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ORIGINAL ARTICLE

Early intervention in pathological infant thumb-sucking: identification and application of evidence-based strategies

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ABSTRACT

Introduction: pathological thumb sucking in childhood is a frequent oral habit that can cause dentofacial alterations, functional difficulties, and emotional repercussions, highlighting its clinical and preventive importance.
Objective: to analyze the most effective early intervention strategies to prevent and correct thumb sucking in children aged 4-6 years.
Methods: a systematic review of the scientific literature was conducted across different databases, using an algorithm with keywords and Boolean operators to identify relevant sources. The selected studies, after applying rigorous inclusion and exclusion criteria, were critically evaluated in terms of timeliness, methodological quality, and thematic relevance, and coherently integrated into the final synthesis of the review.
Development: the findings show that persistence of the habit beyond four years is associated with anterior open bite, deep palate, and phonetic alterations. The most reported strategies include positive reinforcement, physical or chemical barriers, and removable or fixed orthodontic devices. Additionally, parental and caregiver education, along with regular pediatric dental follow-up, are emphasized. The evidence converges on the need for an interdisciplinary approach that combines clinical management with psychological and family support.
Conclusions: early intervention, supported by evidence-based strategies and applied integrally, reduces dental complications and promotes healthy oral development. This approach contributes to improving children's quality of life and preventing functional and emotional sequelae associated with pathological thumb sucking.

Keywords: Habits; Early Medical Intervention; Pediatric Dentistry; Fingersucking.

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INTRODUCTION

Pathological thumb sucking in children aged 4 to 6 years is a persistent oral habit that can significantly affect oral and emotional development. This behavior, beyond the infancy stage, is associated with dental malocclusions, palatal deformities, and alterations in facial growth, as well as repercussions on self-esteem and social interaction. Early identification is essential to prevent complications and guide a comprehensive approach, since the earlier it is detected and addressed, the greater the chances of reversing the habit without permanent consequences.[1,2]

Understanding the causes that originate and perpetuate this habit is a fundamental step in planning intervention strategies. Among the most frequent factors are insufficient breastfeeding, emotional insecurity, changes in the family environment, and the child's emotional immaturity. The multiple causes of this phenomenon require careful analysis that considers biological, psychological, and social aspects, reinforcing the need for an interdisciplinary approach from the earliest stages of life.[3]

Recent scientific evidence underscores that persistent thumb sucking beyond the age of four increases the risk of open bite, high palate, and phonetic difficulties. In this context, oral health professionals recommend early interventions, understood as preventive and corrective actions applied as soon as the habit is detected. These include positive reinforcement, physical or chemical barriers, and, in more complex cases, the use of orthodontic appliances. Early intervention not only reduces the likelihood of dental and phonetic complications but also promotes the child's emotional adjustment, preventing the habit from becoming entrenched as an inappropriate coping mechanism.[4,5]

Parent and caregiver education, along with psychological support, is recognized as an indispensable component of treatment. Early intervention at this level allows the family to become an active agent of change, reinforcing healthy behaviors and offering emotional security to the child. In this way, a positive impact is achieved on both oral health and overall well-being. By integrating the clinical dimension with family and psychological support, the aim is to promote healthy oral development and improve the quality of life of affected children. This interdisciplinary approach, with an emphasis on early detection and intervention, forms the basis for proactively addressing a habit that, if not treated promptly, can leave lasting functional and emotional consequences.[6,7] Considering the above, this review was conducted, with the objective ofTo analyze the most effective early intervention strategies to prevent and correct thumb sucking in children aged four to six years.

METHODS

This study was designed as a systematic literature review, conducted according to the PRISMA (Preferred Reporting Items for Systematic Reviews and Meta-Analyses) guidelines. The objective was to identify, analyze, and synthesize the available scientific evidence on early intervention for pathological thumb sucking in children. The search period was defined as between January 2000 and December 2024, in order to include recent and relevant studies that reflect methodological and clinical advances in the field of pediatric dentistry and the prevention of oral habits.

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The information search was conducted in various electronic bibliographic sources, including internationally recognized databases such as PubMed/MEDLINE, SciELO, ScienceDirect, Google Scholar, LILACS, and BVSALUD. Secondary references obtained from bibliographies of key articles and grey literature (theses, technical reports, and institutional documents) were also considered when they provided relevant data. This strategy broadened the scope of evidence and reduced publication bias.

