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Oral Health Needs in Children with Congenital Heart Disease

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ABSTRACT:

Children with congenital heart disease (CHD) face unique oral health challenges due to both intrinsic disease factors and external care-related barriers. Conditions such as dental caries, gingivitis, and enamel defects are more common in these children compared to their healthy peers. Such oral issues can increase the risk of bacteremia and infective endocarditis, especially during invasive procedures or daily activities. Factors such as parental knowledge, socioeconomic status, and poor oral hygiene further increase the risk. Interdisciplinary preventive strategies—including regular dental check-ups, thorough daily hygiene, dietary counselling, and appropriate antibiotic prophylaxis—are crucial for improving oral health outcomes. Enhanced education for caregivers and healthcare providers about oral-cardiac connections, along with collaborative care between pediatric dentists and cardiologists, is essential to optimise both oral and systemic health in children with CHD.

Introduction

Congenital heart disease (CHD) refers to structural abnormalities of the heart or great vessels that arise during fetal development. It is among the most prevalent birth defects worldwide, affecting approximately 8 to 10 infants per 1,000 live births. These conditions can range from straightforward issues, such as small septal defects, to complex anomalies that necessitate multiple surgical interventions and long-term care. Advances in pediatric cardiology have significantly improved survival rates, leading to an increasing population of children with CHD who require ongoing, multidisciplinary support. Oral health is a crucial yet often overlooked component of comprehensive care for these children, given its relationship to both localised disease and systemic complications, including infective endocarditis (IE) [1].

Oral Disease Burden in Children with CHD

Children with congenital heart disease (CHD) demonstrate a significantly higher prevalence of oral diseases compared to their healthy peers. Research consistently indicates poor oral hygiene, substantial plaque accumulation, gingival inflammation, and elevated rates of untreated dental caries within this population [2,3,4]. For instance, a comprehensive study involving children aged 5–14 with CHD revealed extensive dental caries, alongside high plaque and gingival indices, highlighting severe unmet dental needs [2]. Additionally, a comparative study found a greater incidence of enamel defects and gingivitis among children with CHD, suggesting an increased susceptibility to oral diseases, even when caries scores were found to be similar to those of healthy controls [5].

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A systematic review indicated a trend toward higher prevalence of dental caries in children with congenital heart disease (CHD) compared to their healthy counterparts, highlighting the necessity for targeted oral health interventions [3]. Additionally, a large cross-sectional study revealed that more than one-third of children with CHD had untreated dental lesions and elevated dmft/DMFT scores, further emphasising the magnitude of the issue [6].

Aetiology and Contributing Factors

Biological and Disease-Related Factors

Numerous biological mechanisms contribute to poor oral health in children with congenital heart disease (CHD). One such mechanism is altered enamel development, including enamel hypoplasia, which has been linked to systemic hypoxia and nutritional deficiencies frequently observed in CHD [5,6]. These factors result in structurally weaker teeth that are more susceptible to caries. Additionally, emerging research suggests that the oral microbiomes of children with CHD may differ. Although this area of study is still in its early stages, alterations in bacterial colonisation could influence the risk of caries and periodontal disease [7].

Moreover, the regular use of medications (several of which have sugars or lead to dry mouth), extended nighttime feeding, and challenges with feeding during infancy could heighten the risk of cavities by creating environments conducive to tooth decay and hindering proper self-cleaning [6].

Behavioural and Socioeconomic Factors

Children with congenital heart disease (CHD) frequently exhibit poorer oral hygiene practices compared to their peers, primarily due to caregivers prioritising cardiac management over oral health. Notable patterns include a lower frequency of tooth brushing, inconsistent use of fluoride toothpaste, and infrequent dental visits [8]. A study conducted in Sudan revealed that children with CHD demonstrated reduced brushing frequencies and less effective oral hygiene behaviours, which contributed to a higher prevalence of caries and gingivitis compared to matched controls [8].

