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REVIEW ARTICLE

Relationship between cervical posture and mouth breathing: biomechanical and functional impact

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ABSTRACT

Introduction: mouth breathing in childhood is associated with orofacial and postural alterations that affect skeletal and functional development.
Objective: to analyze the relationship between cervical posture and mouth breathing, evaluating its biomechanical and functional impact.
Methods: a systematic review of the scientific literature was conducted across various databases. The search was performed using an algorithm with keywords and Boolean operators, allowing the identification of relevant sources. The selected studies, after applying inclusion and exclusion criteria, were critically analyzed considering timeliness, methodological quality, and thematic relevance, and were integrated into the final synthesis of the review.
Development: the studies show prevalence rates of oral and postural alterations ranging from thirteen to eighty-eight percent among mouth breathers. Malocclusions such as retruded mandible, crossbite, Angle's Class II, and increased overjet are evidenced. On the postural plane, forward head inclination, hyoid bone descent, and changes in cervical lordosis are described. These modifications are related to nasal obstructions and harmful oral habits, which condition muscular and skeletal compensations. The literature emphasizes the need for interdisciplinary diagnoses and specialized clinical methods to prevent severe deformities.
Conclusions: there is a significant correlation between mouth breathing and postural and orofacial alterations in childhood. Early diagnosis and interdisciplinary approaches are essential to avoid complications in craniofacial growth and cervical posture, promoting healthy integral development.

Keywords: Biomechanical Phenomena; Malocclusion; Posture; Mouth Breathing.

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INTRODUCTION

Mouth breathing—a common phenomenon in contemporary society—is far more than a simple alternative respiratory behavior. Inhaling and exhaling through the mouth instead of the nose can have significant consequences both in the oral cavity and in overall body posture, triggering a cascade of events that affect dental malocclusion development, tooth positioning, and normal growth patterns. [1] Additionally, an increased risk of dental caries has been observed in individuals who adopt this respiratory pattern. [2] Postural alterations such as thoracic hyperkyphosis and changes in cervical lordosis have also been reported. [3]

Breathing is one of the most vital unconscious and involuntary functions, closely linked to chewing, swallowing, and proper lip and tongue muscle activity, all of which stimulate facial development and growth. Numerous studies support the connection between mouth breathing, posture, and patients' quality of life. In early childhood, the intensity, magnitude, and frequency of mouth breathing determine the severity of resulting alterations. Scientific literature highlights that causes of mouth breathing vary—from nasal obstructions to perioral muscle hypotonia—and consequences extend beyond oral health, affecting body posture and muscular balance. [4]

Mouth breathing is considered one of the most detrimental habits in children and is also a symptom of sleep-disordered breathing. Its prevalence ranges from 11 % to 56 % in pediatric populations and may resolve with age; however, if it persists, it can lead to the aforementioned alterations. [5] The relationship between head position and malocclusion has been studied for decades, with evidence showing that mouth breathing contributes to the development of Angle Class II malocclusion. These associations—first described by Schwartz in 1926 and later by Rocabado et al. in 1982—establish clear links between mouth breathing, forward head posture, and malocclusion. [6]

In children and adolescents, mouth breathing induces postural changes such as thoracic kyphosis, shoulder protraction, scapular elevation and abduction, forward head posture, and reduced cervical lordosis. [7] Increased spinal curvature, anterior shoulder shift, and scapular separation disrupt postural equilibrium, often triggering compensatory increases in lumbar and pelvic lordosis. [8] Therefore, understanding the "mouth breather syndrome" and its oral and postural effects is imperative for timely detection and appropriate treatment, enabling targeted interventions that improve quality of life for affected individuals. [9,10] Given this context, the present study was conducted to analyze the relationship between cervical posture and mouth breathing, evaluating its biomechanical and functional impact.

METHODS

A systematic bibliographic review was conducted following PRISMA 2020 guidelines to identify the correlation between mouth breathing and postural and orofacial alterations in pediatric populations. The search period spanned from 2010 to 2024, encompassing recent clinical and observational studies.