The search strategy was designed using a structured algorithm with keywords and Boolean operators, adapted to each database. Terms such as "thumb sucking" OR "thumb sucking" OR "sucção digital" were used, combined with "early intervention" OR "intervenção precoce" and "pediatric dentistry" OR "odontopediatría". The use of AND and OR operators allowed for refining the search and ensuring the inclusion of studies directly related to the topic. Publications in Spanish, English, and Portuguese were considered, given that these languages account for a large part of the scientific output in the area and facilitate the comparison of findings in Latin American and international contexts.

The inclusion criteria included original articles, systematic reviews, and clinical studies published within the defined time frame that explicitly addressed pathological thumb sucking in children and early intervention strategies. Duplicates, articles without full-text access, studies irrelevant to the review's objective, and those outside the search period were excluded. The selection process was carried out in several stages: first, titles and abstracts were reviewed to discard irrelevant records; subsequently, the full texts of the preselected articles were reviewed. Initially, 412 records were identified, of which 194 were eliminated due to duplication and 198 were discarded for not meeting the inclusion criteria. Finally, 20 articles were included in the qualitative synthesis.

Data extraction and analysis were conducted systematically, collecting key variables such as author, year of publication, country of origin, methodological design, sample size and characteristics, type of intervention applied, and main results. The information was organized into comparative matrices to facilitate interpretation and the identification of common patterns. Given the heterogeneity of the studies in terms of design and results, a qualitative narrative synthesis was chosen, integrating the findings into thematic categories related to intervention strategies (behavioral, orthodontic, educational, and multidisciplinary). A meta-analysis was not performed, as methodological differences and the variability of outcome measures precluded homogeneous statistical integration.

In summary, the methodology employed ensured a rigorous and transparent approach, in accordance with PRISMA guidelines, enabling the identification of the best available evidence on early intervention for pathological thumb sucking in children. This process guarantees the reproducibility of the review and provides a solid foundation for the discussion and conclusions drawn from the study.

DEVELOPMENT

Oral habits, such as prolonged, intense, and continuous finger sucking, can interfere with the normal growth and development of the jaws, leading to malocclusion of the teeth and also negatively affecting the development of normal swallowing patterns.[8]

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Thumb sucking is the most common oral habit and has been reported to have a prevalence of between 13 % and 100 % in some societies. Several theories have suggested that the prolongation of this habit may develop from oral fixation, emotional disturbance, or due to hunger or insufficient satisfaction of the sucking urge in infancy. The prevalence of this habit decreases with age and mostly stops around 4 years of age. If this habit persists beyond this age, it can result in a number of physical problems.[9] There are two forms of thumb sucking:[10]

- Nutritious form, which provides essential nutrients; that is, breastfeeding and bottle feeding.
- Non-nutritive sucking, that is, thumb and pacifier sucking. Given that non-nutritive sucking habits are mostly modifiable, understanding how they contribute to malocclusion is important for its prevention.

When analyzing this habit, it is important to consider the existence of three phases in the development of thumb sucking:[11]

- Phase I: Normal and subclinically significant sucking: seen in the first three years of life. The habit is considered normal during this phase and usually ends by the end of it.
- Phase II – Clinically significant sucking: The second phase extends from 3–6 years of age. Treatment should be initiated during this phase.
- Phase III – Intractable sucking: any thumb sucking that persists from age 6 or 7 onwards should alert the dentist.

Research studies at leading dental institutions have shown that the best time to stop thumb sucking is between the ages of three and four, while many pediatric dentists maintain that the damage is reversible if the child stops before the eruption of permanent teeth, which occurs around the ages of five to six. When a child sucks their thumb, a powerful vacuum is created within the mouth, which applies forces to the teeth in the upper and lower jaws, causing the teeth to shift over time.[9]

The impact of excessive thumb sucking on children's dentofacial development is determined by the frequency, duration, and intensity of the habit, as well as by each child's individual circumstances. This behavior can generate a wide range of physical alterations, including anterior open bite, increased overjet, lingual inclination of the lower incisors and labial inclination of the upper incisors, posterior crossbite, tongue thrust, and a high palate. It is also associated with speech impediments, finger injuries due to dryness or repeated pressure, mandibular retrusion, and the presence of a diastema in the midline, all of which have significant functional and aesthetic repercussions on oral health.[1,2,3,5]

