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Oral Health of Children with Orofacial Clefts: A Review

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Abstract. Orofacial clefts (OFCs), encompassing cleft lip, cleft palate, and cleft lip and palate, represent the most common craniofacial congenital anomalies worldwide. Children with OFCs often experience a variety of oral health challenges, including dental anomalies, malocclusion, early childhood caries, periodontal disease, and altered salivary function. These conditions can significantly impact not only oral function but also speech, nutrition, psychosocial well-being, and overall quality of life. This review synthesizes current literature on the prevalence, etiology, and management of oral conditions associated with OFCs. It highlights the importance of early preventive care, the role of multidisciplinary treatment approaches, and the need to assess oral health-related quality of life (OHRQoL) in affected children. Additionally, the review identifies gaps in current research and underscores the necessity for integrated, evidence-based care strategies tailored to the unique needs of children with OFCs. By drawing attention to these critical areas, this review aims to support clinical decision-making and inform future public health policies focused on improving long-term oral and systemic outcomes for this vulnerable population.

Keywords: Orofacial clefts, oral health, dental anomalies, early childhood caries, quality of life

1. Introduction

Orofacial clefts (OFCs) are among the most prevalent congenital anomalies globally, affecting approximately 1 in every 850 to 1250 live births [1,2]. They include cleft lip (CL), cleft palate (CP), and combined cleft lip and palate (CLP), and may appear as isolated anomalies or as part of over 300 syndromes, representing the largest group of craniofacial malformations. The prevalence of OFCs varies widely across geographical regions and ethnic groups, emphasizing the need for localized healthcare strategies and interventions [2].

Children born with OFCs frequently encounter multiple complications, including impaired feeding and nutrition, speech impediments, hearing loss, malocclusion, significant facial deformities, and psychological challenges such as social stigma and reduced self-esteem [3]. Many OFC cases also coexist with congenital cardiovascular anomalies and other systemic health issues, further complicating their medical management and impacting overall quality of life [4].

Given the complexity of OFCs, their effective management requires a comprehensive multidisciplinary approach [2]. Treatment typically involves coordinated care from plastic surgeons, otolaryngologists, dentists, orthodontists, speech therapists, and psychologists. This integrated team

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works collaboratively to develop individualized care plans that address not only physical deformities but also functional deficits, psychological impacts, and social integration challenges.

Among the various health challenges faced by children with OFCs, oral conditions are particularly prominent and include early childhood caries, dental trauma, malocclusion, developmental enamel defects, and issues related to decayed, missing, or filled teeth. Such conditions significantly affect these children's oral functionality, nutrition, speech, and psychosocial well-being. Despite these recognized impacts, research comprehensively exploring oral health conditions specific to children with OFCs remains limited.

Therefore, assessing the oral health burden in children with OFCs is crucial to fully understand the broader implications for their health and quality of life. By identifying oral health prevalence, severity, prevention practices, and current management approaches, gaps can be highlighted and addressed. Such evidence can lead to informed modifications in healthcare practices and policies, emphasizing preventive care and timely interventions. Ultimately, this approach aims to enhance the oral health outcomes, overall well-being, and quality of life for children with OFCs.

The current review aims to systematically address these issues by investigating oral health conditions associated with OFCs and examining their broader impacts. The study seeks to offer valuable insights and recommendations to healthcare providers and policymakers to foster effective, evidence-based oral healthcare strategies for children affected by OFCs.

2. Oral conditions in children with Orofacial Clefts (OFCs)

2.1. Etiology and pathogenesis of OFCs

Orofacial clefts (OFCs) are complex congenital anomalies classified into syndromic (SOFCs) and non-syndromic (NSOFCs) categories [5]. Syndromic OFCs, such as Van der Woude Syndrome (VWS), typically result from identifiable single-gene mutations, notably in the IRF6 and GRHL3 genes [6]. Additionally, environmental factors, including fetal alcohol syndrome, have clearly established teratogenic effects leading to SOFCs [7]. Conversely, the etiology of NSOFCs, which constitute the majority of cases, involves multifactorial interactions between genetic predispositions and environmental influences. Commonly identified risk factors for NSOFCs include maternal smoking (active and passive), alcohol consumption during pregnancy, and certain medications such as nifedipine [8-10]. Conversely, prenatal supplementation with multivitamins, particularly folic acid, has demonstrated preventive benefits [11].

