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REVIEW ARTICLE

Impacts of child obesity in comparison with the incidence of sleep APNEA and its interventions

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ABSTRACT

Introduction: Childhood obesity is a serious medical condition that affects children and adolescents. It's particularly worrisome because the extra pounds often put children on the path to health problems that were once considered adult problems — diabetes, high blood pressure and high cholesterol. Childhood obesity can also lead to low self-esteem and depression.

Objective: To analyze the impacts of childhood obesity in comparison with the incidence of sleep apnea and its interventions.

Methodology: This study is an Integrative Literature Review, with searches conducted in the databases BVS, SciELO, LILACS, BENDEFI, and BIREME. Publications in Portuguese, English, and Spanish addressing childhood obesity associated with sleep apnea and prevention or treatment strategies were included.

Results: Of the 23 articles that talked about childhood obesity, 17 were excluded because they were not related to sleep apnea. Publications older than ten years were disregarded. Titles and abstracts were screened to identify studies eligible for full-text review.

Final Considerations: For all that has been exposed in the course of the work presented so far, it was possible to conclude that childhood obesity can profoundly affect children's physical health, social and emotional well-being and self-esteem. It is also associated with low academic performance and a lower quality of life experienced by the child. Many comorbidities such as metabolic, cardiovascular, orthopedic, neurological, hepatic, pulmonary and renal disorders are also observed in association with childhood obesity.

Keywords: Childhood obesity. Apnea. Nutrition. Consequences.

1. Introduction

The world is undergoing a rapid epidemiological and nutritional transition characterized by persistent nutritional deficiencies, such as stunting, anemia, and iron and zinc deficiencies. Concurrently, there has been a progressive increase in the prevalence of chronic nutrition-related diseases, including obesity, diabetes, cardiovascular diseases, and certain types of cancer. Childhood obesity has reached epidemic proportions in developed countries, and its prevalence is also rising steadily in developing nations[1].

Although the definitions of obesity and overweight have evolved over time, obesity is generally defined as an excess accumulation of body fat. There is no universal consensus regarding cutoff points for excess body fat, overweight, or obesity in children and adolescents. Classification criteria commonly rely on anthropometric indicators, particularly body mass index (BMI), which remains widely used in both clinical and epidemiological settings[2].

Several methods are available to assess body fat percentage. In research settings, techniques such as underwater weighing (densitometry), multifrequency bioelectrical impedance analysis (BIA), and magnetic resonance imaging (MRI) are frequently employed. In clinical practice, however, simpler measures such as BMI, waist circumference, and skinfold thickness are more commonly used due to their feasibility. Although these clinical methods are less precise than research-based techniques, they are considered adequate for identifying health risks in pediatric populations[3].

Body mass index, however, presents important limitations in children, as it does not distinguish between fat mass and fat-free mass (muscle and bone) and may overestimate obesity in large or muscular children. Furthermore, growth patterns vary according to age, sex, and ethnicity. Because the adverse health consequences of obesity are primarily associated with excess adiposity, classification methods ideally should be based on direct fat measurement. Waist circumference has been highlighted as a particularly relevant indicator in children, as it reflects central obesity, a known risk factor for type 2 diabetes and coronary heart disease[4].

It is widely accepted that the rise in obesity results from an imbalance between energy intake and energy expenditure, closely linked to lifestyle behaviors and dietary preferences. Nevertheless, increasing evidence suggests that genetic predisposition also plays a significant role in determining obesity risk. Research has contributed substantially to understanding the multifactorial nature of childhood obesity. Ecological models emphasize that childhood obesity risk factors include dietary intake, physical activity, and sedentary behavior, all of which interact with individual and contextual determinants[5].

Importantly, the impact of these risk factors is moderated by age, sex, and family characteristics, including parenting style and parental lifestyle. Environmental factors—such as school policies, demographic characteristics, and parental work demands—further influence children's eating and activity behaviors[6].

In this context, the following research question emerges: Considering the contemporary lifestyle of children—shaped by technological advances, reduced parental supervision of dietary habits, and increased consumption of industrialized foods—what interventions are necessary to mitigate the impact of childhood obesity on the incidence of obstructive sleep apnea?

2. Methods

2.1 STUDY DESIGN

This study is an Integrative Literature Review, a methodological approach that enables the synthesis of knowledge and the incorporation of evidence from relevant studies into clinical and scientific practice[1-3]. The integrative review was conducted following the methodological stages recommended in the literature: formulation of the hypothesis and objectives of the review; definition of inclusion and exclusion criteria; identification and selection of descriptors and development of the search strategy; electronic database searching; selection of potentially eligible studies; data collection and storage; critical analysis and interpretation of findings; and synthesis and presentation of results[2,3].

