte e sete artigos foram selecionados para análise de texto completo. Não tratar esta síndrome pode ter consequências negativas como déficit de crescimento e atraso no desenvolvimento. Os tratamentos podem variar de acordo com a necessidade de cada paciente e podem ser cirúrgicos ou não, mas a combinação de ambos pode ser uma estratégia eficaz para melhorar os sintomas visando uma melhor qualidade de vida. O diagnóstico e tratamento da SAOS deve envolver uma equipe multidisciplinar de profissionais qualificados, incluindo pediatras, otorrinolaringologistas, odontopediatras/ortodontistas e fonoaudiólogos. Reconhecer esse problema com um diagnóstico detalhado e precoce e um encaminhamento adequado para o tratamento reduz drasticamente as sequelas e melhora a qualidade de vida dos pacientes.

PALAVRAS-CHAVE: Apneia obstrutiva do sono; Diagnóstico; Distúrbio do sono; Tratamento.

1. INTRODUCTION

Obstructive sleep apnea syndrome (OSAS) is a respiratory pathophysiological condition that develops during sleep, presenting recurrent periods of partial obstruction of the upper airways (hypopnea) or complete obstruction of these airways (apnea), affecting sleep quality and consequently the general health of children[1].

A study by Bixler *et al.* (2009)[2] showed a prevalence of childhood OSAS at around 1.2%, and the main symptoms were the presence of daytime behavioral problems, night snoring, and agitated sleep. Excessive daytime somnolence may also occur, but it is less common in younger children[3]. More recent studies show an increasing rate of this syndrome among children due to increased predispositions to childhood obesity and a prevalence of OSAS at around 2-4%[4].

Children with this condition may present serious levels of irritability, lack of focus, hyperactivity, moodiness, excessive fatigue, and personality changes[5]. Some physical conditions, such as overweight, adenotonsillar hypertrophy, mouth breathing, and neuromuscular impairment are major predisposing factors for OSAS[1].

Not treating OSAS may cause a series of complications. Considering the morbidities of this condition, the need for rapid intervention and a safe therapeutic technique is important for the health and development of children. Early diagnosis, therefore, is extremely relevant. The present study aims to analyze

the current knowledge on childhood OSAS to facilitate its diagnosis by clinical dentists, decreasing the delay in acknowledging this problem and minimizing the potential consequences of a late diagnosis.

2. MATERIAL AND METHODS

This literature review was performed in the SciELO and PubMed databases, from which journals indexed over the last 10 years and correlated to the objective of the study were selected. The descriptors used were "*Síndrome de Apneia Obstrutiva do Sono*", "*distúrbios do sono*", and "*apneia do sono na infância*" (indexed in the Descriptors in Health Science - DeCs), and "Obstructive Sleep Apnea Syndrome", "sleep disorders", and "childhood sleep apnea" (indexed in the Medical Subject Heading Terms - MeshTerms/ MeSH). Hence, the inclusion criteria were the year of publication and the descriptors. As exclusion criteria, the studies selected had to be published only in English and Portuguese. Forty articles were selected, and 13 were excluded due to incompatibility with the search terms.

3. LITERATURE REVIEW

Obstructive sleep apnea is a chronic respiratory sleep disorder caused by the recurrent collapse of the upper airways during sleep[6]. This disorder is considered complex, and its symptoms are heterogeneous[7]. According to Chang and Chae (2010)[8], the lack of adequate treatment for children with OSAS may cause growth deficit and developmental delay (more common in younger children) and excessive daytime somnolence (more common in older children).

Bozzini *et al.* (2016)[9] highlight that obstructive sleep apnea peaks between 3 and 8 years old, involving anatomical, craniofacial, and neuromuscular factors, and the presence of excess lymphoid tissues and inflammation of upper airways are considered the most critical components.

Compared to adults, children rarely develop cardiovascular complications such as *cor pulmonale*, heart failure, and systemic hypertension, but these potential complications may develop in untreated cases[8]. The sleep architectures of children are usually more conservative, with a higher cortical excitation threshold. Therefore, awakenings are not developed easily and require a medical follow-up to determine the diagnosis[8].