The specialized literature describes four categories of thumb positioning during thumb sucking, which help to understand the diversity of patterns and their possible dentofacial repercussions. In the first category, the thumb penetrates the mouth beyond the first joint or knuckle, occupying a large part of the palatal vault and exerting pressure on the lower incisors. In the second, the thumb is inserted to the first joint or slightly anterior, frequently in contact with the lower incisors, although without directly reaching the hard palate. The third category corresponds to the complete insertion of the thumb into the oral cavity, approaching the palatal vault, but without contact with the lower incisors. Finally, in the fourth category, the thumb barely progresses within the mouth, and contact is limited to the nail against the lower incisors. These variations in thumb position determine the magnitude and type of forces exerted on the oral structures, influencing the development of malocclusions and associated deformities.[12,13]

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Open bite malocclusion is one of the most complex dentofacial deformities to address, as it compromises both aesthetics and oral function. Its management requires early and accurate diagnosis, aimed at differentiating whether the origin is predominantly dental or skeletal, since this distinction determines the choice of the most appropriate treatment, which can range from orthodontic procedures to surgical interventions in severe cases.[2,9]

Some studies suggest the use of orthodontic devices, such as modified pacifiers or intraoral appliances, to correct thumb sucking. These devices focus on redirecting the sucking motion to a more appropriate position and promoting the correction of associated dental malocclusion. On the other hand, behavioral and psychological interventions, such as habit modification therapy and cognitive-behavioral therapy, are also discussed. These interventions aim to address the underlying causes of the habit and promote lasting behavioral change. Despite differences in treatment approaches, there is a general consensus on the importance of a multidisciplinary intervention involving dentists, orthodontists, psychologists, and other healthcare professionals. This collaboration allows for a comprehensive approach to the physical, emotional, and behavioral aspects of pathological thumb sucking, thus maximizing the chances of successful treatment.[14,15]

On the other hand, the study by Orellana Guerrero DE and López Alarcón L,[16] delves into the long-term consequences of thumb sucking on the dental occlusion of preschool children, highlighting that this habit can generate significant alterations in dental development and overall oral health. The most recent evidence indicates that the duration, frequency, and intensity of the habit are critical variables that determine the degree of impairment. For their part, Espinosa González EJ and Pino Larrea JF,[17] document that prolonged thumb sucking can cause malocclusions, anterior open bite, and alterations in the sagittal relationship of the jaws. Likewise, a review published by Collantes Acuña JE et al.,[18] emphasizes that oral habits such as thumb sucking, mouth breathing, and bruxism increase the risk of temporomandibular disorders and malocclusions, reinforcing the need for a preventive approach from an early age.

Finally, Ramayo-Iuit LC et al.,[19] provide information on the effectiveness of an orthodontic appliance in the treatment of thumb sucking in preschool children, suggesting that intervention with orthodontic appliances can be an effective strategy to correct this habit and prevent future dental complications. In line with this, the literature describes the use of interceptive orthodontics in a child patient with a thumb-sucking habit and skeletal Class II malocclusion, showing positive results in correcting mandibular retrusion and the sagittal relationship of the jaws.[20]

Taken together, these studies highlight the importance of addressing thumb sucking in preschool children holistically, understanding its causes, assessing its long-term consequences, and implementing effective treatment strategies. These findings have significant implications for the oral health and overall well-being of children at this crucial stage of their development.

CONCLUSIONS

Thumb sucking in children aged 4 to 6 years is a habit with significant repercussions for oral health and overall development, as it can lead to malocclusions, palate deformation, mandibular retrusion, open bite, phonetic alterations, and increased risk of cavities, in addition to psychological consequences such as insecurity and social isolation. The severity of these anomalies depends on the frequency, intensity, position, and duration of the habit, highlighting the need for early and effective intervention. The approach should consider the underlying

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causes and combine behavioral strategies, orthodontic appliances, and parental guidance, ensuring consistent family support. The success of treatment lies in the collaboration between healthcare professionals and caregivers, beginning with behavioral modification and, if necessary, resorting to mechanical or orthodontic procedures from age 5–6, the stage at which the most serious complications tend to appear.

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