

Impact of oral dysfunctions on feeding development in children with Down syndrome: A scoping review

Impacto das disfunções orais no
desenvolvimento alimentar em crianças com
Síndrome de Down: Uma revisão de escopo

Impacto de las disfunciones orales en el
desarrollo de la alimentación en niños con
Síndrome de Down: Una revisión del alcance

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Abstract

Introduction: Feeding is essential for child growth, although in children with Down syndrome it may be hindered by anatomical, motor, and sensory changes that compromise sucking, chewing, and swallowing. These difficulties affect nutritional status, speech development, and quality of life. The lack of standardized protocols underscores the need for studies to guide effective interventions. **Objective:** To analyze the scientific literature on the impact of oral dysfunctions on the feeding development of children with Down syndrome. **Method:** This scoping review was conducted according to the Joanna Briggs Institute methodology. The search was performed in PubMed, SciELO, Embase, Scopus, Virtual Health Library, and Google Scholar databases. A total of 214 studies were identified, of which 38 were

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Authors' contributions:

LW: study conception; methodology; data collection; article drafting; critical review.

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excluded as duplicates. After screening titles and abstracts, 87 articles were read in full, and four were included. A search of gray literature identified 210 studies, of which only one met the inclusion criteria. The final sample comprised five studies. **Results:** All studies were conducted in Brazil and published in Portuguese, and included one clinical study, two literature reviews, and two case studies. **Conclusion:** Oral dysfunctions affect the feeding development of children with Down syndrome, delaying the transition to solid foods and compromising nutrition and quality of life. Early and continuous speech therapy intervention is essential to minimize these difficulties and promote functional advances in feeding.

Keywords: Down Syndrome; Feeding and Eating Disorders of Childhood; Child Development.

Resumo

Introdução: A alimentação é fundamental para o crescimento infantil. Em crianças com Síndrome de Down, no entanto, pode ser prejudicada por alterações anatômicas, motoras e sensoriais que comprometem sucção, mastigação e deglutição. Essas dificuldades repercutem no estado nutricional, no desenvolvimento da fala e na qualidade de vida. A ausência de protocolos padronizados reforça a necessidade de estudos que subsidiem intervenções efetivas. **Objetivo:** Analisar a literatura científica quanto ao impacto das disfunções orais no desenvolvimento alimentar de crianças com Síndrome de Down. **Método:** Trata-se de revisão de escopo conduzida conforme a metodologia do Joanna Briggs Institute. As buscas foram realizadas nas bases PubMed, SciELO, Embase, Scopus, Biblioteca Virtual em Saúde e Google Scholar. Foram identificados 214 estudos, dos quais 38 foram excluídos por duplicidade. Após triagem dos títulos e resumos, 87 artigos foram avaliados integralmente, resultando em quatro inclusões. A busca na literatura cinzenta identificou 210 estudos, dos quais apenas um foi selecionado. A amostra final foi composta por cinco estudos. **Resultados:** Todos os estudos incluídos foram realizados no Brasil e publicados em português, sendo um estudo clínico, duas revisões de literatura e dois estudos de caso. **Conclusão:** As disfunções orais impactam de maneira significativa o desenvolvimento alimentar de crianças com Síndrome de Down, dificultando a transição alimentar e comprometendo a nutrição e a qualidade de vida. A intervenção fonoaudiológica precoce e contínua é fundamental para minimizar essas dificuldades e promover avanços funcionais na alimentação.

Palavras-chave: Síndrome de Down; Transtornos de Alimentação na Infância; Desenvolvimento infantil.