2.2 ELIGIBILITY CRITERIA

2.2.1 Types of Studies

Eligible publications included scientific articles, books, dissertations, guidelines, and theses available in the databases of the Virtual Health Library (VHL), including SciELO (Scientific Electronic

Library Online), LILACS (Latin American and Caribbean Literature in Health Sciences), BENDEFI, and BIREME. Studies published between 2020 and 2021 and written in Portuguese, English, or Spanish were considered for inclusion.

2.2.2 Types of Participants

Studies focusing on children diagnosed with obesity, regardless of sex or general health status, were included.

2.2.3 Types of Interventions

Studies addressing treatment strategies for childhood obesity, particularly those involving associated health conditions, with specific emphasis on obstructive sleep apnea, were eligible for inclusion.

2.3 EXCLUSION CRITERIA

Publications that did not address the relationship between childhood obesity and sleep apnea, as well as studies published prior to 2020, were excluded.

2.4 SEARCH STRATEGY

The bibliographic search was conducted in May 2022. Scientific articles, books, dissertations, guidelines, and theses published in Portuguese, English, and Spanish were searched through the Virtual Health Library (VHL), including the databases SciELO, LILACS, BENDEFI, and BIREME.

Controlled descriptors were selected from the Health Sciences Descriptors (DeCS) and the Medical Subject Headings (MeSH), in accordance with the methodology proposed by Mendes et al.[1] and applied by Nogueira et al.[3] The descriptors used included *Childhood Obesity*, *Sleep Apnea*, *Prevention*, and *Interventions*. These terms were combined using the Boolean operators AND, OR, and NOT. The search strategies included the following combinations:

- ("Childhood Obesity" AND "Sleep Apnea") AND (Prevention OR Treatment)
- ("Childhood Obesity" AND "Diseases") AND (Prevention OR Treatment)

2.4.1 Study Selection

After completion of the searches, all identified records were stored in a database. Duplicate references were removed to generate a single list of studies. An initial screening was conducted based on titles and abstracts, followed by full-text reading of potentially eligible studies. Articles that fully met the established inclusion criteria were incorporated into the review. The study selection process followed the methodological framework proposed by Souza et al.[2] and applied by Nogueira et al.[3], ensuring rigor, transparency, and reproducibility.

3. Results

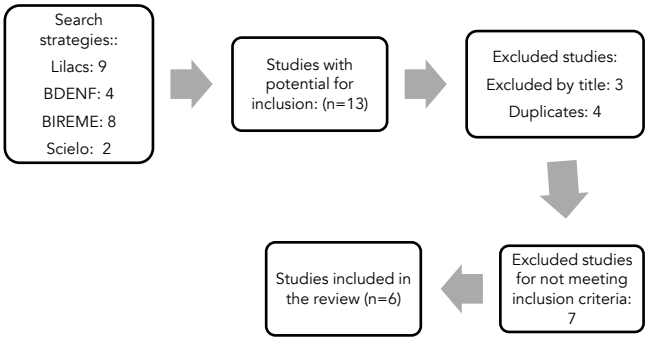
3.1 SEARCH RESULTS

After conducting the searches across the selected databases, 23 records were initially identified. Following the removal of duplicate citations, 13 unique records remained. An initial screening based on titles and abstracts was performed, resulting in the exclusion of seven studies for not meeting the established inclusion criteria.

Subsequently, six studies were selected for full-text review and were ultimately included in the integrative review. The studies included were those conducted by Bonsignore et al. (2019), Santos et al. (2021), Huang and Guilleminault (2017), Siriwat et al. (2020), Anderson and Keim (2016), and Santos et al. (2021)[4-12].

Figure 1 illustrates the study selection process and search strategy flow, detailing each stage from initial identification to final inclusion of studies in the review.

Figure 1. Flow diagram of the search and study selection process.



Source: Author (2022).

3.2 CHARACTERISTICS OF THE INCLUDED STUDIES

The studies included in this review were synthesized in Table 1, which was organized according to the following variables: title, reference/year, objective, methodology, and main results. Subsequently, the selected literature was critically analyzed and discussed to support the interpretation of findings and the development of the study conclusions.

