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Prevalence of Tooth Agenesis in Orthodontic Patients at Arab Population in Israel

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Abstract

Introduction: Non-syndromic tooth agenesis has been occasionally described in literature and data available for its prevalence is rare in Arabs population in Israel. The purpose of the present retrospective radiographic study was to provide data concerning the prevalence of non-syndromic hypodontia in patients reporting to the Center for Dentistry,Research & Aesthetics, Jatt, Almothalat, Israel. *Material and Methods:* Five hundred consecutive patients who met the inclusion criteria were selected from the records. The radiographic records included at least one clear adequate quality Orthopantomogram (OPG), which was supplemented when necessary by a periapical radiograph. *Results:* A prevalence of 2,6 percent hypodontia was seen in the sample. *Conclusions:* It was concluded that hypodontia is prevalent in Arabs population in Israel with a 2,6% incidence which is on the higher limit of the global range (1.6 – 9.6%). However further studies should be conducted on a larger non-orthodontic sample to determine accurately this incidence of hypodontia.

Keywords

Hypodontia, Dental Anomaly, Congenital Facial Dysplasia Missing Tooth

1. Introduction

Congenital absence of teeth or Hypodontia is one of the most common abnormalities in tooth development in human beings. The prevalence of hypodontia varies from 2.63% to 11.2%, depending on the race (1.2,3,4).

In persons of European ancestry, the most common missing teeth are the wisdom teeth (25-35%), the upper lateral incisors (2%) the lower second premolars (3%), or the upper second premolar, with a 4:1 female to male ratio. The prevalence of missing primary teeth is found at 0.1-0.9%, with a 1:1 male to female ratio. Excluding the third molars, missing permanent dentition accounts for 3.5-6.5%. Similar trends of missing teeth can be seen in approximately 3-10% of orthodontic patients.(5.6)

This dental anomaly was found with a greater prevalence in Western population with values b etween 4.4% and 8%.

Regarding gender, this anomaly appears more often to women than to men (7,8,9). Some other studies report not any significant statistical difference between genders (13.14.15).

The prevalence of the absence of permanent teeth, excluding third molar ranges from 1.6% to 9.6% depending on the population studied. There are many theories on the etiology of hypodoncion.

This anomaly has a multi-factorial etiology including:

inheritance - genetic factors, and environmental factors (10). However, there is still a theory capable of explaining the whole phenomenon of congenital absence of dental structures.

Previous studies have shown that hipodoncion has a higher prevalence in the relatives of affected individuals than in the general population (11) which touches also both denticions; the primary and permanent denticionin (12).

Prevalence of Hipodoncion been studied is reported by many other countries. In Arabs Community in Israel (ARAB48,Israel) visiting our Center Dentistry, Research & Aesthetics, Jatt, Almothalath, Israel, there is still not such a study on the prevalence of this anomaly; as well as demographic and other abnormalities that bond characteristics referring to certain age group.

Hipodoncion may be an indication for orthodontic treatment depending on the weight and consequences that it may create.

Lack of teeth can be classified as: hipodoncion, oligodoncion or anodoncion. (The term hipodoncion is used to describe the lack of one to six teeths (excluding third molar), oligodontia absence of more than six teeth (excluding the third molar), and anodontia represents a complete lack of tooth (16).

Many methods of classification have been employed in the literature.(17)

Some researchers have found the congenital absence of teeth to occur either as an isolated family form or as an intermittent form. The inherited form could be either autosomaldominant, autosomalrecessive, or an X-linked trait. (18)Others have defined the congenital absence of teeth according to the number of missing Teeth.(17,19)

Hypodontia refers to the condition where there is an absence of fewer than six teeth .The term Oligodontia is usually used to describe a larger number of missing teeth (six or more). Anodontia is the complete absence of teeth.

Many other researchers have used similar methods of classifying the congenital absence of teeth (20) In general, they identify three categories of hypodontia, excluding third molars, as follows: Mild with 1 or 2 missing teeth. Moderate with 3 – 5 missing teeth. Severe with 6 or more missing teeth. Hypodontia is also classified as either isolated hypodontia or syndromic hypodontia.

Isolated hypodontia refers to those cases without syndromes .(21) Thus, hypodontia can occur either as part of a syndrome or as a non-syndromic, familial form; in the latter it occurs as an isolated trait, affects variable numbers of teeth and appears either sporadically or as an inherited condition within a family pedigree.(22,23,24)

The congenital absence of teeth can seriously affect a young person, both physically and emotionally particularly when the missing tooth is located in the anterior region of the mouth [1]. Early detection of hypodontia may allow a more favorable prognosis and minimal functional, esthetical and psychological complications (25).

The treatment options available for cases with congenitally missing teeth are the maintenance of the primary teeth, orthodontic space closure, space maintenance, restoration with adhesive or fixed denture, tooth transplantation, dental implant or orthodontics space redistribution to facilitate the prosthetic treatment (26).