Resumen

Introducción: La alimentación es fundamental para el crecimiento infantil; sin embargo, en niños con Síndrome de Down, puede verse afectada por alteraciones anatómicas, motoras y sensoriales que comprometen la succión, la masticación y la deglución. Estas dificultades repercuten en el estado nutricional, el desarrollo del habla y la calidad de vida. La ausencia de protocolos estandarizados refuerza la necesidad de investigaciones que orienten intervenciones más eficaces. **Objetivo:** Analizar la literatura científica sobre el impacto de las disfunciones orales en el desarrollo alimentario de niños con Síndrome de Down. **Método:** Se realizó una revisión de alcance conforme a la metodología del Joanna Briggs Institute. La búsqueda se efectuó en las bases de datos PubMed, SciELO, Embase, Scopus, Biblioteca Virtual en Salud y Google Scholar. Se identificaron 214 estudios; 38 fueron excluidos por duplicidad. Tras la revisión de títulos y resúmenes, se leyeron 87 textos completos, de los cuales se incluyeron cuatro. En la literatura gris se identificaron 210 documentos, y solo uno cumplió con los criterios de inclusión. La muestra final comprendió cinco estudios. **Resultados:** Todos los estudios fueron realizados en Brasil y escritos en portugués. Incluyeron un estudio clínico, dos revisiones bibliográficas y dos estudios de caso. **Conclusión:** Las disfunciones orales afectan significativamente el desarrollo alimentario de niños con Síndrome de Down, dificultan la transición alimentaria y comprometen la nutrición y la calidad de vida. La intervención fonoaudiológica temprana y sostenida es esencial para minimizar estas dificultades y favorecer mejoras funcionales en la alimentación.

Palabras clave: Síndrome de Down; Trastornos de Ingestión y Alimentación en la Niñez; Desarrollo Infantil.

Introduction

Nutrition plays a fundamental role in child growth and development, influencing nutritional, motor, and psychosocial domains. In children with Down Syndrome (DS), this process can be challenging due to numerous anatomical, physiological, and neuromotor factors affecting oral function¹. Muscle hypotonia, a common characteristic of DS, impairs the strength and coordination of the muscles involved in sucking, chewing, and swallowing, making feeding difficult from the first months of life. In addition, structural changes, such as relative macroglossia, a high-arched palate, and reduced mandibular growth, contribute to feeding difficulties that directly impact the nutritional status and quality of life of these children².

Another prominent factor is the presence of sensory and motor deficits that affect perception and response to oral stimuli, making the transition to solid foods more challenging³. Children with DS often experience difficulties introducing new foods and show resistance to varied textures and flavors, which may lead to selective eating and challenges in achieving adequate weight gain. These difficulties affect not only food intake but also speech development, as the oral-motor coordination required for feeding is closely related to articulation and phonetic skills. Limited exposure to different types of foods can result in inadequate nutritional intake, contributing to deficiencies in essential micronutrients and compromising these children's overall development^{1,4}.

Insufficient specific knowledge regarding these challenges can hinder early and adequate intervention, thereby impeding the management of feeding and diminishing quality of life^{2,5}. Furthermore, the scarcity of standardized assessment and intervention protocols underscores the need for additional scientific research on this topic. Given the importance of nutrition for child growth and well-being, it is crucial to identify the primary challenges faced by this population and propose approaches that promote effective and accessible dietary adaptation⁶.

Moreover, early speech therapy is essential to mitigate these impacts, promoting safer and more effective feeding. However, gaps remain in understanding how these dysfunctions directly affect the process of feeding development and which therapeutic approaches are most effective. Accordingly, this

research is justified by the need to further investigate the impact of oral dysfunctions on feeding development in children with DS, aiming to support more precise and effective intervention strategies that improve quality of life for this population.

Given the above, we aimed to analyze the literature on the impact of oral dysfunctions on the feeding development of children with DS.

Method

This scoping review was conducted following the methodology proposed by the Joanna Briggs Institute (JBI) for scoping reviews⁷ and in accordance with the Preferred Reporting Items for Systematic Reviews and Meta-Analyses Extension for Scoping Reviews (PRISMA-ScR) guidelines⁸. The protocol was developed based on the JBI Manual for Evidence Synthesis and followed the recommended steps to ensure transparency and reproducibility. The protocol was published on the Open Science Framework OSF platform under DOI 10.17605/OSF.IO/3DXM4.

Research question

Using the PCC strategy, the following research question was formulated: "How can oral dysfunctions impact the process of feeding development in children with Down Syndrome?"

Inclusion and exclusion criteria

To ensure the relevance of the selected studies, the following inclusion criteria were established:

- Population: Studies investigating children with DS;
- Interventions: Studies addressing oral dysfunctions;
- Outcomes: Studies discussing the impact of oral dysfunctions on feeding development, nutrition, growth, and speech therapy interventions; and
- No date restrictions were applied.

The exclusion criteria included:

- Studies without access to the full text; and
- Editorials, conference abstracts, and opinion articles.

