

Obesity and Sleep-disordered Breathing in Children: Obstructive Sleep Apnea and Its Impact on Ear, Nose, and Throat Health

Obesidade e Distúrbios Respiratórios do Sono em Crianças: Apneia Obstrutiva do Sono e Seu Impacto na Saúde dos Ovidos, Nariz e Garganta

Obesidad y Trastornos Respiratorios del Sueño en Niños: Apnea Obstructiva del Sueño y Su Impacto en la Salud de los Oídos, la Nariz y la Garganta

RESUMO

Introdução: A apneia obstrutiva do sono (AOS) em crianças é um distúrbio respiratório caracterizado por obstruções intermitentes das vias aéreas superiores (VAS) durante o sono. A obesidade infantil é um fator de risco majoritário, contribuindo para o estreitamento das VAS e aumento da resistência respiratória. **Objetivo:** Revisar a interconexão entre obesidade e AOS em crianças, enfatizando o impacto da doença na saúde otorrinolaringológica (ORL), particularmente em estruturas como ovidos, nariz e garganta. **Métodos:** Revisão sistemática e narrativa da literatura (PubMed, Scopus, SciELO) com foco em estudos de 2015 a 2025 que abordaram a fisiopatologia, manifestações clínicas, complicações ORL (otite média, disfunção tubária, hipertrofia adenotonsilar) e abordagens terapêuticas na criança obesa com AOS. **Resultados:** A obesidade aumenta significativamente a gravidade da AOS e é um preditor de falha na adenotonsilectomia, o tratamento padrão. Crianças obesas apresentam maior prevalência de disfunção da tuba auditiva e otite média serosa, além de maior colapso faríngeo residual pós-cirurgia (Tabela 1). A resistência nasal elevada e a inflamação sistêmica contribuem para a patogênese do distúrbio. **Conclusão:** A obesidade exerce um papel significativo na gravidade e persistência da AOS infantil, elevando o risco de alterações auditivas e refratariedade ao tratamento cirúrgico ORL. Isso reforça a necessidade de uma abordagem multidisciplinar obrigatória que integre o tratamento otorrinolaringológico (cirúrgico ou não) com estratégias agressivas de controle ponderal e metabólico.

DESCRIPTORES: Obesidade Infantil; Apneia Obstrutiva do Sono; Otorrinolaringologia; Otite Média; Hipertrofia Adenotonsilar; Disfunção Tubária.

ABSTRACT

Introduction: Obstructive sleep apnea (OSA) in children is a respiratory disorder characterized by intermittent upper airway (UA) obstructions during sleep. Childhood obesity is a major risk factor, contributing to UA narrowing and increased respiratory resistance. **Objective:** To review the interconnection between obesity and OSA in children, emphasizing the impact of the disease on otorhinolaryngological (ENT) health, particularly on structures such as the ears, nose, and throat. **Methods:** Systematic and narrative literature review (PubMed, Scopus, SciELO) focusing on studies from 2015 to 2025 that addressed pathophysiology, clinical manifestations, ENT complications (otitis media, eustachian tube dysfunction, adenotonsillar hypertrophy), and therapeutic approaches in obese children with OSA. **Results:** Obesity significantly increases the severity of OSA and is a predictor of adenotonsillectomy failure, the standard treatment. Obese children show a higher prevalence of eustachian tube dysfunction and serous otitis media, as well as greater residual pharyngeal collapse after surgery (Table 1). Increased nasal resistance and systemic inflammation contribute to the disorder's pathogenesis. **Conclusion:** Obesity plays a significant role in the severity and persistence of pediatric OSA, increasing the risk of hearing alterations and refractoriness to ENT surgical treatment. This highlights the need for a mandatory multidisciplinary approach integrating otorhinolaryngological (surgical or nonsurgical) treatment with aggressive weight and metabolic control strategies.

DESCRIPTORS: Childhood Obesity; Obstructive Sleep Apnea; Otorhinolaryngology; Otitis Media; Adenotonsillar Hypertrophy; Eustachian Tube Dysfunction.

