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# Risk Factors Associated with Obstructive Sleep Apnea in Children and Adolescents: A Systematic Review

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**ADMINISTRATIVE INFORMATION**

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**Review Stage at time of this submission -** Data analysis.

**Conflicts of interest -** None declared.

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**Amendments -** This protocol was registered with the International Platform of Registered Systematic Review and Meta-Analysis Protocols (INPLASY) on 3 January 2026 and was last updated on 3 January 2026.

## INTRODUCTION

**Review question / Objective** What are the risk factors for obstructive sleep apnea in children and adolescents?

**Rationale** Identifying risk factors for OSA in children and adolescents is essential in order to target the at-risk population more effectively and develop appropriate prevention and management strategies. This approach aims to optimize long-term prognosis and limit associated complications.

**Condition being studied** Obstructive sleep apnea syndrome (OSAS) in children is a respiratory disorder that occurs during sleep and is characterized by a series of pathophysiological changes . It is characterized by recurrent episodes of partial or complete obstruction of the upper airway (UAW), causing a reduction (hypopnea) or cessation (apnea) of inspiratory airflow . OSA is generally considered to be the most severe form of the spectrum of “sleep-disordered breathing,” which includes primary snoring, upper airway resistance syndrome, and obstructive hypoventilation . A primary snorer is a person who has an obstructive apnea-hypopnea index (OAHI) of less than 1 event per hour with chronic snoring . VAS resistance syndrome is characterized by an increase in negative intrathoracic pressure during inspiration, in the absence of apparent apneic or hypopneic events. This phenomenon leads to an increase in respiratory micro-awakenings, resulting in increased sleep fragmentation and excessive daytime sleepiness . The global prevalence of pediatric OSA varies . The clinical manifestations of OSA in children and adolescents differ, but snoring remains the most frequently reported symptom . Parents may also observe breathing pauses, followed by sniffing or gasping , as well as labored breathing . Children may also exhibit mouth breathing , excessive sweating, hyperextension of the neck during sleep , paradoxical chest and abdominal movements , and very restless sleep . Excessive daytime sleepiness is a typical symptom in adolescents with OSA, while hyperactivity and inattention predominate in younger children with sleep-disordered breathing.

Without treatment, pediatric OSA is associated with significant complications such as growth retardation, elevated blood pressure, and various severe cardiorespiratory disorders. In addition, cognitive impairment, learning disabilities, and decreased academic performance are major and frequent consequences of undiagnosed or untreated OSA.

## METHODS

**Search strategy** A systematic literature search was conducted in the PubMed, ScienceDirect, Google Scholar, Scopus, and Cochrane Library databases to identify relevant publications in English and French for the assessment of risk factors for obstructive sleep apnea (OSA) in children and adolescents, published between September 2015 and September 2025. The search strategy included the following keywords: Pediatric obstructive sleep apnea (OSA), Risk factors, Children, Adolescents, Sleep-disordered breathing, Upper airway obstruction, Tonsillar hypertrophy, Craniofacial abnormalities, and Polysomnography, chosen for their relevance to the study objective.
The selected keywords were organized and combined in Boolean equations to optimize the search in scientific databases. This approach allowed for the systematic cross-referencing of the main concepts—obstructive sleep apnea, risk factors, children, and adolescents—while including relevant synonyms and MeSH terms. The use of AND and OR operators ensured accurate selection of relevant publications while excluding non-targeted articles, such as those concerning adults or animal studies. The Boolean equations used are:
? ("sleep apnea, obstructive"[MeSH Terms] OR "obstructive sleep apnea"[All Fields]) AND ("risk factors"[MeSH Terms] OR "predisposing factors"[All Fields]) AND ("child"[MeSH Terms] OR "children"[All Fields] OR "adolescent"[MeSH Terms] OR "adolescents"[All Fields])
? ("pediatric obstructive sleep apnea"[All Fields] OR "OSA, pediatric"[All Fields]) AND ("risk factors"[MeSH Terms]) AND ("upper airway obstruction"[MeSH Terms] OR "tonsillar hypertrophy"[MeSH Terms] OR "obesity"[MeSH Terms])
? (("obstructive sleep apnea"[MeSH Terms]) OR ("sleep-disordered breathing"[MeSH Terms])) AND ("children"[MeSH Terms] OR "adolescent"[MeSH Terms]) AND ("risk factors"[MeSH Terms] OR "predisposing factors"[All Fields]). The selection of articles took place in two phases. In the first phase, publications were selected based on an analysis of titles and abstracts, leading to the identification of 110 potentially eligible articles. After the second selection phase, which involved reading the full text, 13 articles were retained that met the eligibility criteria.