Search strategy

The search was performed in the following databases: National Library of Medicine (PubMed), Scientific Electronic Library Online (SciELO), Embase

via Medline, Scopus, Virtual Health Library (VHL), and Google Scholar. Combinations of descriptors and keywords selected via Health Sciences Descriptors (DeCS) and Medical Subject Headings (MeSH) were used together with Boolean operators (AND/OR) relevant to the topic, including: “*Síndrome de Down*,” “*disfunções orais*,” “*desenvolvimento alimentar*,” “*mastigação*,” “*deglutição*,” “*seletividade alimentar*,” “*fonoaudiologia*,” “*intervenção precoce*,” as well as their English equivalents “Down Syndrome” and “oral dysfunctions.”

Selection and evaluation of the studies

The study selection process was conducted in two stages by two reviewers, with a third reviewer available to resolve disagreements. Studies will be extracted using Rayyan⁹:

- STAGE 1 - Title and abstract screening: Initially, the titles and abstracts of the identified articles were reviewed to assess eligibility in accordance with the inclusion criteria.
- STAGE 2 - Full-text review: Articles passing the initial screening were read in full to confirm their relevance and methodological adequacy to the study objectives.

Data extraction and analysis

Data from the included studies were extracted using a standardized instrument recommended by

the JBI, collecting information on authors, year of publication, country of origin, study objectives, methodological design, and main findings. No assessment of methodological quality was performed, as this is not required for scoping reviews per JBI guidelines.

Data synthesis

Results are presented in tables to provide a clear and structured overview of the main evidence identified. Additionally, research gaps and implications for practice are discussed. This JBI-based approach ensures a comprehensive mapping of the existing literature on the selected topic, supplying a critical and structured synthesis of available information.

Results

A total of 214 studies were identified in the databases, of which 38 were excluded as duplicates. Titles and abstracts were initially analyzed, and in the next phase, 87 articles were read in full. This process led to the inclusion of four articles in the final sample. Additionally, the search of gray literature yielded 210 studies, but only one met this study’s criteria after thorough analysis. Thus, the final sample consisted of five articles, as presented in Figure 1.

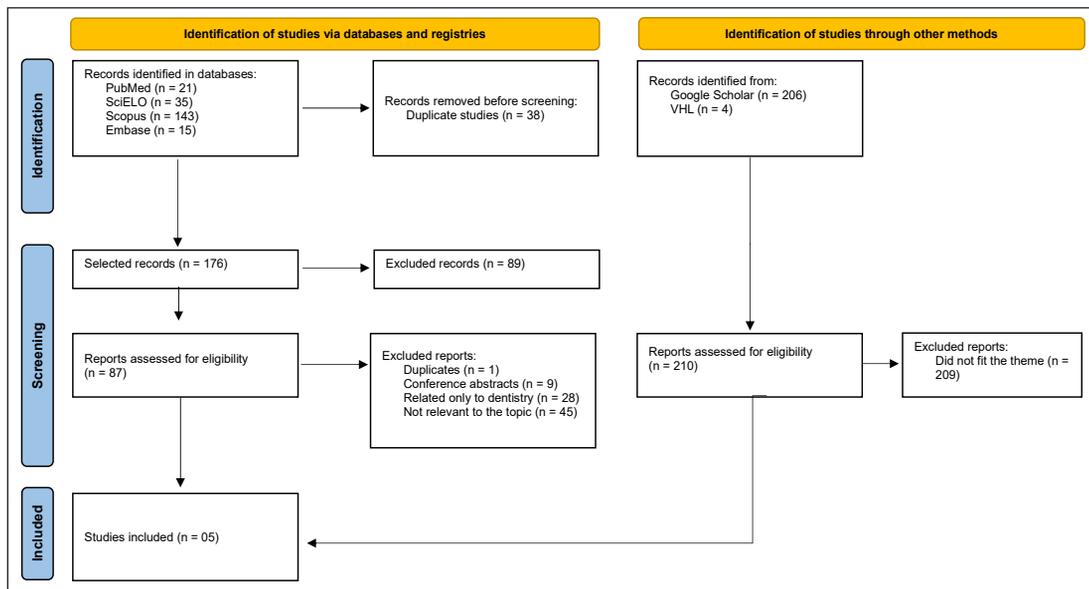


Figure 1. PRISMA flowchart depicting the database searches

All five selected articles originated in Brazil (100%), were written in Brazilian Portuguese (100%), and included one clinical study (20%), two literature reviews (40%), and two case studies (40%). The main findings of each study are summarized in Table 1.

