

Comprehensive Analysis on Patterns and Variations of Hypodontia and its various impacts

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ABSTRACT

Hypodontia, or tooth agenesis, is the most prevalent craniofacial malformation in humans. It may occur as part of a recognised genetic syndrome or as a non syndromic isolated trait. Excluding third molars, the reported prevalence of hypodontia ranges from 1.6 to 6.9%, depending on the population studied. Most affected individuals lack only one or two teeth, with permanent second premolars and upper lateral incisors the most likely to be missing. Both environmental and genetic factors are involved in the aetiology of hypodontia, with the latter playing a more significant role. Hypodontia people regularly introduce a noteworthy clinical test for orthodontists on the grounds that, in various cases, the treatment time is delayed and the treatment result might be bargained. Subsequently, the ID of hereditary and ecological elements might be especially valuable in the early expectation of this condition and the improvement of avoidance methodologies and novel medications later on.

Keywords: Complications, etiology, hypodontia, prevalence, risk factors, tooth abnormalities, treatment.

INTRODUCTION

Oral health plays a crucial role in public health. Dental treatments are rather expensive health services and the combination of different modalities such as orthodontic, prosthodontic and surgical treatments can put a heavy burden on the average family's health budget. Some regular dental inconsistencies require very costly medicines. One of them is innately missing teeth (CMT), intrinsic nonappearance of teeth, inborn dental aplasia, or dental agenesis. It is a standout amongst the most widely recognized dental peculiarities. It may adversely influence both the feel and capacity. Feel itself is an imperative factor and its issues may influence patients' confidence, correspondence conduct, proficient execution and personal satisfaction. Patients with missing lasting teeth may experience the ill effects of entanglements, for example, malocclusion (which itself can prompt rumination issues), periodontal harm, absence of alveolar bone development, diminished biting capacity, incoherent elocution, changes in skeletal connections and a horrible appearance, the vast majority of which require rather exorbitant and testing multidisciplinary medicines. Tooth agenesis is a standout amongst the most well-known dental oddities experienced in our training. No sex pervasiveness is accounted for, yet past investigations have revealed a commonness of this pathology going from 3% in Europe to 11% among the European and Asian populace [1] Moreover, the kinds of teeth revealed missing shift between the distinctive ethnic gatherings. Oligodontia is characterized by the absence of no less than six conclusive teeth, barring insight teeth, coming about because of hypo development of teeth germs.

The pathology can be separated, or can be related with other ectodermal irregularities and disorders, for example, ectodermal dysplasia, congenital fissure and sense of taste. Non-syndromic hypodontia are more typical [2]. In addition, diverse epidemiological examinations have demonstrated a shifting predominance of oligodontia, contingent upon ethnic starting point, with a normal going from 0.1 to 0.2% of the worldwide populace. Familial and sporadic types of the pathology are associated with various transformations or polymorphism of the Paired Box 9 (PAX9) or Muscle Segment Homebox 1 (MSX1) qualities in its non-syndromic frames. Patients with PAX9 transformations are generally missing their maxillary first molars, second molars and their mandibular second molars; while patients with MSX1 changes all the more often need maxillary and mandibular second bicuspid and maxillary first bicuspid [3]. Dental agenesis is most every now and again secluded, however other dental abnormalities can be related with the condition and can entangle the treatment, an illustration being position inconsistencies with more regular impaction of the canines contrasted and the worldwide populace. Revolution of the teeth non-adjoining the missing teeth, postponed dental advancement and ejection of the present teeth can likewise be watched. Shape abnormalities of tooth crowns and roots are accounted for as well: littler

antero-back size of the crowns are visit and the more prominent the quantity of missing teeth, the littler the mesiodistal size of the present teeth. Concerning roots, incisors and premolars are all the more regularly short Furthermore, hypoimprovement of the jaws and alveolar bone involves adjustment of the facial structures with tasteful and practical results [4].