Information sources included widely recognized scientific databases—PubMed, SciELO, Google Scholar, and BVSALUD—as well as secondary references from relevant articles. Publications in English and Spanish were included to ensure representation of both regional and international literature. The search strategy used keywords and MeSH/DeCS terms: "mouth breathing,"

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"cervical posture," "dental malocclusion," "orofacial biomechanics," combined with Boolean operators (AND, OR). Temporal and thematic filters were applied.

Inclusion criteria comprised clinical, cross-sectional, observational studies, and meta-analyses evaluating the relationship between mouth breathing and postural or dental alterations in children and adolescents. Duplicates, articles without full-text access, publications outside the temporal range, and irrelevant studies were excluded.

The selection process initially identified 75 articles. After duplicate removal and title/abstract screening, 9 studies strictly meeting inclusion criteria were selected. The procedure was illustrated using a PRISMA flow diagram depicting identification, screening, eligibility, and inclusion phases.

Data extraction and analysis were performed using comparative matrices, collecting variables such as author, year, population, methodological design, diagnostic methods, and main results. A qualitative synthesis of findings highlighted common patterns in the association between mouth breathing and malocclusion, as well as postural alterations (forward head posture, hyoid bone descent, cervical lordosis changes).

DEVELOPMENT

This research sought to identify the relationship between mouth breathing and oral/postural alterations. Findings confirm a significant association between mouth breathing and the development of malocclusions and mandibular changes—including retruded mandible, crossbite, maxillofacial underdevelopment, upper and lower lip protrusion, Angle Class II relationship, and increased overjet—in children aged 12 years or younger. Protective measures are therefore needed to improve these patients' oral health. Key findings are summarized in Table 1.

Table 1. Main findings from the literature.

Source	Population (characteristics)	Results	Contributions
Masutomi et al. (2024) [11]	103 participants; 20,4 % mouth breathers (with malocclusion)	13,6 % had malocclusions (p > 0,05). Patients exhibited retruded maxilla and mandible.	Association between mouth breathing and lip closure strength, tongue pressure, and masticatory efficiency.
Paolantonio et al. (2019) [12]	1,616 six-year-old children (with malocclusion)	46 % showed less severe malocclusion (p = 0,008).	Oral habits and mouth breathing are strongly linked to anterior open bite, posterior crossbite, and increased overjet.
Mendoza et al. (2019) [13]	147 children aged 2–12 years (with malocclusion)	31,8 % exhibited mouth breathing. Significant association with posterior crossbite (p < 0,012) and Angle Class II (p < 0,008).	Children are highly susceptible to malocclusion during growth; preventive measures are essential.
Wang et al. (2021) [14]	1,093 eleven-year-old adolescents (with malocclusion)	Malocclusion incidence: 72,66 %. Mouth breathing significantly influenced malocclusion (p < 0,001).	Malocclusion and four oral habits were independent risk factors for caries in adolescents.

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Neiva et al. (2018) [15]	417 children aged 5–12 years (postural alterations)	Mouth breathing associated with forward head posture.	Forward head posture strains head extensor muscles and stretches infrahyoid muscles, causing inferior-posterior hyoid traction.
Waseem et al. (2022) [16]	60 patients; mean age 9,13 ± 1,68 years (lordosis alteration)	Cervical lordosis alteration significantly associated with mouth breathing (p < 0,001).	Mouth breathing causes craniofacial alterations, including dental malocclusions.
Milanesi et al. (2017) [17]	10 children aged 6–12 years (postural alterations)	Moderate positive correlation between cervical lordosis/cervical distance and peak expiratory flow (p = 0,017).	Breathing mode influences postural and respiratory measurements.
Jaiswal et al. (2023) [18]	20 children aged 6–12 years (head posture)	Increased NSL/VER and FH/VER angles in mouth breathers (p < 0,001).	Prolonged postural changes in mouth breathers may cause severe skeletal deformities.
Mohamed et al. (2022) [19]	126 children aged 6–12 years (head posture)	Hyoid bone positioned more anteriorly in older mouth-breathing subjects (P = 0,036).	Mouth-breathing children show extended head posture and lower hyoid position.