2.2. Dental anomalies

Children with OFCs frequently experience various dental anomalies due to anatomical and developmental complexities. These include missing teeth (hypodontia), extra teeth (supernumerary teeth), and malformed teeth exhibiting enamel hypoplasia or dysmorphism [12]. Hypodontia is notably common in children with cleft lip and palate (CLP), affecting normal occlusion and aesthetics, while supernumerary teeth can cause crowding and complicate orthodontic management [13]. Addressing these anomalies often necessitates multidisciplinary collaboration involving orthodontic interventions, prosthodontic restorations, or dental implants to restore functional and aesthetic outcomes.

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2.3. Malocclusion and developmental enamel defects

Malocclusion is a significant concern, frequently intensified by the disrupted development of craniofacial structures in OFC patients. Malocclusions, such as overjet, crossbite, or open bite, can impair chewing efficiency, speech articulation, and facial appearance, thus necessitating early orthodontic or surgical intervention. Developmental enamel defects further complicate dental management, characterized by hypoplasia or hypomineralization linked to genetic, environmental, or systemic health factors like congenital heart disease or neural tube defects.

2.4. Early Childhood Caries (ECC)

Early childhood caries (ECC) is disproportionately prevalent among children with OFCs due to compromised oral hygiene maintenance and dietary factors. ECC not only leads to pain and discomfort but can significantly impair nutritional intake, exacerbating feeding difficulties and affecting overall development. Therefore, preventive measures such as routine oral hygiene education, fluoride supplementation, dietary counseling, and regular dental check-ups are critically important.

2.5. Periodontal health and salivary function

Periodontal health is compromised due to anatomical variations and surgical scar formations, increasing susceptibility to gingivitis and periodontitis. The management of periodontal conditions includes specialized oral hygiene techniques, routine professional cleanings, and adjunctive therapies like antimicrobial mouthwashes. Children with OFCs also often exhibit altered salivary function, potentially leading to xerostomia (dry mouth), which can increase risks for dental caries and mucosal infections. Xerostomia management strategies involve adequate hydration, artificial saliva substitutes, and careful monitoring of medication side effects.

2.6. Tooth trauma and otitis media

Tooth trauma is another heightened risk among children with OFCs, resulting from structural vulnerabilities of the oral cavity. Prompt management of dental injuries, including fractures and avulsions, is essential to prevent complications such as tooth loss or infections. Additionally, children with cleft palate specifically face increased susceptibility to otitis media, characterized by middle-ear infections that can lead to hearing loss and necessitate medical or surgical interventions.

2.7. Oral microbiome and infectious risks

Altered anatomical structures and therapeutic interventions such as surgical repairs or orthodontic appliances can modify the oral microbiome, increasing vulnerability to opportunistic infections. Candida albicans, a yeast species commonly found in the oral cavity, frequently causes oral candidiasis due to its enhanced pathogenic potential in altered oral environments of OFC patients [14]. Preventive strategies to mitigate infectious risks include maintaining rigorous oral hygiene, using antifungal treatments as needed, and regular professional oral health assessments [15].

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2.8. Multidisciplinary management and quality of life

Effective management of these diverse oral conditions mandates a multidisciplinary approach involving plastic surgeons, dentists, orthodontists, otolaryngologists, speech therapists, and psychologists. Collaborative efforts ensure comprehensive, patient-centered care addressing the unique oral and systemic needs of children with OFCs. Additionally, assessing oral health-related quality of life (OHRQoL) among these children is vital to understanding the broader impacts of OFCs and improving care practices and healthcare policies accordingly.

3. Malocclusion, early childhood caries, and other specific oral conditions

3.1. Malocclusion in OFCs

Malocclusion is a common oral condition in children with OFCs, with a prevalence that varies depending on the type and severity of the cleft. The altered development of the craniofacial structures in these children can lead to a range of malocclusions, including overjet, overbite, crossbite, and open bite. These malocclusions can affect chewing, speech, and facial aesthetics and may require orthodontic treatment or surgical intervention to correct.

Early orthodontic intervention is often recommended in children with OFCs to guide the growth and development of the jaws and teeth and prevent malocclusion progression. This may involve using removable or fixed appliances, such as palatal expanders or functional appliances, to correct skeletal discrepancies and improve occlusion. In some cases, orthognathic surgery may be necessary to achieve optimal results.

3.2. Early Childhood Caries (ECC) in OFCs

Early childhood caries is a significant oral health problem in children with OFCs, with a higher prevalence compared to the general population. The altered anatomy of the oral cavity, combined with difficulties in maintaining oral hygiene and dietary factors, can contribute to the development of ECC in these children. ECC can cause pain, discomfort, and malnutrition, and can also lead to more severe dental problems if left untreated.

