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Archives of Dental Research

Journal homepage: https://www.adr.org.in/

Review Article The significance of nasal breathing in children and its relationship to malocclusion

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ARTICLE INFO	A B S T R A C T
Article history: Received 16-05-2024 Accepted 26-11-2024 Available online 23-12-2024	The conventional habit breaking appliances prevents child from the habits but it doesn't correct the malocclusions generated Here is the scope for myofunctional appliances where it stops the habits and at the same time it tunes the orofacial musculature and also aligns the teeth and improves the ease of life myofunctional makes the orofacial musculature functional and effective which enhances the proper growth and modulation of the craniofacial structures. Aim of the paper is to evaluate the change in quality of life
Kevwords:	through myofunctional therapy.
Myobrace Myofunctional therapy Nasal breething Mouth breathing	This is an Open Access (OA) journal, and articles are distributed under the terms of the Creative Commons Attribution-NonCommercial 4.0 International, which allows others to remix, and build upon the work non-commercially, as long as appropriate credit is given and the new creations are licensed under the identical terms.
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1. Introduction

For children's general health and development, nasal breathing is essential. It has an impact on many elements of their health, such as dental and facial development. The purpose of this article is to examine the importance of nasal breathing in children and any possible links to malocclusion.¹ Lizhuo et al., claim that one of the most prevalent harmful oral practices in kids is mouth breathing, making the air enter completely or partially through oral cavity. In addition to nasal obstruction caused by various kinds of nasal diseases, the pathological hypertrophy of adenoids and/or tonsils is often the main etiologic factor of mouth breathing in children.² Mouth breathing that is not corrected can lead to improper development of the maxillofacial and dental structures and compromise the dentofacial system's health. The precise etiology of mouth breathing can lead to a variety of development patterns and malocclusions in mouth breathers. Breathing through the mouth can also harm dental health by raising the risk of periodontal diseases and dental caries.³ According to Dr

2. Nasal Breathing and Facial Growth

Proper nasal breathing aids in the development of the face and jaws. The consistent flow of air through the nasal passages stimulates proper growth, contributing to a wellaligned dental arch and facial structure.⁴

There is an established correlation between nasal breathing and facial growth, especially during childhood. The way a child breathes whether through the nose or mouth can have significant impacts on the development of their facial structures Proper nasal breathing encourages optimal facial growth and development in several ways:

Facial Muscles and Bones: Nasal breathing encourages the proper alignment of facial muscles and the growth of facial bones. When a child breathes through the nose, the tongue rests against the roof of the mouth, applying gentle pressure that helps in the development of the upper jaw (maxilla) and the proper positioning of teeth.⁵

Edward Hartley Angle, father of orthodontics of all the various causes of malocclusion, mouth-breathing is the most potent, constant, and varied in its results.

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Palatal Development: Nasal breathing aids in the expansion and development of the palate (roof of the mouth). The tongue's position against the palate during nasal breathing assists in creating enough space for teeth eruption and proper alignment, preventing issues like crowding or malocclusion.

Airway and Breathing Pattern: Adequate oxygenation and healthy breathing patterns are ensured by maintaining a clear airway through correct nasal breathing. It helps children to develop healthy breathing patterns when they consistently breathe through their nose However, children who breathe through frequently may see changes in their face growth. Narrowing of the Upper Jaw: Breathing through the mouth may cause the upper jaw to narrow, which may interfere with teeth eruption and positioning of teeth.

While the correlation between nasal breathing and facial growth is widely acknowledged, it's important to note that various factors can influence facial development, including genetics, environmental factors, allergies, and individual habits.⁶

It is possible to prevent orthodontic difficulties linked to inappropriate breathing patterns and have a favorable impact on facial development by treating any underlying conditions that may be causing mouth breathing in children, such as allergies or nasal obstructions, and promoting appropriate nasal breathing habits. Seeking advice from medical specialists such as pediatricians, orthodontists, or ENT specialists can assist in managing and addressing issues pertaining to nasal breathing and its impact on a child's facial development.