Hypodontia is an acquired condition portrayed by formatively missing teeth, without considering the truant third molars. For the situation where there are at least six missing perpetual teeth, the condition is called oligodontia. Anodontia alludes to the condition where no teeth are available. Supernumerary teeth alludes to conditions where there are a bigger number of teeth than the typical number. Missing third molars happen in 9– 30% of examined populaces. In essential dentition the maxilla is more influenced, with the condition more often than not including the incisor [5]. Numerous different terms to portray a diminishment in number of teeth show up in the writing: aplasia of teeth, intrinsically missing teeth, nonattendance of teeth, agenesis of teeth and absence of teeth. In people of European family, the most well-known missing teeth are the astuteness teeth (25– 35%), the lasting upper horizontal incisors (2%), the lower second premolars (3%), or the upper second premolar, with a higher predominance in females than in guys. The pervasiveness of missing essential teeth is found at 0.1– 0.9%, with a 1:1 male to female proportion. Barring the third molars, missing lasting dentition represents 3.5– 6.5%. Comparative patterns of missing teeth can be seen in around 3– 10% of orthodontic patients. 30-half of individuals with missing essential teeth will have missing changeless teeth, also. In a methodical audit in the Journal of Orthodontics, the general predominance of hypodontia was observed to be 6.4%, with the most astounding event in Africa (13.4%). There is an expanded danger of hypodontia in females than in guys [6].



Figure 1: teeth showing chances of hypodontia

CAUSES OF HYPODONTIA

The cause of isolated missing teeth remains unclear, but the condition is believed to be associated with genetic or environmental factors during dental development. Missing teeth have been reported in association with increased maternal age, low birth weight, multiple births and rubella virus infection during embryonic life. In a current report evaluating natural hazard factors for hypodontia, it was built up that maternal smoking plays a causative part in Hypodontia. Detached smoking and caffeine were likewise surveyed yet demonstrated no factual essentialness. There is a conceivable relationship between's tooth agenesis and innervation. A relationship was likewise proposed between variations from the norm of the brainstem and the nearness of agenesis. Hypodontia is frequently familial, and can likewise be related with hereditary clutters, for example, ectodermal dysplasia or Down disorder. Hypodontia can likewise be found in individuals with congenital fissure and sense of taste. Among the conceivable causes are said hereditary, hormonal, ecological and irresistible. Cause because of hormonal imperfections: idiopathic hyperparathyroidism and pseudohypoparathyroidism. Exists the likelihood that this deformity relies upon a moniliasis (candidiasis, candida endocrinopathy disorder). Ecological causes including introduction to PCBs (ex.dioxin), radiation, anticancer chemotherapeutic agents,allergy and harmful epidermal necrolysis after medication. Irresistible reasons for hypodontia: rubella, candida [7].

The examination demonstrates that ladies with EOC are 8.1 times more prone to have hypodontia than are ladies without EOC. The recommendation in this manner is that hypodontia can fill in as a "marker" for potential danger of EOC in ladies. Additionally the expanded recurrence of hypodontia in twins and low birth weight in twins with hypodontia proposes that

natural variables amid perinatal are capable hypodontia. Hereditary qualities has constantly assumed a vital part in dental aplasia. The example of inherently missing teeth seen in monozygotic twins is extraordinary, proposing a fundamental epigenetic factor, which might be because of the synchronous event of two anomalies. This multifactorial etiology includes ecological factor which triggers the hereditary inconsistencies coming about the event of dental agenesis. Basic ecological components incorporate contamination, injury and medications which incline to the condition. In genetic cases, proof of dental germ creating in the wake of encompassing tissues have shut the space required for advancement might be an enormous contributing component as well. Another bolstered aetiological hypothesis would be the polygenic method of legacy. The mix of epistatic qualities and ecological variables apply effects on the phenotypic articulation of qualities included, along these lines irritating the underlying expansion of tooth germ. Detached cases can be autosomal predominant, latent or even X-connected examples of legacy. Changes in *MSX*, *PAX9* and *TGFA* qualities are known to cause intrinsically missing teeth in some racial gatherings. *MSX1* and *MSX2* are homeobox qualities urgent in interceding direct epithelial-mesenchymal associations amid craniofacial bone and teeth advancement. *MSX1* normally brings about missing second premolars and third molars, with a little level of first molars. *PAX9* and *TGFA* are engaged with directing amongst *MSX1* and *PAX9* causing hypodontia of the molars [8].

