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(REVIEW ARTICLE)

Tooth Agenesis in Children: Understanding Anodontia, Oligodontia and Hypodontia

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Abstract

Tooth number abnormalities such as anodontia, oligodontia, and hypodontia represent hereditary developmental disorders that significantly affect oral function, esthetics, and quality of life in children. This literature review aims to explore the etiology, clinical features, and management of these conditions by analyzing current and past scientific evidence. Genetic and environmental factors are identified as major contributors to these anomalies, with specific gene expression changes in odontogenesis playing a critical role. Clinically, patients may present with functional difficulties, occlusal disturbances, and psychosocial impacts requiring multidisciplinary management. The review emphasizes the importance of thorough history taking to distinguish congenital agenesis from tooth loss due to extraction. Early parental awareness and timely consultation with pediatric dentists are essential for optimal care. This study provides a comprehensive overview of developmental dental disorders, highlighting the need for updated research, preventive strategies, and integrated clinical approaches to improve treatment outcomes in affected pediatric populations.

Keywords: Anodontia; Clinical features; Etiology; Hypodontia; Oligodontia; Pediatric dentistry

1. Introduction

Dental development plays an important role in a person's oral function and aesthetics. Dental anomalies, such as anodontia, oligodontia, and hypodontia, have a significant impact on oral health and quality of life.[1] Although the literature has discussed these anomalies, a thorough literature study on the etiology, clinical features, and management of the three anomalies is still not available.

Today, developmental dental anomalies are relatively common, with hypodontia affecting 6.4–8.1% of European populations[20] and around 7% of Chinese populations.[22] More severe forms such as oligodontia occur in approximately 0.1–0.3% of individuals,[19] while complete anodontia is extremely rare, affecting less than 0.1% and usually associated with ectodermal dysplasia.[23] finding during routine dental examinations. These conditions can lead to clinical problems, including difficulty in tooth eruption, aesthetic impact, occlusal disorders, and periodontal problems.[2] Therefore, an in-depth understanding of the etiology, clinical features, and management of anodontia, oligodontia, and hypodontia is crucial to provide appropriate treatment and improve patients' quality of life.

The main problem of this study involves identifying the etiology of the three disorders as well as exploring their clinical features and management. As a hypothesis, we assume that both genetic and environmental factors contribute to these disorders. Analysis of the possible clinical features and management strategies will be the focus to form comprehensive guidelines for the diagnosis and management of developmental dental disorders.

The benefits of this research include the provision of in-depth scientific information on anodontia, oligodontia, and hypodontia disorders, the development of practical guidelines for clinicians and the public, and an increased understanding of the oral health and aesthetic impact on individuals with developmental dental disorders.

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2. Methods

This literature review was conducted by collecting and analyzing articles from both national and international journals. The search strategy involved databases such as PubMed, ScienceDirect, and Google Scholar, using keywords including *"anodontia," "oligodontia," "hypodontia," "clinical features," "etiology,"* and *"pediatric dentistry."* Relevant studies published between 2000 and 2025 were included to capture both classical and updated findings (Brook, 2016; Zhang et al., 2015; Salgado et al., 2018). Inclusion criteria were articles that addressed the etiology, clinical features, and management of tooth number anomalies, including case reports, systematic reviews, and epidemiological studies. Exclusion criteria involved articles without available full texts, non-English studies, and papers unrelated to developmental anomalies of tooth number.

A total of 27 references were selected, consisting of peer-reviewed journals, case reports, and review articles, which together provided a comprehensive basis for the analysis of genetic and environmental factors, clinical manifestations, and management approaches (Mady et al., 2023; Kamath et al., 2017; Shilpa et al., 2018).

2.1. Purpose

The purpose of this literature review is to investigate and present in-depth information regarding developmental dental disorders, specifically anodontia, oligodontia and hypodontia. In this context, author used references that included scientific literature, research articles, and books that addressed the etiology, clinical features, and management of these three disorders. These sources involved current research to classic sources relevant to this topic. The periodicity of the literature sources covers the development of knowledge from the past to the present, forming a solid foundation for a deeper understanding of the issue.