According to Enlow and Hans et al: As dysfunction continues to affect growth, the dental arches become narrower and this reduces room for the tongue further, which leads to a worsening of breathing and myofunctional disorders. This causes a negative spiral which continues to affect the patient's growth and severity of their malocclusion, and the cycle repeats until the dysfunction is addressed. The many years of poor jaw growth and incorrect muscle use leads to poor tone in the oral and facial muscles, a significant contributor to SRBDs.⁷

3. Impact of Nasal Obstruction on Mouth Breathing

Nasal obstruction, whether due to allergies, anatomical issues, or chronic congestion, can lead to oral breathing in children. Mouth breathing alters the normal growth patterns of the face and may contribute to malocclusion, such as crowded teeth or misaligned jaws.

Mouth breathing modifies natural growth patterns of face and may be a factor in malocclusion, which results in crowded teeth or misaligned jaws.

1. **Mouth Breathing**: A predilection for mouth breathing is sometimes caused by nasal blockage. People

instinctively turn to breathing through their lips when their nasal passages are obstructed in order to make up for the reduced airflow through their noses. Bypassing the nose's natural filtration and humidification processes, mouth breathing lowers the quality of air that is inhaled.

- 2. Altered breathing rate and volume: Nasal congestion can affect breathing rate and volume. Comparing mouth breathing to nasal breathing, mouth breathing is generally shallower and faster. The efficiency of gas exchange in the lungs and the increased breathing rate may be due to this change in breathing patterns.
- 3. **Increased breathing:** Nasal congestion leading to mouth breathing can make breathing difficult. Breathing through the lips often uses different muscles that can tire after exercise or physical activity.
- 4. **Sleep disorders:** Nasal congestion can seriously affect the quality of sleep. When nasal congestion causes mouth breathing during sleep, it can lead to snoring, sleep apnea, and irregular sleep patterns. Therefore, it can cause daytime fatigue and affect general well-being.
- 5. Chronic condition: If left untreated, long-term nasal congestion can cause changes in breathing patterns. Even in cases where the nasal passages are not blocked, people can develop a habit of breathing through their mouth, which can cause problems with altered breathing mechanics. Restoring regular breathing patterns and general health requires treatment of nasal congestion. Depending on the underlying cause, a number of treatments may be used, such as antiinflammatory medications, surgery to correct structural problems, allergy treatments, or nasal decongestants to temporarily relieve congestion. It is necessary to get advice from an otolaryngologist or other doctor to diagnose nasal obstruction and choose the most appropriate course of action to restore normal nasal breathing. Prompt treatment of nasal congestion can help prevent long-term changes in breathing patterns and related health problems.
- 6. Effects of mouth breathing on oral health: Chronic mouth breathing can cause an incorrect position of the tongue and weaken the support of the upper dental arch. This imbalance can exacerbate orthodontic problems and imbalances. Mouth breathing during childhood can affect the development of the jaw and teeth. Mouth breathing can cause tongue misalignment, which can lead to orthodontic problems such as overcrowded teeth, an open bite, or misaligned jaws. This can affect speech, healthy chewing and overall facial development.

4. The Connection between Allergies, Nasal Breathing, and Defective Congestion

Allergy-prone children often have nasal congestion that affects their nasal breathing. Long-term nasal congestion can affect how malocclusion develops, emphasizing the connection between nasal health and dental health. This nasal breathing pattern encourages a wider upper dental arch, providing sufficient space for the eruption and alignment of adult teeth.⁸

According to Marco Fernado et al. The passage from nasal to oral respiration can determine altered development of the dentoskeletal structures and of the nasal capsule, resulting in an anatomical-functional adaptation of the neuromuscular system, having important repercussions on craniofacial morphology. The low rest postural position of the tongue, indispensable in allowing the intraoral airflow and associated with increased pressure induced by the cheeks due to the augmented vertical dimension, can cause a transversal deficit in the upper jaw.^{9–11}

5. Impact of Allergies and Nasal Congestion

Allergies, chronic nasal congestion, or structural issues such as enlarged adenoids or nasal polyps can hinder nasal breathing in children. Persistent nasal congestion often leads to mouth breathing as a compensatory mechanism to maintain airflow. Chronic mouth breathing, especially during formative years, can potentially impact facial growth patterns and dental alignment.