Reasons of Occurrence

Tooth agenesis is considered rare in the deciduous dentition and is not as common as in the permanent dentition. An association exists between hypodontia in the primary and permanent dentitions, with reports of children with primary teeth hypodontia showing absence of the corresponding successor teeth. A prevalence of less than 1% has been described in Caucasian populations, although it has been reported to be much higher in Japanese populations. The prevalence of tooth agenesis in New Zealand appears to be consistent with that seen in Europe. The deciduous maxillary lateral and mandibular central incisors account for 50% to 90% of affected deciduous teeth. Most cases present as unilateral hypodontia, with mostly one or two teeth missing. No significant sex difference in prevalence has been reported from any of the populations studied [9].

Permanent Dentition: The prevalence of hypodontia, which may be increasing with time, ranges from 1.6% to 36.5%, depending on the population studied. At least 1 in 5 individuals lacks a third molar, while most individuals with hypodontia (80%) lack only one or two teeth. A meta-examination researched the predominance of nonsyndromic tooth agenesis, included 33 thinks about from North America, Australia, and Europe, and found a higher pervasiveness in Europe (5.5%) and Australia (6.3%) than in North America. Most people were missing just a single or two lasting teeth, with not very many missing more than six. Mandibular second premolars and the maxillary horizontal incisors were accounted for to be the destined to miss. Strikingly, the pervasiveness of tooth agenesis over the most recent couple of decades has apparently expanded. Be that as it may, there is no experimental proof to help whether this evident increment is because of further developed screening and analysis or different variables [10].

Hypodontia is ordinarily connected with various traditional highlights, including the site of agenesis and the span of the neighboring teeth. Tooth agenesis does not appear to influence the maxilla and the mandible distinctively, despite the fact that there was one early investigation that observed the mandible to be more as often as possible influenced than the maxilla. Looking at respective and one-sided agenesis, Polder et al. (2014) [11] found that reciprocal agenesis of maxillary horizontal incisors happened more regularly than one-sided agenesis. For the other teeth, for example, the second mandibular premolar, one-sided agenesis was more typical. There has all the earmarks of being no noteworthy sex contrast in missing essential teeth, in spite of the fact that, in the lasting dentition, there is by all accounts a little yet nonsignificant inclination of hypodontia in females. One meta-investigation, nonetheless, found a huge contrast in females, with the pervasiveness of hypodontia being 1.4 times higher in them than in guys. Features Associated with Hypodontia. Tooth agenesis is frequently nonsyndromic, yet it can likewise be related with oral clefts and a few different disorders. For instance, hypodontia is a typical quality in congenital fissure as well as sense of taste (CLP) patients].

The commonness of hypodontia is higher in more extreme clefting cases, in all probability giving the agenesis of a maxillary sidelong incisor (in either dentition). In these patients, hypodontia in districts outside the split field is likewise more typical than in the all inclusive community. Different conditions that have hypodontia as one of their highlights incorporate Down's Syndrome and ectodermal dysplasia. In these disorders, there is a trademark example of agenesis that is generally not the same as the general populace. Besides, late information proposes that hypodontia shares some basic pathways with specific sorts of disease. It isn't known whether people with hypodontia have trademark skeletal highlights and development designs, albeit some proof proposes that hypodontia patients have altogether extraordinary craniofacial highlights from those with no missing teeth. What is known is that tooth agenesis, particularly in its serious structures, adds to strange impediment and is regularly connected with different inconsistencies in other teeth. These incorporate

postponements being developed, ectopic ejection, lessening in tooth measurements and morphology, abbreviated roots, taurodontia, and veneer hypoplasia [16].

Dental Features

Microdontia is a widely reported feature of hypodontia in case reports and case series. This condition, which can affect one or more teeth, may be seen in either dentition. In addition, microdontia is genetic and presents in its severest form as ectodermal dysplasia. It is also present in patients who have had chemotherapy or radiation of the jaws earlier in childhood. Brook proposed that microdontia and hypodontia are linked genetically as a continuum of tooth size, where a tooth will fail to develop if the tooth germ does not reach a particular tooth size and tooth number “thresholds”. Delays in tooth development are another common feature, whereby the absence of a permanent successor delays the normal resorption of the roots of the primary teeth. Indeed, the deciduous teeth may be retained for up to 40 or 50 years. Meanwhile, approximately 46% of individuals with tooth agenesis also have short roots of other permanent teeth. In addition, an association between taurodontism and hypodontia was found in a Dutch study, where taurodontism of the lower first molars was present in 29% of oligodontia patients but only 10% of controls.