Table 1. Characteristics of the included studies

Database	Author/Year	Objective	Study design	Main Findings
LILACS	Anderson & Keim, 2016	Examine association between childhood obesity and parent–child interactions.	Observational study	Family environment influences childhood obesity and may contribute to respiratory complications and OSA.
LILACS	Bonsignore et al., 2019	Review comorbidities associated with obstructive sleep apnea.	Review	OSA frequently associated with cardiometabolic diseases and worsened prognosis due to chronic organ damage.
BDENF	Huang & Guilleminault, 2017	Discuss mechanisms of pediatric obstructive sleep apnea.	Review	Pediatric OSA has multifactorial causes including adenotonsillar hypertrophy, obesity, and neuromuscular factors.
BDENF	Santos et al., 2021	Analyze relationship between childhood obesity and respiratory diseases.	Narrative review	Childhood obesity associated with increased cardiovascular, metabolic, and respiratory disorders.
BIREME	Santos et al., 2021	Describe preventive strategies for childhood obesity.	Integrative review	Family and community environments strongly influence children's eating habits and obesity prevention.
SciELO	Siriwat et al., 2020	Investigate association between OSA and insulin resistance in obese children.	Cohort study	OSA associated with increased insulin resistance even after adjustment for BMI and waist measures.

Source: Author (2022).

4. Discussion

Childhood obesity has increasingly been recognized as a major public health concern, as highlighted by Siriwat et al.[7] Obese children are more likely to become obese adults, and numerous medical conditions are associated with obesity. Increasingly, children are being prescribed the same medications as their parents to manage hypertension, diabetes, and dyslipidemia.

In the same study, Siriwat et al.[7] reported that the prevalence of obesity among children aged 6 to 11 years increased from 7% in 1980 to 18% in 2012, while the proportion of adolescents aged 12 to 19 years with obesity rose from 5% to 21% during the same period. These substantial increases have led to a higher prevalence of obesity-related health conditions among children and adolescents. Population-based research conducted in 2007 involving individuals aged 5 to 17 years revealed that approximately 70% of children and adolescents with obesity had at least one cardiovascular disease risk factor. It is also well established that obesity increases the risk of musculoskeletal disorders, diabetes, and cancer[7].

In addition to these metabolic and systemic complications, childhood obesity has also been increasingly associated with sleep-related breathing disorders, particularly obstructive sleep apnea (OSA). Excess adipose tissue in the cervical and upper airway regions may contribute to airway narrowing and increased collapsibility during sleep[14,15]. As a result, children with obesity are significantly more likely to develop OSA when compared with children with normal body weight, reinforcing the importance of early prevention and management strategies[4,16].

Lifestyle changes over the past three decades have had a significant impact on childhood obesity rates, as described by Santos et al.[12]. Children previously consumed one snack per day, whereas currently, one in five school-aged children consumes up to six snacks daily. Additional factors have also been associated with the development of childhood obesity, including genetic predisposition. Nevertheless, health experts largely agree that unhealthy diets and physical inactivity are the primary drivers of the sharp rise in childhood obesity rates. Although heredity may explain part of the obesity epidemic, it does not justify the dramatic increase observed over the last 30 years[12].

According to Santos and Pereira[12], weight stigma is rooted in a fundamental misunderstanding of the origins of obesity, in which the interaction of behavioral, environmental, genetic, and metabolic factors is often overlooked. Instead, widespread social and cultural weight stigma reinforces the misconception that obesity is solely the result of unhealthy personal choices.

Weight stigma is highly prevalent during childhood and adolescence and may influence health outcomes throughout life, as highlighted by Huang and Guilleminault[9]. Given the persistently high global prevalence of pediatric obesity, understanding how weight stigma influences weight trajectories and health outcomes in children and adolescents with overweight or obesity, including those with rare genetic forms of obesity, has become increasingly important.

To move beyond perspectives that perpetuate weight bias, stigma, and discrimination, it may be necessary to reconsider models that directly equate body weight with health. Recognition of obesity as a chronic disease by health organizations and professional societies has encouraged clinical and scientific communities to identify and understand its underlying causes. Nevertheless, stigma remains a widespread issue affecting children and adolescents with obesity across multiple everyday environments[8].

Studies conducted by Anderson and Keim[4] demonstrated that obstructive sleep apnea (OSA) is a complex and multifactorial disorder characterized by upper airway obstruction, chronic intermittent hypoxia, and sleep fragmentation. OSA is strongly associated with metabolic disturbances, including insulin resistance and metabolic syndrome, and represents a significant risk factor for type 2 diabetes. It is also linked to cardiovascular disease. One study reported that the prevalence of moderate-to-severe OSA was 23.4% among females, 49.7% among males, and 70% among individuals with obesity. Additionally, OSA contributes to the development of nonalcoholic fatty liver disease[4].