- 1. Orthodontic Considerations: Prolonged mouth breathing due to allergies or nasal obstructions can contribute to malocclusion and dental misalignment. Habitual mouth breathing alters the resting position of the tongue, leading to changes in oral posture that may negatively influence the development of the upper jaw and dental arches. This alteration can potentially result in issues like crowded teeth, open bites, or other orthodontic problems.¹² However, while mouth breathing is always significantly associated with all occlusal problems examined, bad habits have a significant role only in some, probably because of their lower relevance than other factors implicated in the etiopathogenesis of malocclusions. Thus, we can assume that the "risk of developing malocclusion" related to bad habits would be expressed in individuals more susceptible to genetic causes and unfavorable growth pattern.
- 2. Treatment and Management: Addressing the underlying cause of nasal congestion or allergies is crucial to mitigate the impact on breathing patterns and facial development. Managing allergies through medication, avoiding triggers, or seeking medical intervention for structural issues can help restore nasal breathing. Early intervention

by healthcare professionals, such as ENT specialists or orthodontists, can prevent or minimize potential malocclusion problems associated with chronic mouth breathing.^{13,14}

Encouraging proper nasal breathing habits and seeking appropriate medical care for allergies or nasal obstructions during childhood are essential steps in preventing potential malocclusion issues. Consulting with healthcare professionals specialized in respiratory health, allergies, or orthodontics can help manage and address concerns related to nasal breathing, allergies, and their impact on facial growth and dental alignment in children.

5.1. The link of myofunctional therapy with TMD and Craniomandibular pain

In a different specialty of dentistry, practitioners who were treating patients for craniomandibular pain and temporomandibular joint dysfunction were also realizing something peculiar. In the textbook 'Clinical Management of Head, Neck and TMJ Pain and Dysfunction', Dr Harold Gelb and his colleagues wrote a chapter called 'Myofunctional Therapy in the Treatment of the Craniomandibular Syndrome'.⁹ The authors highlighted the relationship between breathing, myofunctional and temporomandibular joint disorders (TMD), with references also made to malocclusion. Two different manifestations, TMD and malocclusion, of the same underlying dysfunction.

According to Dr Harold Gelb et al., in abnormal breathing, such as mouth breathing, the tongue is usually depressed, and the upper and lower teeth are apart during swallowing. As a result of this pattern, abnormal deglutition ensues. The muscles contract irregularly resulting in abnormal displacement of the lips and cheeks. It then becomes obvious that in the correction or prevention of malocclusion, the coordination of the surrounding muscles is of utmost importance.¹⁵

6. Addressing Nasal Breathing Issues

Nasal congestion is such a frequent and multifactorial occurrence in young children that parents and medical caregivers often overlook the need for medical intervention. However, children with congestion can suffer quality-oflife detriments resulting from sleep disturbance, learning impairment, and fatigue.

Early identification and management of nasal breathing difficulties in children are crucial. Treatment options such as nasal decongestants, allergy management, or surgical interventions for severe cases can help restore proper nasal breathing and potentially mitigate the risk of malocclusion.