Preventive measures, such as fluoride supplementation, dietary modifications, and regular dental check-ups, prevent ECC in children with OFCs. Parents and caregivers should be educated on the importance of oral hygiene and encouraged to establish a good oral hygiene routine from an early age. In some cases, topical fluoride applications or sealants may be recommended to provide additional protection against caries.

3.3. Other specific oral conditions

In addition to malocclusion and ECC, children with OFCs may also experience other specific oral conditions, such as tooth trauma, developmental enamel defects, and oral mucosal lesions. Tooth trauma is more common in these children due to the altered anatomy of the oral cavity and may require prompt management to prevent long-term complications. Developmental enamel defects can affect the quality and appearance of the tooth enamel and may be associated with other systemic conditions. Oral mucosal lesions, such as candida or aphthous ulcers, can also occur more frequently in children with OFCs due to alterations in the oral microbiota or immune function.

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4. Oral health-related quality of life in children with OFCs

4.1. Assessment of OHRQoL

The oral health-related quality of life (OHRQoL) of children with OFCs is essential in managing their oral conditions. OHRQoL encompasses the impact of oral health on the child's daily functioning, social interactions, and emotional well-being. Several instruments have been developed to assess OHRQoL in children, including the Child Perceptions Questionnaire (CPQ) and the Early Childhood Oral Health Impact Scale (ECOHIS).

Assessing OHRQoL in children with OFCs can provide valuable insights into the impact of oral conditions on their overall quality of life. It can help guide treatment planning and decision-making and highlight areas where additional support or interventions may be needed to improve the child's well-being.

4.2. Factors influencing OHRQoL

Several factors can influence the OHRQoL of children with OFCs, including the severity and type of cleft, associated conditions, and the child's age and gender. Children with more severe clefts or related conditions such as hearing loss or speech impediments may experience a greater impact on their OHRQoL. Younger children may also be more vulnerable to the social and emotional challenges associated with OFCs.

In addition, the child's family environment and access to healthcare services can also affect their OHRQoL. Families with limited resources or those living in areas with inadequate healthcare services may face greater challenges in managing their child's oral health needs.

4.3. Improving OHRQoL in children with OFCs

Improving the OHRQoL of children with OFCs requires a comprehensive approach that addresses their oral health needs and overall well-being. This may involve a combination of medical, dental, and psychosocial interventions tailored to each child's needs.

Medical interventions may include surgery to correct the cleft deformity or to manage associated conditions such as hearing loss or speech impediments. Dental interventions may involve orthodontic treatment, restorative dentistry, or preventive measures to prevent dental caries and periodontal disease. Psychosocial interventions may include counseling or support groups to help children, and their families cope with the social and emotional challenges associated with OFCs.

5. Discussion

The oral health of children with OFCs is a complex and multifaceted issue requiring a multidisciplinary management approach. These children face various oral conditions, including dental anomalies, malocclusion, early childhood caries, and periodontal problems, which can significantly impact their oral health and overall well-being. In addition, the altered anatomy of the oral cavity and the presence of associated conditions can further complicate their oral health management.

Preventive measures and timely interventions are crucial to preventing the progression of oral conditions and minimizing their impact on the child's oral health and development. This requires close collaboration between healthcare professionals from different disciplines, including plastic surgeons, otolaryngologists, dentists, speech therapists, and psychologists.

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Future research in oral health in children with OFCs should focus on several key areas. First, more longitudinal studies are needed to better understand these children's natural history of oral conditions and identify risk factors for their development and progression. Second, more research is needed on the effectiveness of different treatment modalities, including orthodontic, surgical, and psychosocial interventions, in improving the oral health and overall well-being of children with OFCs.

In addition, there is a need for more research on the impact of oral health on the quality of life of children with OFCs and their families. This can help guide the development of patient-centered care models that address the unique needs and concerns of these children and their families.

Finally, more research is needed on the role of genetics and environmental factors in the etiology and pathogenesis of OFCs and their associated oral conditions. This can help identify new targets for prevention and treatment and ultimately lead to improved oral health outcomes for children with OFCs.

6. Conclusions

In conclusion, the oral health of children with OFCs is a necessary research and clinical practice area. These children face various oral conditions that significantly impact their health and well-being. A multidisciplinary approach to management is essential to address their unique needs and optimize their oral health outcomes.

Preventive measures, such as regular dental check-ups, oral hygiene education, and fluoride supplementation, are crucial to prevent the development of oral conditions in these children. Timely interventions, including orthodontic treatment, surgical correction, and psychosocial support, are also necessary to manage existing conditions and to improve the child's quality of life.

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