Table 1. Stratification of the selected studies

Reference	Study objective	Main results
Barata e Branco (2010) ⁴ .	To characterize the phonoarticulatory alterations found in individuals with DS through a literature review, focusing on the importance of early intervention in such circumstances.	- Anatomical and functional characteristics: Individuals with DS often have a small oral cavity and alterations in the organs that make up the stomatognathic system, such as the lips, tongue, and palate. These characteristics can lead to phonoarticulatory disorders and feeding difficulties.##- Impact on feeding: Orofacial alterations can compromise essential functions such as sucking, chewing, and swallowing, which are fundamental for proper feeding development.
Fraga et al. (2015) ¹⁰	Perform a speech-language assessment of swallowing in infants diagnosed with DS and congenital heart disease admitted to Unit 2A and the Pediatric Intensive Care Unit of the institution of origin, with suspected swallowing difficulties, referred to the speech-language service.	- Oropharyngeal dysphagia: Both infants evaluated had oropharyngeal dysphagia, characterized by difficulties in the oral and pharyngeal phases of swallowing. These difficulties compromise the efficiency and safety of oral feeding.##- The speech therapy evaluation allowed for the identification of swallowing dysfunctions and the implementation of intervention strategies, such as oral stimulation and food volume control, aiming to improve feeding efficiency and reduce the risk of aspiration.##- The oral dysfunctions observed may result in insufficient caloric intake, compromising the child's nutritional status and overall development. In the study, one of the infants was classified as malnourished, possibly due to feeding difficulties resulting from dysphagia.
Vieira (2018) ¹¹	Reporting the clinical case of a 23-month-old child with DS.	- Suction difficulties in the initial feeding phase, requiring a nasogastric tube until 8 months of age.##- Adverse reflexes during feeding, such as choking, gagging, and refusal to eat.##- Difficulties in the feeding transition: the introduction of solid foods was delayed and unsuccessful.##- Restricted food preferences, accepting only cold, sweet, and mushy foods.##- Reduced feeding autonomy, with a constant need for assistance from caregivers.
Cruz et al. (2021) ⁶	Analyze the benefits of speech therapy intervention in babies with DS.	- Difficulty coordinating sucking and swallowing can prolong the breastfeeding phase and hinder the introduction of food.##- Frequent choking and food refusal may occur due to low tongue mobility and breathing difficulties.##- Food development may be slower, affecting nutrition and weight gain.
Daniel et al. (2021) ¹ .	To assess the adequacy of dietary components and the nutritional status of children and adolescents with DS followed up at the pediatric genetics outpatient clinic of the Botucatu Clinical Hospital.	Muscle hypotonia, common in children with DS, can affect the strength and coordination of the muscles involved in feeding. The study identified slow chewing (16.2% of children in the study), early satiety (13.5%), and increased appetite (21.6%). Weak orofacial muscles can lead to a preference for softer, processed foods, reducing fiber intake and affecting intestinal transit, with 32.4% of participants reporting irregular bowel habits.

DS: Down Syndrome

Discussion

Research on the impact of oral dysfunctions on the feeding development of children with DS demonstrates that these difficulties are intrinsically linked to anatomical and functional alterations of the stomatognathic system, substantially compromising these children's ability to feed efficiently and safely. The studies analyzed indicate that oral dysfunctions can undermine processes from breastfeeding to the transition to solid foods, affecting not

only nutrition but also oral motor development and communication skills.

Barata and Branco⁴ noted that individuals with DS often present with a reduced oral cavity, muscle hypotonia, and alterations in phonoarticulatory organs such as lips, tongue, and palate, factors that can directly interfere with sucking, chewing, and swallowing. The combination of these factors leads to persistent feeding difficulties that, if not addressed early, can worsen as the child develops. This effect is illustrated by Fraga et al.¹⁰, who

evaluated infants with DS and congenital heart disease and identified oropharyngeal dysphagia, a disorder affecting the oral and pharyngeal phases of swallowing, thereby increasing the risk of aspiration, malnutrition, and feeding-related respiratory difficulties.