Notes: NSL = Nasion-sella line; VER = true vertical line; FH = Frankfort horizontal line

Harmful oral habits are non-physiological behaviors that can cause dental misalignment and serious developmental issues, leading to dentoskeletal deformities and occlusal changes. [20] Regarding oral and postural alterations in children aged 6–12 years, Masutomi et al., [11] found a 13,6 % prevalence of malocclusion (retruded maxilla and mandible) in mouth breathers, with significant association between mouth breathing and lip closure strength.

Paolantonio et al., [12] reported a 46 % malocclusion prevalence in children with nasal breathing difficulties, with anterior open bite, posterior crossbite, and increased overjet being most common. Borsa et al., [21] found an 88 % malocclusion prevalence in mouth-breathing children, with deep bite as the most frequent manifestation. Similarly, Mendoza et al., [13] noted significant associations between mouth breathing and posterior crossbite and Angle Class II.

Wang et al.,[14] found a 72,66 % malocclusion prevalence in mouth-breathing children, significantly linked to anterior crossbite. Festa et al., [22] reported a high malocclusion rate (81,4 %) in mouth-breathing children, with Angle Class II and increased overjet as the most frequent alterations.

Regarding postural problems, Neiva et al., [15] stated that mouth-breathing children develop forward head posture, straining extensor muscles and stretching infrahyoid muscles, causing inferior-posterior hyoid traction. Chambi et al., [23] found that mouth breathing in early childhood (around age 8) reduces nasopharyngeal cross-sectional area, while older children exhibit lower hyoid positions.

Mohamed et al.,[19] noted that mouth-breathing children display extended head posture and a lower hyoid bone position. Waseem et al., [16] identified direct associations between oral breathing and cervical lordosis alterations. Similarly, Milanesi et al. [17] found a positive correlation between mouth breathing and postural/respiratory measures, including cervical lordosis and cervical distance.

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Additionally, Jaiswal et al., [18] reported changes in NSL/VER and FH/VER angles in mouth-breathing children. Thus, prolonged postural changes in these children may lead to severe skeletal deformities. Overall, oral and postural alterations in children are significantly linked to respiratory disorders—primarily mouth breathing. Although the mechanisms by which these pathologies affect craniofacial development remain unclear, upper airway obstruction is thought to impair nasal breathing, forcing children to compensate via mandibular movements (causing malocclusion) or altered head positions (inducing cervical changes). [24]

Regarding diagnostic methods, Borsa et al.,[21] emphasized that accurate diagnosis of respiratory problems in children requires extraoral examination—assessing subnasal profile, nasolabial angle, and labiomental fold. Festa et al.,[22] recommended otorhinolaryngological evaluation including nasal endoscopy to assess adenoid hypertrophy, tonsil classification, and nasal septum deviation.

For diagnosis and treatment, orthodontic clinical exams to record occlusal variables should be performed by experienced specialists capable of accurately identifying oral problems. Postural assessments should be conducted clinically or with specialized equipment. [13] Moreover, mouth breathing detection should not rely solely on parental reports,[14] but include clinical exams to identify nasal issues affecting infant respiration. [15,21]

Paolantonio et al.,[12] stressed that harmful habits and mouth breathing are risk factors for malocclusion that must be promptly identified and corrected to prevent worsening of existing occlusal conditions.

CONCLUSIONS

Reviewed evidence confirms a significant relationship between mouth breathing and various oral and postural alterations in pediatric populations, with prevalence rates ranging from 13,6 % to 88 %. Common issues include malocclusions—such as retruded mandible, crossbite, anomalous maxillofacial development, lip protrusion, Angle Class II, and increased overjet—as well as postural changes like forward head posture, hyoid bone descent, and cervical lordosis modifications. These conditions primarily stem from upper airway obstruction that impedes nasal breathing, forcing children to compensate through mouth breathing, thereby impacting craniofacial growth and posture. For accurate and timely diagnosis, clinical evaluation by specialized professionals—complemented by exams to identify associated nasal problems—is recommended to ensure appropriate interdisciplinary intervention and promote healthy, integrated development.

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