3. Results

This text presents a research study on hereditary disorders of tooth development in children, specifically anodontia, oligodontia and hypodontia. The text emphasizes the importance of understanding the etiology, clinical features, and management of these conditions for effective treatment.[11] It aims to provide valuable scientific information for managing dental abnormalities in specific populations, by addressing both genetic and environmental factors. The importance of the history in assessing dental problems is highlighted, including the distinction between congenital conditions and teeth lost due to extraction.[12]

The introduction emphasizes the important role of tooth development in oral function and aesthetics, highlighting the lack of comprehensive studies of the mentioned disorders despite the existing literature. The discussion emphasizes the clinical challenges faced by these anomalies, stressing the need for in-depth knowledge to ensure appropriate treatment and improve patient quality of life.[13]

Understanding dental developmental abnormalities is not limited to recognizing their clinical manifestations, but also requires an in-depth investigation of the underlying mechanisms. Previous studies have shown that the prevalence and severity of these disorders can vary across populations, indicating the influence of both hereditary and environmental factors.[14] These variations underscore the importance of more comprehensive research using clinical, genetic, and epidemiological approaches, which will form the basis for the focus of this study.

This study focuses on identifying the etiology, clinical features, and management of anodontia, oligodontia, and hypodontia, with hypotheses suggesting contributions from genetic and environmental factors. The benefits of this study include providing detailed scientific information for clinicians and the public, as well as a better understanding of the oral health and aesthetic impact on individuals with these dental abnormalities.

This review identified that anodontia, oligodontia, and hypodontia are the most frequently reported tooth number abnormalities in children. The included literature consistently emphasizes that both genetic and environmental factors contribute to the pathogenesis of these anomalies.[19] Clinical manifestations vary, ranging from partial absence of one or several teeth to complete anodontia, often associated with syndromes such as ectodermal dysplasia.[24] Reported prevalence rates show that hypodontia occurs in 6.4–8.1% of European populations and about 7% of Chinese populations, whereas oligodontia is found in 0.1–0.3% of individuals, and anodontia remains extremely rare (<0.1%).[16] In addition, several studies highlight the importance of differentiating congenital agenesis from teeth lost due to extraction, as well as the psychosocial implications of missing teeth in pediatric patients.[1] These findings collectively provide a comprehensive overview of the epidemiology, etiology, and clinical features of tooth number anomalies in children.

4. Discussion

This literature review discusses hereditary disorders of tooth development, such as anodontia, oligodontia and hypodontia. Their etiology, clinical features, and management are discussed in depth. The author concludes that genetic and environmental factors play an important role in these disorders. Advice is given to parents to understand pediatric dental abnormalities and take action such as consulting a dentist after children's teeth erupt.

A deeper understanding of the biological mechanisms behind hereditary dental abnormalities is also needed to provide a scientific basis for prevention and treatment efforts. Recent studies show that the complex interaction between genetic and environmental factors not only affects the number of teeth that grow, but also the morphological quality and function of the resulting teeth.[3] This makes research on gene expression and its supporting factors increasingly important, so this review emphasizes the relevance of this basic understanding before further discussing the role of parents and the hereditary aspects of disorders such as anodontia, oligodontia, and hypodontia.

In continuation of this literature review, the author highlights the importance of parental understanding of pediatric dental abnormalities. It is argued that anodontia, oligodontia and hypodontia are hereditary disorders that can significantly affect dental development.[4] The etiology of these disorders includes both genetic and environmental factors, with an emphasis on changes in the expression of specific genes involved in odontogenesis.[5]

In the concluding section, the author advises parents to be informed about dental abnormalities in children and the steps that can be taken, including consulting a dentist after children's teeth erupt. This aims to understand and effectively manage these disorders. Overall, this literature review provides insight into the various aspects of hereditary disorders of dental development, highlighting the clinical implications and the need for attention to genetic and environmental factors in their understanding and management.

The strengths of this study include a comprehensive description of hereditary dental disorders, involving an extensive literature review to present depth information. In addition, the study set clear objectives, such as describing the etiology and clinical featuresof anodontia, oligodontia, and hypodontia. However, some shortcomings may include a lack of emphasis on the methodological aspects of the study, such as whether it was a case study, meta-analysis, or observational study. Additional information regarding the study sample, data collection methodology, and data analysis could provide further context.

In addition, the study could be improved by including the latest research findings or recent developments in the field of hereditary dental disorders. This can ensure that the study provides a current and relevant understanding of the topic.