RESUMEN

Introducción: La apnea obstructiva del sueño (AOS) en niños es un trastorno respiratorio caracterizado por obstrucciones intermitentes de las vías respiratorias superiores (VAS) durante el sueño. La obesidad infantil es un factor de riesgo importante, que contribuye al estrechamiento de las VAS y al aumento de la resistencia respiratoria. **Objetivo:** Revisar la interconexión entre obesidad y AOS en niños, destacando el impacto de la enfermedad en la salud otorrinolaringológica (ORL), particularmente en estructuras como los oídos, la nariz y la garganta. **Métodos:** Revisión sistemática y narrativa de la literatura (PubMed, Scopus, SciELO) enfocada en estudios de 2015 a 2025 que abordaron la fisiopatología, manifestaciones clínicas, complicaciones ORL (otitis media, disfunción tubárica, hipertrofia adenoamigdal) y abordajes terapéuticos en niños obesos con AOS. **Resultados:** La obesidad aumenta significativamente la gravedad de la AOS y es un predictor de fracaso en la adenoamigdalectomía, el tratamiento estándar. Los niños obesos presentan una mayor prevalencia de disfunción de la trompa de Eustaquio y otitis media serosa, además de mayor colapso faríngeo residual después de la cirugía (Tabla 1). La resistencia nasal elevada y la inflamación sistémica contribuyen a la patogénesis del trastorno. **Conclusión:** La obesidad desempeña un papel importante en la gravedad y persistencia de la AOS infantil, aumentando el riesgo de alteraciones auditivas y de refractariedad al tratamiento quirúrgico ORL. Esto refuerza la necesidad de un enfoque multidisciplinario obligatorio que integre el tratamiento otorrinolaringológico (quirúrgico o no) con estrategias agresivas de control ponderal y metabólico.

DESCRIPTORES: Obesidad Infantil; Apnea Obstructiva del Sueño; Otorrinolaringología; Otitis Media; Hipertrofia Adenoamigdal; Disfunción Tubárica.

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INTRODUCTION

Childhood obesity has reached epidemic proportions globally, establishing itself as one of the most serious threats to the health of new generations, associated with a wide range of metabolic, cardiovascular, and respiratory comorbidities^[1, 2]. Among these, Obstructive Sleep Apnea (OSA) stands out as a condition with high prevalence (1% to 5% of children) and potential morbidity, whose incidence accompanies the increase in body mass index (BMI)^[3, 4].

OSA is characterized by recurrent obstruction of the upper airway (UA) during sleep, inducing intermittent hypoxia, hypercapnia, and sleep fragmentation. These consequences compromise the child's physical development, cognitive performance, and behavioral adjustment^[5]. Traditionally, the main anatomical cause of pediatric OSA is adenotonsillar hypertrophy. However, in obese children, the pathogenesis is more complex, including the accumulation of adipose tissue in the pharyngeal walls and a systemic inflammatory state^[6, 9].

The impact of OSA in obese children is not limited to respiratory and metabolic disorders; it directly interferes with otolaryngological (ENT) health. Growing evidence points to a relationship between OSA and an increased incidence of serous otitis media (SOM), auditory tube dysfunction, and chronic rhinitis^[7, 8].

Therefore, this study aims to deepen the understanding of the intrinsic relationship between obesity, OSA, and ear, nose, and throat health, with a view to

improving the diagnosis and comprehensive clinical management of affected children^[10, 11].

METHODS

Search Strategy and Data Sources

A systematic and narrative review of the scientific literature was conducted. The electronic search was performed in the Medline/PubMed, Scopus, SciELO, and Google Scholar databases. The inclusion period for articles was limited to between 2015 and September 2025.

The descriptors (in combination with Boolean operators AND/OR) used were: 'childhood obesity', 'obstructive sleep apnea', 'sleep-disordered breathing', 'otitis media', 'eustachian tube dysfunction', 'adenotonsillar hypertrophy', and 'rhinitis'.

Eligibility Criteria and Study Selection

Inclusion Criteria:

- Articles addressing the relationship between obesity, OSA, and ENT complications in children and adolescents (up to 18 years of age).
- Observational studies (cohort, case-control, cross-sectional), syste-

matic reviews, meta-analyses, and clinical trials.

- Published in English or Portuguese.

Exclusion Criteria:

- Case reports or case series with fewer than 10 patients.
- Studies focused exclusively on adults.
- Editorials, letters to the editor, or conference abstracts without full text.

Data Extraction and Synthesis

Initial screening was performed by a single reviewer, focusing on titles and abstracts. Potentially relevant articles had their full text evaluated to determine final eligibility. Data extraction focused on findings of: (a) Pathophysiology (mechanisms of obstruction in obese individuals), (b) ENT complications (prevalence of otitis/tubal dysfunction), (c) Therapeutic response (cure rate or persistence of OSA after adenotonsillectomy), and (d) Quantitative data (Apnea-Hypopnea Index - AHI). The data synthesis was predominantly narrative, given the heterogeneity of clinical measurements in ENT studies.

Table 1 – Characteristics of Selected Studies on the Obesity-OAS-ENT Interaction

Ref.	Author(s), Year	Study Design	Population (n)	Main Focus	Relevant ENT Finding
[12]	Huang et al., 2025	Cross-sectional (Large Cohort)	4,668	Obesity and Severity of OSA	Association of obesity with moderate/severe forms of OSA.
[13]	Lumachi et al., 2024	Systematic Review	N/A	Pathophysiology of Tubal Dysfunction	Negative pharyngeal pressure in obese individuals contributes to serous otitis media.
[14]	Arens et al., 2017	Cohort Study	90	Adenotonsillectomy failure	Obesity is the strongest predictor of residual OSA after surgery.