Socioeconomic factors, including the education level of parents and the availability of dental services, also play a significant role in determining oral health outcomes. Kids with parents who have lower levels of education typically exhibit poorer oral health statuses, highlighting the importance of preventive initiatives at the community level [8].

Parental Knowledge and Attitudes

Parents often have limited awareness of the connection between oral health and systemic outcomes, such as infective endocarditis (IE). Previous research has indicated that a substantial number of caregivers of children with congenital heart disease (CHD) lack fundamental instruction in oral hygiene practices and have a poor understanding of their systemic significance [9]. Notably, even in families with exposure to dental diseases, preventive dental education remains infrequent [9]. Additionally, studies examining parents' attitudes reveal that while caregivers may grasp the general importance of oral health, this understanding does not consistently lead to effective preventive behaviours [10].

Risk of Infective Endocarditis

One of the most significant systemic risks linked to poor oral health in children with congenital heart disease (CHD) is infective endocarditis (IE). IE is a serious infection affecting the heart's endocardial surface, typically initiated by bacteria that enter the bloodstream during activities such as dental plaque manipulation, brushing, or chewing, especially in the presence of gingival inflammation [11]. Viridans group streptococci, which are commonly found in the oral cavity, are associated with a notable number of IE cases. This highlights the importance of maintaining good oral health for patients with CHD.

Given this risk, many guidelines have historically recommended antibiotic prophylaxis for high-risk dental procedures in certain CHD cases. However, the primary focus should always be on preventing oral disease through effective hygiene practices and regular professional dental care [11].

Preventive and Therapeutic Needs

The oral health requirements of children with congenital heart disease (CHD) involve both preventive and therapeutic approaches. Preventive measures include early education on the importance of brushing with

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fluoridated toothpaste, dietary counselling to reduce sugar intake, and professional applications of fluoride or sealants when appropriate. A case-control study revealed that children with CHD who participated in preventive interventions exhibited improved oral health outcomes compared to baseline measurements, suggesting that well-implemented, tailored preventive programs can be effective [12].

Therapeutically, timely and continuous dental treatment is crucial for eliminating existing caries, managing periodontal disease, and addressing enamel defects that may act as reservoirs for plaque. In more complex clinical situations or for young children with significant treatment needs, dental care under general anaesthesia may be necessary to safely and comprehensively address dental issues while minimising the risk of bacteremia and other complications [13].

Interdisciplinary Care and Collaboration

Effective management of oral health in children with congenital heart disease (CHD) necessitates interdisciplinary collaboration. Pediatric cardiologists, paediatricians, and pediatric dentists should engage in regular communication to develop coordinated care plans that consider each child's cardiac status and minimise procedural risks. Routine dental referrals should be integrated into cardiac follow-up appointments, and pediatric dentists must be well-informed about cardiac conditions, necessary precautions, and the potential requirement for antibiotic prophylaxis according to current guidelines.

Furthermore, community outreach and education initiatives involving both cardiac and dental teams can enhance awareness of the significance of oral health in this vulnerable population. Prioritising training for caregivers to recognise early signs of oral diseases and to facilitate access to preventive services is essential.

Challenges and Gaps in Knowledge

Despite the evidence of increased oral health needs, several research gaps remain. The heterogeneity in study designs, variability in caries measurement indices, and diversity in age groups studied make it challenging to draw definitive conclusions about the magnitude of oral disease risks in CHD children. More longitudinal studies are needed to understand causal pathways and the effectiveness of specific preventive interventions. Additionally, the oral microbiome's role in disease progression in CHD populations warrants further investigation [7].

Conclusion

Children with congenital heart disease have significant oral health needs characterised by higher rates of caries, gingivitis, plaque accumulation, and enamel defects. These oral conditions not only affect local oral health but also pose serious systemic risks such as infective endocarditis. Multifactorial contributors include biological, behavioural, socioeconomic, and caregiver knowledge barriers. Comprehensive care models involving preventive dental practices, regular professional dental care, interdisciplinary healthcare coordination, and parental education are imperative to optimise oral and systemic health outcomes for these children.

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