Both children and adults with OSA exhibit upregulation of proinflammatory cytokines, such as interleukin-6 (IL-6), which enhances activation of nuclear factor signaling pathways. For these reasons, OSA is considered a chronic low-grade inflammatory disease. Recurrent hypoxia and reoxygenation during OSA episodes trigger inflammatory cascades that contribute to vascular inflammation and cardiovascular morbidity[9].

In pediatric populations, the consequences of untreated OSA extend beyond respiratory disturbances during sleep[14]. Recurrent episodes of intermittent hypoxia and sleep fragmentation may negatively affect cognitive development, behavior, and academic performance. In addition, growing evidence suggests that pediatric OSA may contribute to long-term cardiometabolic complications, highlighting the importance of early diagnosis and adequate therapeutic intervention[9].

Continuous positive airway pressure (CPAP) therapy is currently considered the cornerstone of OSA treatment. However, despite the benefits observed in multiple clinical trials, poor adherence remains evident in a substantial proportion of pediatric patients, suggesting that alternative or complementary therapeutic strategies are required[8]. Considering the growing prevalence of childhood obesity worldwide, the burden of pediatric obstructive sleep apnea may continue to increase in the coming decades. This finding highlights the importance of multidisciplinary approaches involving pediatricians, nutritionists, sleep specialists, and public health initiatives aimed at promoting healthy lifestyles from early childhood[4].

Although this review included studies published only up to 2021, more recent research has expanded the understanding of the relationship between childhood obesity and obstructive sleep apnea. Ergenekon et al. discuss medical alternatives to CPAP, such as anti-inflammatory

agents and montelukast, which may be considered in pediatric cases[17]. Similarly, Di Filippo et al. report the effectiveness of adenotonsillectomy in obese children with OSA, while emphasizing that obesity remains a limiting factor for surgical success[18]. In addition, a recent publication in *The Lancet Respiratory Medicine* highlights the need for multidisciplinary approaches in persistent OSA cases, reinforcing that management should extend beyond weight loss and CPAP use[19]. These complementary studies support the findings of this review and point to the importance of diversified and individualized therapeutic strategies.

Anderson and Keim[4] also concluded that hormones related to obesity, weight regulation, satiety, and energy expenditure may be altered in individuals with OSA. Leptin, a hormone produced by adipose tissue, binds to the ventromedial nucleus of the hypothalamus—known as the satiety center—suggesting that weight reduction strategies and hormonal regulation may help mitigate OSA severity.

Most studies evaluating the effects of weight loss on OSA severity present methodological limitations, including lack of randomization, absence of control groups, inadequate adjustment for confounding factors, and limited follow-up periods. While more recent investigations have explored weight loss effects on OSA outcomes, many have focused primarily on bariatric surgery in adult populations. Given these limitations, further high-quality studies are needed to clarify the role of weight reduction strategies in pediatric OSA management[8].

5. Conclusions

Based on the findings of the studies analyzed in this review, there is strong evidence that obstructive sleep apnea (OSA) and weight gain exhibit a cyclical relationship. Research indicates that obesity increases the risk of developing OSA, while weight loss may help reduce the likelihood and severity of the disorder. Conversely, effective treatment of sleep apnea may also contribute to weight reduction, reinforcing the bidirectional relationship between these conditions.

Although the association between obesity and sleep apnea is well established, and the treatment of one condition may positively influence the other, multiple additional factors must be considered. Obstructive sleep apnea is a complex and multifactorial condition, and its management should not be limited to a single symptom or isolated characteristic of the disease. A comprehensive and individualized approach is therefore essential.

Currently, continuous positive airway pressure (CPAP) therapy is considered the most common and effective treatment for obstructive sleep apnea. However, this intervention can be financially burdensome for some patients when required as a lifelong therapy, and others experience difficulty tolerating CPAP use. In such cases, weight loss represents a viable and complementary strategy for reducing the severity and progression of sleep apnea. Evidence suggests that weight reduction not only decreases the severity of OSA but may also contribute to preventing the development of the disorder.

Furthermore, recent publications beyond the methodological time frame of this review reinforce the importance of diversified therapeutic strategies. Ergenekon et al. (2023) highlight medical alternatives to CPAP, such as anti-inflammatory agents and montelukast; Di Filippo et al. (2023) demonstrate the potential benefits and limitations of adenotonsillectomy in obese children with OSA; and *The Lancet Respiratory Medicine* (2023) emphasizes the need for multidisciplinary approaches in persistent cases. Together, these complementary studies suggest that future management of pediatric OSA should integrate weight control, medical therapies, and surgical interventions within a personalized and multidisciplinary framework.

