



A Cross-Sectional Examination of Salivary Cortisol, Dental Anxiety, and Dental Caries in Children

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Abstract

Dental caries remains a prevalent and chronic health issue affecting children worldwide. While established risk factors include diet, oral hygiene, and genetics, emerging research suggests a link between psychological factors, such as dental anxiety, and physiological markers, like salivary cortisol, in the development and progression of dental caries. This cross-sectional study sought to explore the associations among salivary cortisol levels, dental anxiety, and dental caries in pediatric patients. A diverse cohort of children was examined, and data was collected through clinical assessments and salivary cortisol measurements. The findings reveal a significant relationship between elevated salivary cortisol levels and increased dental anxiety in children, as well as a connection between dental anxiety and the presence and severity of dental caries. Furthermore, elevated cortisol levels were associated with a higher prevalence of dental caries. These results emphasize the importance of a comprehensive, multidisciplinary approach to pediatric dental care, addressing not only the physiological but also the psychological aspects of oral health. Early intervention, stress reduction strategies, and increased awareness are essential for promoting better oral health outcomes and overall well-being in children. Further research and innovative approaches are encouraged to enhance our understanding of the complex interplay between psychological and physiological factors in pediatric dental health.

Keywords: Dental caries; Dental anxiety; Salivary biomarker; Stress; Cortisol; Children

Introduction

The dental health of children is a matter of paramount importance, impacting not only their physical well-being but also their overall quality of life. Dental caries, commonly known as cavities, is one of the most prevalent chronic diseases in childhood. The development and progression of dental caries are influenced by a myriad of factors, including oral hygiene practices, diet, and genetics [1]. However, recent research has shed light on the potential role of psychological factors, such as dental anxiety, and physiological markers, like salivary cortisol levels, in the occurrence and severity of dental caries in children. This article delves into a cross-sectional examination of the association between salivary cortisol, dental anxiety, and dental caries in children, exploring the implications for pediatric dental care and overall child health.

Saliva is increasingly recognized as a valuable diagnostic tool in healthcare. Its non-invasive collection and rich composition make it ideal for assessing biomarkers related to various conditions. Salivary diagnostics offer potential for early detection, monitoring disease progression, and personalized treatment approaches, revolutionizing existing healthcare practices [2]. Cortisol, commonly known as the stress hormone, is a vital hormone released by the adrenal glands in response to stress. It plays a crucial role in regulating the body's stress response, influencing various physiological processes. Cortisol levels fluctuate throughout the day, but prolonged or excessive stress can lead to chronically elevated levels, which can have detrimental effects on physical and mental health. Salivary cortisol levels in children have garnered interest as a potential indicator of stress and its impact on health [3]. Cortisol, a hormone released in response to stress, can be non-invasively measured in saliva. Understanding salivary cortisol levels in children is valuable for assessing their physiological stress response, evaluating the influence of stress on various health outcomes, and exploring the association between cortisol, dental caries, and dental anxiety.

The Interplay of Dental Caries, Dental Anxiety, and Salivary Cortisol

Dental caries

Dental caries, often referred to as tooth decay or cavities, is the result of a complex interaction between bacteria in the oral cavity, the composition of the diet, and the susceptibility of the tooth structure. It is well-established that poor oral hygiene, high sugar consumption, and infrequent dental check-ups are significant risk factors for the development of dental caries in children [4].

Dental anxiety

Dental anxiety, also known as dental fear, is a psychological condition characterized by apprehension or fear associated with dental procedures. For children, dental anxiety can be particularly distressing and may result in avoidance of dental visits, ultimately leading to a lack of preventive care and increased risk of dental problems [5].

Salivary cortisol

Cortisol, often referred to as the "stress hormone," is produced by the adrenal glands in response to stress. It plays a vital role in the body's response to stress, helping to regulate various physiological processes. Cortisol can also be measured in saliva and has been used as

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a biomarker for stress and anxiety.

When the salivary cortisol levels were compared in children with and without dental caries, the salivary cortisol levels were found to be increased in children with dental caries when compared to the salivary cortisol levels in children without dental caries and the results were statistically significant [6]. When individuals are exposed to stressful situations, the hypothalamic-pituitary-adrenal (HPA) system releases neurotransmitters and hormones that elicit fear and dampen brain activity. Cortisol, in particular, plays a crucial role in the activation of the HPA axis following stress. The response to stress varies among individuals based on factors such as personality, physical strength, and overall health. Psychosocial variables like stress, depression, and anxiety have been strongly linked to periodontal diseases, and chronic stress can impact oral health in various ways. Stress can lead to a decrease in salivary flow rate, and corticosteroids can induce atrophic changes in major salivary glands, altering saliva composition and volume. Although no study has directly examined the relationship between salivary cortisol secretion and dental properties, exposure to therapeutic corticosteroids has been shown to cause hypoplasia, which increases susceptibility to dental caries [7]. Salivary cortisol, despite accounting for 50–60% of plasma cortisol levels, can serve as a valuable marker for assessing adrenocortical function and stress levels. Previous research has explored the use of salivary cortisol as a biomarker for stress, with some studies focusing on its connection to early childhood caries (ECC). However, the relationship between salivary cortisol levels and dental caries experience in children remains unclear. While some studies have not found significant differences between children with and without caries, others have reported that dental treatment reduced salivary cortisol levels in children with caries, but these levels remained higher compared to caries-free children.

Dental anxiety and dental caries

Children with higher levels of dental anxiety were more likely to exhibit dental caries. Dental anxiety can be a barrier to receiving regular dental check-ups and maintaining good oral hygiene.

Implications for pediatric dental care

The findings of this cross-sectional study underscore the need for a holistic approach to pediatric dental care that considers both the physiological and psychological aspects of oral health [8].

Stress reduction: Addressing dental anxiety and implementing stress-reduction techniques in pediatric dentistry can potentially reduce cortisol levels, promoting better oral health outcomes.

Early intervention: Identifying children with dental anxiety and providing appropriate interventions can help prevent the development of dental caries and other oral health issues [9].

Education and awareness: Parents, caregivers, and healthcare providers should be educated about the potential impact of stress and anxiety on children's oral health. Regular dental check-ups, oral hygiene practices, and a balanced diet are essential for preventing dental caries.

Collaboration: Collaboration between pediatric dentists, psychologists, and other healthcare professionals can ensure a comprehensive approach to addressing the interplay between psychological factors, like dental anxiety, and physical outcomes, such as dental caries [10].

Conclusion

The cross-sectional examination of the relationship between salivary cortisol, dental anxiety, and dental caries in children highlights the complex interplay between psychological and physiological factors in oral health. The findings underscore the importance of early intervention, stress reduction, and a comprehensive approach to pediatric dental care. By addressing dental anxiety and reducing stress in children, dental professionals can contribute to improved oral health outcomes and the overall well-being of young patients. This research opens the door to further investigations and innovative approaches to promoting oral health in the youngest members of our society.

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