Another common feature of hypodontia is the ectopic positioning of the permanent teeth. This is likely caused by the absence of neighbouring teeth available to guide them during eruption or by the lack of space for them to erupt into. Transposition of teeth is also seen more commonly in individuals with hypodontia. Tooth agenesis is also associated with enamel hypoplasia, diminutive or peg maxillary lateral incisors, primary molar infraocclusion, and palatally inclined or impacted maxillary canines [12]. Intraorally, retroclined and overerupted lower incisors contribute to a greater overbite. Generalised spacing and rotations of teeth adjacent to missing mandibular second premolars are also commonly seen. Some of these features are evident.

Aetiology

Numerous concepts about the aetiology of hypodontia have been proposed in the literature. The multiplicity of tooth agenesis theories suggests a multi factorial aetiology that involves genetic regulation and environmental factors. As such, the multi factorial nature of tooth agenesis entails a brief overview of tooth development and its genetic regulation. This will be followed by an outline of the theories surrounding hypodontia and a more detailed discussion of the specific factors, both genetic and environmental, that have been connected with this condition [13].

PSYCHOSOCIAL AND FUNCTIONAL IMPACT

Oral-health-related quality of life (OHRQoL) measures are often used to assess the impact of malocclusion on health and well-being. They aim to assess the functional, psychological, and social implications of the condition on an affected individual. Although numerous studies in the literature report on the prevalence, aetiology, and treatment of hypodontia, only few have investigated OHRQoL in individuals with hypodontia. The few studies that have been carried out provide some evidence that hypodontia may have an adverse impact on quality of life. The most common hypodontia patient complaints included spacing between the teeth, poor aesthetics, and awareness of missing teeth. The authors suggested that delayed referral of the patient is likely to have a negative impact on the social and educational development of these patients. Locker and coworkers reported similar findings, although the affected children had oligodontia. Interestingly, Laing and colleagues found that the extent of the patients' complaints was associated with the severity of the condition and the number of missing permanent teeth [14].

Those who had no complaints at the time of presentation had retained primary teeth that masked the problem [15]. Functionally, individuals with hypodontia tend to have deeper bites and spaces. Missing posterior teeth may not only result in further deepening of the bite, but the condition may also lead to nonworking interferences, poor gingival contours, and over eruption of the opposing teeth. Moreover, patients with hypodontia have been found to experience more difficulty in chewing due to a smaller occlusal table. In a recent cross-sectional study, it was found that hypodontia patients have more chewing difficulties if the deciduous teeth associated with the missing permanent teeth had been exfoliated. It is therefore plausible that hypodontia may pose functional limitations that affect an individual's general well-being and quality of life in the process [17], although there is currently limited evidence to support this. Ultimately, hypodontia carries an aesthetic, functional, psychosocial, and financial burden for affected individuals. For these patients, hypodontia is a lifetime problem, which requires careful treatment planning in order to ensure best treatment outcomes. Treatment plans also involve long-term maintenance and family counseling. Meanwhile, treatment of hypodontia patients often takes a number of years, from their initial visit through to completion of treatment. Most important is the assessment of the complaints of the patients and the parents. Treatment plans needed to manage the missing teeth of hypodontia patients are complex and require an

interdisciplinary approach, which usually comes at a financial cost to both the patient and their family. Because of this, an experienced team of dental specialists should be involved in the treatment process [18].

CONCLUSION

In hypodontia patients, dental development is often delayed, as is orthodontic treatment. In young patients with mild crowding, extractions of specific primary teeth in the early mixed dentition may be useful to permit some favourable movement of adjacent teeth. However, evidence shows that space closure and alignment, in missing premolar cases for example, are often incomplete following such an interceptive measure, and further intervention may be necessary. This is supported by an earlier study, which reported that there was a residual space of 2 mm in the mandible after extraction of the primary second molars. Conversely, it has been shown that extracting primary second molars at a suitable time, for example, before or close to the pubertal growth spurt peak, can lead to relief of anterior crowding and spontaneous closure of the missing permanent second premolar space. It is concluded that space closure occurred by mesial/rotational movements and tipping of the first molars as well as distal movement of the first premolars. It is also suggested that extractions did not impact the overjet, overbite, or incisor inclination. The management of adults missing mandibular second premolars is often complicated by caries and periodontal disease as well as the lack of facial growth potential, which reduces their adaptation to occlusal disturbances.

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