7. Discussion

The prevalence of mouth breathing among children persists despite advancements in medicine and early diagnostic tools. It's become a significant concern, but parental awareness and understanding of normal developmental stages for their child's age can greatly assist in addressing this issue. When mouth breathing leads to malocclusion or other pathological conditions, it becomes crucial for dentists to collaborate with both the child and parents to find effective solutions and provide timely dental care. Clinical symptoms vary in severity based on the duration of mouth breathing. Without intervention, developmental deficiencies worsen, leading to more pronounced structural changes in the body.¹⁶

Adenotonsillar hypertrophy is the most common cause of mouth breathing in children. Adenoids and palatine tonsils are located in different sites of upper airway. During the growth period, the obstruction occurring in different locations and times may result in corresponding facial patterns. Thus, the dentofacial development of children with both tonsillar hypertrophy and adenoid hypertrophy presents great complexity.¹

Due to the introduction of newer technologies such as Augmented Reality and Virtual Reality, it is now possible to reduce the occurrence of conditions that will lead to mouth breathing and Malocclusion. The integration of Augmented Reality (AR) and Virtual Reality (VR) technologies represents a significant leap forward in the evolving field of dentistry, ushering in a more advanced and patientcentric healthcare approach. The potential of Virtual and Augmented Reality (VR/AR) technology to revolutionize dentistry spans multiple crucial areas: education, clinical decision-making, and patient care management. In dental education, VR/AR offers an immersive learning experience. VR can provide highly immersive training and educational experiences for dental students and professionals. Users can interact with detailed 3D models of oral anatomy, explore complex structures, and practice various dental procedures in a controlled virtual environment. Augmented Reality (AR) in dentistry spans various specialties, revolutionizing treatment, education, and patient outcomes. [19]

It has been found that malocclusion is closely and significantly associated with a history of allergic rhinitis in the present adolescent population. Multivariate analysis identified allergic rhinitis as an independent factor for an awareness of malocclusion. Mouth breathing due to upper airway obstruction (nasal obstruction) is likely to have negative effects on the general development of the cranial complex. Furthermore, mouth breathing is associated with the development of dental malocclusion including anterior open bite and large overjet.[14]

The following factors has to be analyzed thoroughly before going to the final diagnosis and treatment planning of a patient for Myofunctional therapy. Before all, the chief complaints of the patient and the attitude of the patient towards the treatment approach is very important. The dentist should spare enough time to educate the child and parents regarding the procedure. Age is a very crucial element in myofunctional therapy. The clinician should clinically evaluate the patient prior to diagnosis and treatment planning. It includes Dental examination summary, skeletal examination summary, soft tissue evaluation, photo analysis, model analysis, radiographic evaluation and cephalometric analysis, airway analysis, functional analysis, growth pattern and cervical vertebral maturation index staging.

8. Conclusion

Nasal breathing significantly influences the facial and dental development of children. Understanding its importance and addressing any nasal breathing issues early on can potentially reduce the risk of malocclusion and promote overall oral health in the pediatric population.[16, 17] Undeniable need for a multidisciplinary approach to first access and then treat the root cause of malocclusion. Early detection and early intervention in case of malocclusion due to improper breathing would go a long way in improving not only the oral health but also the quality of life in affected individuals.

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9. Introduction

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10. Discussion

Nasal Breathing and Facial Growth: Proper nasal breathing aids in the development of the face and jaws. The consistent flow of air through the nasal passages stimulates proper growth, contributing to a well-aligned dental arch and facial structure.⁴

There is an established correlation between nasal breathing and facial growth, especially during childhood. The way a child breathes whether through the nose or mouth can have significant impacts on the development of their facial structures.

10.1. Proper nasal breathing encourages optimal facial growth and development in several ways:

- 1. Facial Muscles and Bones: Nasal breathing encourages the proper alignment of facial muscles and the growth of facial bones. When a child breathes through the nose, the tongue rests against the roof of the mouth, applying gentle pressure that helps in the development of the upper jaw (maxilla) and the proper positioning of teeth.⁵
- 2. **Palatal Development:** Nasal breathing aids in the expansion and development of the palate (roof of the mouth). The tongue's position against the palate during nasal breathing assists in creating enough space for teeth eruption and proper alignment, preventing issues like crowding or malocclusion.
- 3. Airway and Breathing Pattern: Adequate oxygenation and healthy breathing patterns are ensured by maintaining a clear airway through correct nasal breathing. It helps children to develop healthy breathing patterns when they consistently breathe through through their noseHowever, children who breathe through frequently may see changes in their face growth.
- 4. Narrowing of the Upper Jaw: Breathing through the mouth may cause the upper jaw to narrow, which may interfere with teeth eruption and positioning of teeth.