Obstructive sleep apnea syndrome (OSAS) is commonplace in childhood and characterized by symptoms such as recurrent obstructions of upper airways during sleep, which may cause significant neurocognitive and cardiovascular consequences, thus requiring a diagnosis to start an adequate treatment and improve the quality of life[10].

Children can also present symptoms such as depression, aggressive behavior, and impulsiveness, which may relate to school performance impairment[11]. The OSAS is also characterized by repetitive obstructions of upper airways, where intermittent hypoxia, hypercapnia, and adenotonsillar hypertrophy are aggregated, and the latter is considered the main risk factor in childhood[12].

It is worth noting that childhood OSAS presents pathophysiological complexities because it involves the mechanical obstruction of upper airways, which is often secondary to adenotonsillar hypertrophy[10].

Giuca *et al.* (2021)[13] highlight that every apnea episode should be considered pathological in children, as they occur differently in adults. This is because, in children affected by OSAS during sleep, hypoventilation combined with the physiological hypotonia of the pharynx muscles related to the non-physiological reduction of the oropharyngeal space, retroposition of the tongue, shrinking of upper airways, and increased nasal resistance occur during the apnea episode.

Obesity, tonsillar hypertrophy, adenoid, and individuals of the male sex are risk factors for childhood OSAS[14]. According to Bozzini *et al.* (2016)[9], pharyngeal and palatal tonsillar hypertrophy is the main predisposing factor to OSAS.

Other abnormalities fit these factors, such as increased lower facial height, higher craniocervical angle, reduced mandibular and maxillary impairments, small posterior space of upper airways, and lower position of the hyoid bone, as well as expressive characteristics of the absence of sleep such as dark circles, excessive somnolence, and irritability[9].

Perinatal risk factors may influence the occurrence of childhood OSAS, such as premature birth (adjusted odds ratio (aOR): 1.87, 95% confidence interval (CI): 1.13–3.08) and cesarean section (aOR: 1.32, 95% CI: 1.03–1.68). Other factors may predict the occurrence of OSAS, such as mothers exposed to smoking (aOR: 2.59, 95% CI: 1.57–4.26); also, mothers aged 35 years or older who perform manual labor and live in suburban areas considerably stimulate the risks of childhood OSAS[15].

Before defining a diagnosis, the physiological function of sleep at different life stages should be considered, as these variations are significant in neurophysiological and behavioral functions. Therefore, the development age is described as a constant process of physical and neuropsychological changes and synaptic remodeling, which compose the neurophysiological basis of the brain plasticity typical of this phase, mainly occurring during sleep[16].

Screening is essential to diagnose OSAS, and dentists play an important role in installing, managing, and following up the use of oral appliances, as well as referring patients with OSAS suspicions to sleep specialists. Other methods can also diagnose obstructive sleep apnea syndrome[17].

Pediatric polysomnographic criteria are important tools for establishing the diagnosis and severity of OSAS, classifying children with an apnea-hypopnea index (AHI) ≥ 1 event/h as apneic[18].

However, polysomnography (PSG) in children should be performed according to the

recommendations of the Administrative Council of the American Academy of Sleep Medicine (AASM), considering that OSAS should be detected using both polysomnographic and clinical criteria for an accurate diagnosis[19]. The age of children must be considered before applying the polysomnographic parameters because they vary with age, requiring the use of rules compatible with each age[20].

The diagnosis may also be performed with the conventional cephalometric method, which is extensively used in clinical practice, easily accessible, inexpensive, and reduces patient exposure to radiation. Other methods may be used to assess the anatomical characteristics of upper airways and craniofacial structures, using technologies such as magnetic resonance imaging and computed tomography[9].

There are several treatments available for childhood OSAS, both surgical and non-surgical, which aim to meet the needs of each patient. Some include oral appliances, lingual tonsillectomy, supplementary oxygen, supraglottoplasty, anti-inflammatories, and rapid maxillary expansion[10]. Continuous positive airway pressure (CPAP) is a non-surgical standard procedure to treat people affected with OSAS, but it presents low adherence[21].

Positive airway pressure is not recommended for children because it might cause maxillary growth over time and growth problems[22]. However, treatments with corticosteroids and leukotriene receptor antagonists are effective in children, but only in those with mild OSAS[21].