Conflict of Interest Statement:

The authors have no conflicts of interest to declare.

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References:

1. Mendes KDS, Silveira RCCP, Galvão CM. Integrative literature review: a research method to incorporate evidence in health care and nursing. Texto Contexto Enferm. 2008;17(4):758-764. doi: 10.1590/S0104-07072008000400018

2. Souza MT, Silva MD, Carvalho R. Integrative review: what it is and how to do it. Einstein (Sao Paulo). 2010;8(1):102-106. doi:10.1590/S1679-45082010RW1134

3. Nogueira CJ, et al. Recommendations for the practice of physical exercise in the face of COVID-19: an integrative review. Rev Bras Fisiol Exerc. 2021;20(1):101-124.

4. Anderson SE, Keim SA. Parent-child interaction, self-regulation, and obesity prevention in early childhood. Curr Obes Rep. 2016;5(2):192-200. doi:10.1007/s13679-016-0208-9

5. Beoufleur D, Oliveira LA. Psychological aspects related to childhood obesity. Published 2015. Accessed March 10, 2026. http://www.uniedu.sed.sc.gov.br/wp-content/uploads/2016/09/unoesc-DAYANE-BOUFLEUR.pdf

6. Soares LD, Petroski EL. Prevalence, etiological factors, and treatment of infant exogenous obesity. Rev Bras Cineantropom Desempenho Hum. 2003; 5(1):63-74.

7. Frontzek LGM, Modena CM, Bernardes LR. Childhood obesity: games and workshops for child health in family and social relationships. Curitiba: Juruá; 2017.

8. Bonsignore MR, et al. Obstructive sleep apnea and comorbidities: a dangerous liaison. Multidiscip Respir Med. 2019;14(1):1-12. doi:10.1186/s40248-019-0179-8

9. Huang YS, Guilleminault C. Pediatric obstructive sleep apnea: where do we stand? Adv Otorhinolaryngol. 2017;80:136-144. doi:10.1159/000470885

10. Siriwat R, Wang L, Shah V, Mehra R, Ibrahim S. Obstructive sleep apnea and insulin resistance in children with obesity. J Clin Sleep Med. 2020; 16(7):1081-1090. doi:10.5664/jcsm.8414

11. Santos ACG, Santos RC Jr, Santana IAO, et al. Childhood obesity and respiratory diseases: a dangerous association. Rev Eletronica Acervo Saude. 2021;13:e7443.

12. Santos JAS, Pereira JS, Moreira L, et al. Childhood obesity: a serious problem that requires attention. Rev Liberum Accessum. 2021;9(2).

13. Zani CR, Santos GG, Borges KO. Childhood obesity: beyond weight. Undergraduate thesis. Centro Universitário de Belo Horizonte; 2021. https://repositorio.animaeducacao.com.br/bitstream/ANIMA/18995/1/TCC-OBESIDADE-INFANTIL.pdf

14. Marcus CL, Brooks LJ, Ward SD, et al. Diagnosis and management of childhood obstructive sleep apnea syndrome. Pediatrics. 2012;130(3):e714-e755. doi:10.1542/peds.2012-1672

15. Verhulst SL, Van Gaal L, De Backer W, Desager K. The prevalence, anatomical correlates and treatment of sleep-disordered breathing in obese children and adolescents. Sleep Med Rev. 2008;12 (5):339-346. doi:10.1016/j.smrv.2007.11.002.

16. Narang I, Mathew JL. Childhood obesity and obstructive sleep apnea. J Nutr Metab. 2012;2012: 134202. doi:10.1155/2012/134202

17. Ergenekon AP, Gokdemir Y, Ersu R. Medical treatment of obstructive sleep apnea in children. *J Clin Med.* 2023;12(15):5022. doi:10.3390/jcm12155022.

18. Di Filippo P, Orlandi G, Neri G, Di Pillo S, Chiarelli F, Rossi N, Attanasi M. Effect of tonsillectomy in a child with obesity and obstructive sleep apnea: a case report and review of the literature. *Front Pediatr.* 2023;10:1101267. doi:10.3389/fped.2022.1101267.

19. Ersu R, Chen ML, Ehsan Z, Ishman SL, Redline S, Narang I. Persistent obstructive sleep apnoea in children: treatment options and management considerations. *Lancet Respir Med.* 2023;11(3):283-296. doi:10.1016/S2213-2600(22)00262-4

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