While the correlation between nasal breathing and facial growth is widely acknowledged, it's important to note that various factors can influence facial development, including genetics, environmental factors, allergies, and individual habits.⁶

It is possible to prevent orthodontic difficulties linked to inappropriate breathing patterns and have a favourable impact on facial development by treating any underlying conditions that may be causing mouth breathing in children, such as allergies or nasal obstructions, and promoting appropriate nasal breathing habits. Seeking advice from medical specialists such as paediatricians, orthodontists, or ENT specialists can assist in managing and addressing issues pertaining to nasal breathing and its impact on a child's facial development. According to Enlow and Hans etal : As dysfunction continues to affect growth, the dental arches become narrower and this reduces room for the tongue further, which leads to a worsening of breathing and myofunctional disorders. This causes a negative spiral which continues to affect the patient's growth and severity of their malocclusion, and the cycle repeats until the dysfunction is addressed. The many years of poor jaw growth and incorrect muscle use leads to poor tone in the oral and facial muscles, a significant contributor to SRBDs.⁷

11. Impact of Nasal Obstruction on Breathing Patterns

Nasal obstruction, whether due to allergies, anatomical issues, or chronic congestion, can lead to oral breathing in children. Mouth breathing alters the normal growth patterns of the face and may contribute to malocclusion, such as crowded teeth or misaligned jaws.

Mouth breathing modifies natural growth patterns of face and may be a factor in malocclusion, which results in crowded teeth or misaligned jaws.

Mouth Breathing: A predilection for mouth breathing is sometimes caused by nasal blockage. People instinctively turn to breathing through their lips when their nasal passages are obstructed in order to make up for the reduced airflow through their noses. Bypassing the nose's natural filtration and humidification processes, mouth breathing lowers the quality of air that is inhaled air.

Altered breathing rate and volume: Nasal congestion can affect breathing rate and volume. Comparing mouth breathing to nasal breathing, mouth breathing is generally shallower and faster. The efficiency of gas exchange in the lungs and the increased breathing rate may be due to this change in breathing patterns.

Increased breathing: Nasal congestion leading to mouth breathing can make breathing difficult. Breathing through the lips often uses different muscles that can tire after exercise or physical activity.

Sleep disorders: Nasal congestion can seriously affect the quality of sleep. When nasal congestion causes mouth breathing during sleep, it can lead to snoring, sleep apnea, and irregular sleep patterns. Therefore, it can cause daytime fatigue and affect general well-being.

Chronic condition: If left untreated, long-term nasal congestion can cause changes in breathing patterns. Even in cases where the nasal passages are not blocked, people can develop a habit of breathing through their mouth, which can cause problems with altered breathing mechanics. Restoring regular breathing patterns and general health requires treatment of nasal congestion. Depending on the underlying cause, a number of treatments may be used, such as anti-inflammatory medications, surgery to correct structural problems, allergy treatments, or nasal decongestants to temporarily relieve congestion. It is necessary to get advice from an otolaryngologist or other doctor to diagnose nasal obstruction and choose the most appropriate course of action to restore normal nasal breathing. Prompt treatment of nasal congestion can help prevent long-term changes in breathing patterns and related health problems.

Effects of mouth breathing on oral health: Chronic mouth breathing can cause an incorrect position of the tongue and weaken the support of the upper dental arch. This imbalance can exacerbate orthodontic problems and imbalances. Mouth breathing during childhood can affect the development of the jaw and teeth. Mouth breathing can cause tongue misalignment, which can lead to orthodontic problems such as overcrowded teeth, an open bite, or misaligned jaws. This can affect speech, healthy chewing and overall facial development. The Connection between Allergies, Nasal Breathing, and Defective Congestion: Allergy-prone children often have nasal congestion that affects their nasal breathing.