**Participant or population** Children and adolescents with OSAS.

**Intervention** Search in the scientific literature to identify potential risk factors.

**Comparator** Control / comparison groups.

**Study designs to be included** Observational research (cohort, case-control studies) and interventional studies.

**Eligibility criteria**
• Studies addressing OSA risk factors;
• Studies focusing on children and adolescents;
• Full text available;
• Studies evaluating OSA risk factors in children and adolescents, including observational (cohort and case-control studies) and interventional research;
• Studies published during the selected period.

**Information sources** A systematic literature search was conducted in the PubMed, ScienceDirect, Google Scholar, Scopus, and Cochrane Library databases to identify publications in English and French relevant to the assessment of risk factors for obstructive sleep apnea (OSA) in children and adolescents, published between September 2015 and September 2025. The search strategy included the following keywords: Pediatric obstructive sleep apnea (OSA), Risk factors, Children, Adolescents, Sleep-disordered breathing, Upper airway obstruction, Tonsillar hypertrophy, Craniofacial abnormalities, and Polysomnography; chosen for their relevance to the study's objective.

**Main outcome(s)** 13 studies selected for the final analysis: 3 case-control studies, 5 cohort studies, and 5 observational studies. Demographic, clinical, and anatomical factors influence the risk of OSA in children. Male sex, age between 2 and 6 years, obesity, prematurity, and exposure to passive smoking are significant risk factors. Among comorbidities, juvenile idiopathic arthritis, craniofacial abnormalities, and increased airway resistance increase the risk, as does asthma.

**Quality assessment / Risk of bias analysis** The risk of bias in the included studies was assessed independently by two reviewers, depending on the type of study. For case-control and cohort studies, the Newcastle-Ottawa Scale (NOS) was used, assessing participant selection (max. 4 points),

comparability of groups (max. 2 points), and exposure or outcome (max. 3 points). Studies were then classified as high, moderate, or low risk based on the total score.
For the quality of observational studies, the STROBE checklist ("Strengthening the Reporting of Observational Studies in Epidemiology") was applied. Each item is rated as present, absent, or not applicable, and an overall score is used to assign a quality grade ranging from poor to excellent. This approach allows for a systematic assessment of the methodological reliability and reporting quality of the included publications.

**Strategy of data synthesis** The data will be analyzed through a data extraction table. The table will summarize for each study the characteristics of the participants, the identified risk factors, the statistical methods used, and the main findings.

**Subgroup analysis** Subgroup analyses were planned a priori to explore potential sources of heterogeneity among the included studies. Stratified analyses were conducted according to age groups (infants, preschool children, school-aged children, and adolescents). Additional subgroup comparisons were performed based on sex, obesity status, and the presence of craniofacial abnormalities or adenotonsillar hypertrophy. When sufficient data were available, analyses were also stratified by study design, including cohort, case–control, and cross-sectional studies. Subgroup results were interpreted as exploratory and were used to inform clinical relevance rather than to draw definitive causal conclusions.

**Sensitivity analysis** Sensitivity analyses were performed to evaluate the robustness of the overall findings. The analyses were repeated after excluding studies with moderate risk of bias according to the Newcastle–Ottawa Scale or the STROBE checklist. Additional sensitivity analyses assessed the impact of excluding studies with small sample sizes or those not using polysomnography as the diagnostic reference standard. A leave-one-out approach was applied to identify the influence of individual studies on the results. The consistency of findings across sensitivity analyses supported the stability and reliability of the conclusions.

**Language restriction** Studies published in English or French will be considered for inclusion.

**Country(ies) involved** Morocco.

**Keywords** Pediatric obstructive sleep apnea (OSA), Risk factors, Children, Adolescents, Sleep-disordered breathing, Upper airway obstruction, Tonsillar hypertrophy, Craniofacial abnormalities, Polysomnography.

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