According to Bariani *et al.* (2020)[22], adenotonsillectomy surgery is the main treatment for children with OSAS, solving 85-90% of cases. Marcus et al. (2013)[23] highlight the importance of adenotonsillectomy as a primary treatment for adenotonsillar, a risk factor for childhood OSAS.

Dentists play an important role in acknowledging these changes previously and referring patients to an adequate professional to prevent late diagnoses and unfavorable prognoses. They also perform important measures in orthodontic changes affected by OSAS. Pediatric treatment is essential because it aims to reduce the severity of the syndrome by increasing the airway space and improving the airflow with orthopedic upper mandibular expansion and mandibular advancement using mandibular advancement and rapid palatal devices[24].

4. DISCUSSION

Studies on childhood OSAS have been developing, as verified in the articles analyzed. However, the knowledge on this disease must be disseminated regarding its diagnoses in the dental clinical practice to improve treatment prognosis and prevent severe complications, considering that some of these diagnoses may be delayed because of the difficult access to another professional, increasing the risks of metabolic and cardiovascular complications and potentially causing cognitive function implications.

The findings of the studies are clear, showing notoriety, and analyzing the factors related to the predispositions of childhood OSAS. The studies performed in 2009 show a prevalence rate of around 1.2% for childhood OSAS[2]. However, a more recent study in 2020 shows an increased prevalence of OSAS at around 2-4%[4]. This is due to increased predisposing factors and the access to trained professionals for a previous diagnosis, treatment, and improved prognosis. A follow-up with a multidisciplinary team is often required, including pediatricians, otorhinolaryngologists, pediatric dentists/orthodontists, and speech therapists to reach a diagnosis[13].

These data emphasize the importance of treatment and early diagnosis to reduce the damage caused by this complication because not treating OSAS may cause neurobehavioral and cardiovascular complications and harm growth[8,10,11,22].

Bariani *et al.* (2020)[22] and Marcus *et al.* (2013)[23] highlight the importance of adenotonsillectomy, considered a primary treatment that solves 85-90% of cases of children with OSAS. However, Venekamp *et al.* (2015)[25] emphasize the harm and benefits of adenotonsillectomy. They indicate moderate qualities in children regarding symptoms, behavior, and improved quality of life, thus considering the procedure beneficial in terms of polysomnography (PSG) parameters but without evidence indicating benefits in terms of objective measures of neurocognitive attention and performance.

Hence, detailed screening is required to determine adequate treatment. Mitchell *et al.* (2015)[26] have reservations about distinguishing the levels and severity of the syndrome in children before surgery, using clinical parameters. Thus, a diagnosis may be established according to the needs of everyone to determine which children are in higher need of polysomnography (PSG) before adenotonsillectomy (AT), reinforcing the ideas of Gianoni-Capenakas *et al.* (2020)[17] on the importance of screening according to patient needs.

Brockbank (2017)[10] highlights procedures that may be used in the treatment of children with OSAS, either surgical such as adenotonsillectomy as the most used treatment, supraglottoplasty, and the installment of oral appliances; or non-surgical such as polysomnography, drug therapies, and positive airway pressure, aiming at the most adequate procedures according to patient needs. Apodaca *et al.* (2020)[27] have reservations about surgical procedures because although patients treated surgically showed better results, 31% had persistent OSAS, which shows that combining treatments may be a more suitable strategy.

However, it is worth noting the importance of the role of dentists in the treatment and diagnosis of OSAS and otorhinolaryngologists in orthodontic treatment[24]. The treatment of OSAS must be multidisciplinary, prioritizing well-being, prognosis, and treatment effectiveness.

5. CONCLUSION

The study evidenced the importance of screening as a diagnostic method, considering the physiological functions of sleep and the epidemiological profile of patients, which are significant factors in understanding the variations in neurophysiological and behavioral functions. Pediatric polysomnographic criteria are important tools to determine the diagnosis, as well as the conventional cephalometric method, which is inexpensive and easily accessible.

A multidisciplinary team is required for treatment because obstructive sleep apnea syndrome is a multifactorial disease. Acknowledging this problem with an early diagnosis and an adequate treatment referral drastically reduces after-effects and improves the quality of life for patients.

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