Long-term nasal congestion can affect how malocclusion develops, emphasising the connection between nasal health and dental health. This nasal breathing pattern encourages a wider upper dental arch, providing sufficient space for the eruption and alignment of adult teeth.⁸

According to Marco Feranado et al. The passage from nasal to oral respiration can determine altered development of the dentoskeletal structures and of the nasal capsule, resulting in an anatomical-functional adaptation of the neuromuscular system, having important repercussions on craniofacial morphology. The low rest postural position of the tongue, indispensable in allowing the intraoral airflow and associated with increased pressure induced by the cheeks due to the augmented vertical dimension, can cause a transversal deficit in the upper jaw.^{9–11}

Impact of Allergies and Nasal Congestion: Allergies, chronic nasal congestion, or structural issues such as enlarged adenoids or nasal polyps can hinder nasal breathing in children. Persistent nasal congestion often leads to mouth breathing as a compensatory mechanism to maintain airflow. Chronic mouth breathing, especially during formative years, can potentially impact facial growth patterns and dental alignment.

Orthodontic Considerations: Prolonged mouth breathing due to allergies or nasal obstructions can contribute to malocclusion and dental misalignment. Habitual mouth breathing alters the resting position of the tongue, leading to changes in oral posture that may negatively influence the development of the upper jaw and dental arches. This alteration can potentially result in issues like crowded teeth, open bites, or other orthodontic problems.¹² However, while mouth breathing is always significantly associated with all occlusal problems examined, bad habits have a significant role only in some, probably because of their lower relevance than other factors implicated in the aetipathogenesis of malocclusions. Thus, we can assume that the "risk of developing malocclusion" related to bad habits would be expressed in individuals more susceptible to genetic causes and unfavourable growth pattern.

Treatment and Management: Addressing the underlying cause of nasal congestion or allergies is crucial to mitigate the impact on breathing patterns and facial development. Managing allergies through medication, avoiding triggers, or seeking medical intervention for structural issues can help restore nasal breathing. Early intervention by healthcare professionals, such as ENT specialists or orthodontists, can prevent or minimize potential malocclusion problems associated with chronic mouth breathing. ^{13,14}

Encouraging proper nasal breathing habits and seeking appropriate medical care for allergies or nasal obstructions during childhood are essential steps in preventing potential malocclusion issues. Consulting with healthcare professionals specialized in respiratory health, allergies, or orthodontics can help manage and address concerns related to nasal breathing, allergies, and their impact on facial growth and dental alignment in children.

11.1. The Link of myofunctional therapy with TMD and Craniomandibular Pain

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12. Addressing Nasal Breathing Issues

Nasal congestion is such a frequent and multifactorial occurrence in young children that parents and medical caregivers often overlook the need for medical intervention. However, children with congestion can suffer quality-oflife detriments resulting from sleep disturbance, learning impairment, and fatigue. Early identification and management of nasal breathing difficulties in children are crucial. Treatment options such as nasal decongestants, allergy management, or surgical interventions for severe cases can help restore proper nasal breathing and potentially mitigate the risk of malocclusion.

13. Conclusion

Nasal breathing significantly influences the facial and dental development of children. Understanding its importance and addressing any nasal breathing issues early on can potentially reduce the risk of malocclusion and promote overall oral health in the pediatric population.^{17,18} Undeniable need for a multidisciplinary approach to first access and then treat the root cause of malocclusion. Early detection and early intervention in case of malocclusion due to improper breathing would go a long way in improving not only the oral health but also the quality of life in affected individuals.

14. Conflict of Interest

None.

15. Source of Funding

None.

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Cite this article: Hassan AA, Santhosh S, Ramdas SS. The significance of nasal breathing in children and its relationship to malocclusion. *Arch Dent Res* 2024;14(2):85-91.