4.1. Clinical Overview of Anodontia

The paper provides a fairly comprehensive overview of anodontia, covering the definition of the condition, variations such as partial anodontia, and an age of diagnosis of approximately 13 months. A description of anodontia without ectodermal dysplasia and its possible association with genetic mutations provides additional context.[6] The reference to the use of X-rays to examine unerupted gums also reflects a relevant diagnostic approach.[27]

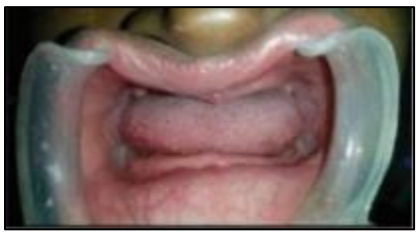

Figure 1 Anodontia.[24]

In addition to clinical aspects, it is also important to emphasize the functional and psychosocial impacts of anodontia, especially in children who are in the phase of speech and nutritional development. Total tooth loss can cause masticatory dysfunction, phonetic difficulties, and delayed jaw growth due to a lack of mechanical stimulation.[7] This condition often affects patients' self-confidence from an early age, so a multidisciplinary approach involving pediatric dentistry, orthodontists, prosthodontists, and psychologists is essential to ensure patients' quality of life remains optimal.[8]

4.2. Clinical Overview of Oligodontia

The paper provides a clear clinical overview of oligodontia, including characteristics such as reduced crown length, lower cusp or cingula, and conical crowns on erupting teeth. The association with hypodontia, details on the maxillary permanent molar teeth, as well as information on agenesis in oligodontia provides an in-depth understanding.[9] References to differences in dental agenesis patterns between populations add an interesting dimension of understanding. In the context of research, updating current data and references can increase the reliability of information. Overall, the paper provides a comprehensive understanding of oligodontia with good details.[26]

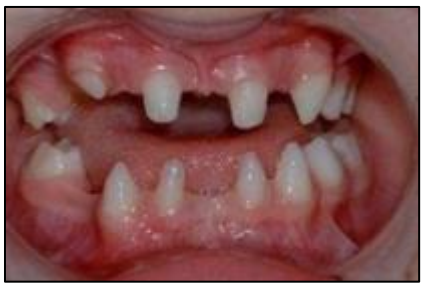

Figure 2 Oligodontia.[25]

4.3. Clinical Overview of Hypodontia

The paper presents a comprehensive clinical overview of hypodontia, covering microdontia, transposition of permanent teeth ectopic permanent teeth, and infraocclusion of primary molar teeth. Emphasis on the difference between natural and extracted tooth loss provides relevant diagnostic nuances.[10] Descriptions of the characteristics of hypodontia patients, such as lower mandibular plane angle and smaller lower anterior facial height, provide a holistic picture. The description of the relationship between Class III skeletal and craniofacial structures in children with hypodontia adds insight. Nonetheless, updating the data and current references can strengthen the reliability of the information. Overall, the paper provides a good understanding of the clinical features of hypodontia.

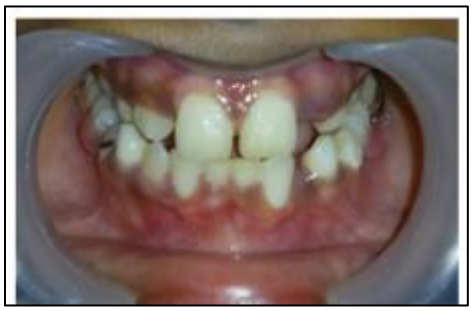

Figure 3 Hypodontia.[27]

5. Conclusion

Developmental dental abnormalities such as anodontia, oligodontia, and hypodontia constitute complex hereditary conditions influenced by both genetic and environmental factors. These disorders not only compromise oral function and esthetics but also exert a profound impact on the psychosocial well-being and quality of life of affected children. A comprehensive understanding of their etiology, clinical characteristics, and management strategies is therefore essential for accurate diagnosis and effective treatment planning.

This literature review highlights the importance of integrating genetic insights, clinical evaluation, and preventive approaches into the management of tooth agenesis. Early recognition through detailed history-taking and diagnostic imaging, combined with timely multidisciplinary interventions involving pediatric dentists, orthodontists, prosthodontists, and psychologists, is crucial in minimizing functional, developmental, and psychological consequences.

Future research should emphasize the role of molecular genetics and gene–environment interactions in the pathogenesis of these anomalies, while also exploring innovative treatment modalities and preventive strategies. Strengthening parental awareness and early dental consultations are equally important in ensuring optimal outcomes.

By advancing knowledge and clinical practice, dental professionals can provide more precise, holistic, and patient-centered care for children with tooth number abnormalities.

Compliance with ethical standards

Disclosure of conflict of interest

No conflict of interest to be disclosed.

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