Feeding difficulties are not confined to the breastfeeding period but often persist throughout childhood, potentially impairing feeding autonomy. Vieira¹¹ presented a clinical case of a child with DS who had sucking difficulties in the first months of life, required a nasogastric tube, rejected solid foods, and exhibited pronounced food selectivity.

This restrictive eating pattern, marked by a preference for cold, sweet, and soft foods, limits intake of essential nutrients such as fiber and may result in gastrointestinal problems such as constipation¹², as observed by Daniel et al.¹, who reported intestinal irregularity in 32.4% of the children studied. Additionally, the muscle hypotonia common in DS affects the coordination of the muscles involved in eating, leading to slow chewing, early satiety, and difficulties in processing food orally. Such dysfunction compromises nutrition and can result in deficits in growth and overall development.

The impact of oral dysfunctions on feeding extends beyond motor and sensory challenges to encompass psychosocial and emotional aspects for both the child and the family¹³. Food refusal, common in this context, often results in caregiver stress, making mealtimes a source of tension. Family engagement is therefore critical to the success of speech therapy, as continuity of therapeutic efforts and adaptation of the feeding environment support clinical improvement¹¹.

Speech therapy intervention is widely identified as an effective approach for minimizing the impacts of oral dysfunctions on eating development in children with DS. The review by Cruz et al.⁶ posited that early stimulation of oral functions, including targeted exercises to strengthen orofacial muscles, can improve feeding coordination, reduce choking risk, and foster more efficient oral language development.

In one reported case, intervention involved oromyofunctional exercises to strengthen lips, tongue, and cheeks, chewing training using foods with varying textures, and encouragement of feeding autonomy through positive sensory experiences. After three months of follow-up, significant improvements were noted in food acceptance,

chewing efficiency, and reduced food selectivity, demonstrating the effectiveness of the speech therapy approach¹¹.

The importance of early intervention is underscored by the recommendation that oral function stimulation should begin in the first months of life, as lack of timely referral may exacerbate feeding and speech-articulation issues⁴. Cruz et al.⁶ further emphasized that speech therapy not only benefits feeding but also supports communication development, enhancing the child's social interaction. Additionally, family involvement in the therapeutic process strengthens intervention outcomes, ensuring that strategies applied in the clinical setting are reinforced in the child's daily life.

The findings of this review reveal that the impact of oral dysfunctions on feeding in children with DS is multifactorial, encompassing anatomical, functional, nutritional, and psychosocial components. Early and ongoing speech therapy intervention is essential to alleviate these challenges, improving food acceptance, chewing efficiency, and feeding autonomy. Moreover, family support and modification of the feeding environment are critical factors for consolidating therapeutic gains. Accordingly, the evidence underscores the need for an interdisciplinary approach to feeding children with DS to address their specific needs in a coordinated and effective manner.

A limitation of this study is the predominance of case reports and literature reviews, which restricts the generalizability of findings. Furthermore, the scarcity of longitudinal studies that track the progression of feeding difficulties and the long-term effectiveness of speech-language interventions limits understanding of lasting impacts. The lack of standardized assessment and intervention protocols also hampers comparison across studies and the development of unified guidelines for managing oral dysfunctions in children with DS.

Despite these limitations, this review makes a substantial contribution to speech-language pathology by demonstrating the significance of early intervention in managing feeding difficulties in children with DS. Identifying major oral dysfunctions and their implications for feeding development underscores the necessity of specialized monitoring from infancy, enabling adoption of more effective therapeutic strategies. Additionally, the results highlight the vital role of family partici-

pation in therapy, ensuring that clinical progress is maintained in the home environment.

Conclusion

Based on the evidence reviewed, oral dysfunctions directly impact feeding development in children with DS, hindering the transition to new foods and compromising nutrition and quality of life. Early and continuous speech therapy intervention is essential to reduce these difficulties, fostering improvements in sucking, chewing, swallowing, and food acceptance. Furthermore, involving the family in the therapeutic process amplifies intervention effects, making mealtimes more positive and functional. Therefore, further research is needed to standardize clinical protocols and provide longitudinal follow-up of children with DS, thereby enabling increasingly evidence-based and effective interventions.

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