[15]	Zaffanello et al., 2020	Meta-analysis	N/A	ENT complications in pediatric OSA	Higher prevalence of rhinitis and sinusitis in children with OSA and overweight.
[16]	Gami et al., 2018	Case-control study	75	Endoscopic Evaluation (DISE)	Obese individuals present more extensive multilocal pharyngeal collapse.

RESULTS

Quantitative Data

The studies analyzed confirm that obesity is a determining factor for the severity and persistence of OSA in children [3, 12]. The Apnea-Hypopnea Index (AHI) is significantly higher in obese children when compared to normal weight children with purely adenotonsillar OSA [6, 12]. For example, a study of more than 4,600 children found that overweight and obesity were associated with a 2.5 to 4 times higher risk of developing moderate to severe OSA, with an AHI \geq 5 events/hour [12].

Otorhinolaryngological Impact

Obesity potentiates the ENT repercussions of OSA.

- Eustachian Tube Dysfunction and Serous Otitis Media (SOM): Overweight children with OSA have a higher incidence of SOM due to Eustachian tube dysfunction [7, 13]. Increased negative pressure in the nasopharynx, exacerbated by VAS collapse, and systemic inflamma-

tion (adipokines and inflammatory cytokines) contribute to tubal edema and difficulty in middle ear ventilation [13].

- Nasal Resistance: Increased fat deposition on the sides of the pharynx and mucosal edema, often associated with chronic rhinitis and sinusitis, increase anterior nasal resistance, correlating directly with the severity of OSA and intense snoring [8, 15].
- Adenotonsillectomy Failure: Although adenotonsillar hypertrophy is the most common cause, obesity is a robust predictor of residual or persistent OSA after adenotonsillectomy, with failure rates as high as 50% [14]. Drug-Induced Sleep Endoscopy (DISE) studies have confirmed that pharyngeal collapse in obese individuals is more extensive, often involving the hypopharynx and base of the tongue, areas that are not treated by adenotonsillectomy [16].

DISCUSSION

The intersection between obesity and paediatric OSA represents a diagnostic and therapeutic challenge that requires an integrated ENT and metabolic approach.

Complex Pathophysiology and the ENT Component

The relationship is multifactorial, transcending simple hypertrophic anatomy. Fat accumulation is not limited to the pharynx; obesity induces chronic systemic inflammation, which manifests locally as persistent mucosal edema (chronic rhinitis) and contributes to lymphatic (adenotonsillar) hypertrophy [1, 3, 15].

Eustachian tube dysfunction and the subsequent development of OMS in obese children with OSA are a crucial ENT finding. The Eustachian tube, which opens into the nasopharynx, is directly impacted by the negative pharyngeal pressures generated by respiratory efforts against obstruction and the adjacent inflammatory process, resulting in inadequate ventilation and accumulation of effusion in the middle ear [7, 13].

Limitations of Surgical Treatment

Adenotonsillectomy is the first line of treatment for most children with OSA. However, in the obese population, its effectiveness is significantly lower [14]. The results of this review confirm that the persistence rate of OSA is twice as high or more in obese children (Table 2), due to non-adenotonsillar obstructive mechanisms [16].

The recognition that collapse in the upper airway of obese children extends to the hypopharynx and base of the tongue implies that treatment must go beyond ENT surgery. Effective management requires the integration of weight control, Continuous Positive Airway Pressure (CPAP) therapy in cases of persistence [17], and complementary ENT interventions (such as tongue base

Tabela 2 – Taxas de Persistência de AOS Pós-Adenotonsilectomia

Ref.	Grupo de Pacientes	n (Pacientes)	Taxa de Persistência de AOS Moderada/Grave (%)	Fator Etiológico Principal da Persistência
[14]	Pós-AT Obesos	45	48%	Colapso Faringe/Base da Língua
[14]	Pós-AT Não Obesos	45	20%	Obstrução Residual Tonsilar
[16]	Pós-AT Obesos	30	52%	Colapso Hipofaríngeo Multilocal
[17]	Pós-AT Obesos com Comorbidades	60	61%	Obesidade e Inflamação Sistêmica

surgery or palatoplasty in selected cases)^[16]. Prevention of childhood obesity, therefore, assumes the role of the most effective preventive strategy against OSA and its ENT and systemic complications^[12,18].

CONCLUSION

Childhood obesity is a major risk

factor for obstructive sleep apnea (OSA) and a significant predictor of disease persistence and otolaryngological (ENT) complications, such as serous otitis media and tubal dysfunction. The pathogenesis in obese children is complex and involves airway lumen reduction and systemic inflammation, which limit the effectiveness of adenotonsillectomy. The management of OSA in obese children

requires a rigorous multidisciplinary approach that combines ENT expertise (initial diagnosis and surgical treatment) with aggressive weight control and metabolic surveillance. Early identification and treatment of obesity are essential to optimize long-term outcomes and prevent damage to physical and cognitive development.

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