Patients with congenitally missing teeth present a clinical challenge to the general dental practitioners and the orthodontists alike. Successful management of these patients necessitates a multidisciplinary approach (orthodontics, restorative dentistry, oral surgery) (27,28, 29). No study has been yet conducted to assess the prevalence of hypodontia in Arabs48 in Israel.

The aim of the present study was to create baseline information by evaluating the prevalence of hypodontia of the permanent dentition in Arabs 48 population in Israel.

2. Materials and Methods

We conducted a retrospective study of all orthopantomograms (OPGs) of Palestinian patients aged 12 to 39,5 years (Mean age #16,2), taken between 2006 and 2013, which were available in the Center For Dentistry, Research & Aesthetics, Jatt, Almothalath, Israel. Ambiguous OPGs of subjects with no proper record of date of birth and poor quality image were excluded.

Older OPGs, available as X-ray films, were viewed on a negatoscope in a dark room, while more recent studies, available in the digital format, were viewed on a computer monitor. The X-rays were examined for the presence of all teeth, including third molars, in each quadrant. The teeth were considered to be present if there was evidence of crypt formation with or without the calcification of the crown and vice versa. Teeth absent due to dental caries or for orthodontic reasons were cross-checked with dental records at the hospital and considered “not missing”In cases of uncertainty, the first two authors examined the OPG together to arrive at a consensus of the tooth most likely to be missing. The operational definition of hypodontia in this study was the developmental absence of one to five teeth, excluding third molars.

Ethical approval for the study was obtained from the Human Ethics Committee of the institution.

Statistical analysis was performed using SPSS software (SPSS, Chicaco, IL). Descriptive statistics were tabulated, and comparisions between groups was done using the chi-square test.

3. Results

Of the 2200 patients, 846 were males (38,4%) and 1354 were females (61,6%) (Table 1)(Fig.1); the mean age was 16,2years, ranging from 10,2 to 39,5 years. (Table 2)

Table 1. *Gender distribution of patients treated*

Treated (Orth.)	N=2200	%
Female	1354	61.6%
Male	846	38.4%

Table 2. *Means age Hypodontia*

Age, Impacted	Min	Max	Avg
	10.2	39.5	16.2

The results showed that 57 patients ,24males(42.1%), 33 females(57.9%)) out of 2200 had hypodontia(2.6%).(Table3,Fig.2)

A total of a 167congenitally missing teeth were found among the 57 patients ; Congenitally missing permanent teeth were more frequent in the mandible (52.1%) than in the maxilla (47.9%) (Table.4)(Fig.3).

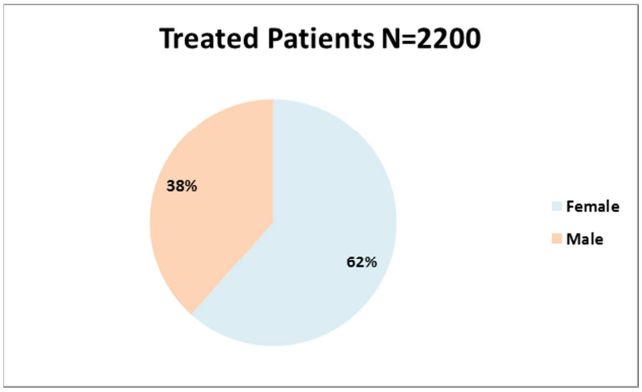

Fig. 1. *Gender distribution of patients treated*

Table 3. *Gender distribution of patients treated with hypodontia*

Missing	N=57	%Missing
Female	33	57.9%
Male	24	42.1%

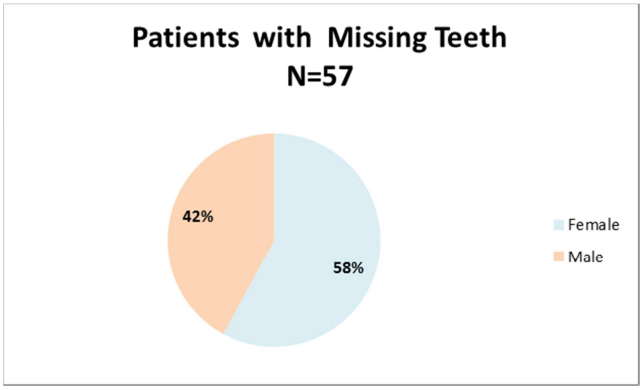

Fig. 2. *Gender distribution of patients treated with hypodontia*

Moreover, hypodontia was more in the left side (48.5%) but more frequent in the right side(51.5%) of the maxillary and mandibular arches (Table.5)(Fig.4).

Table 4. *Distribution of congenitally missing permanent teeth in the maxilla and mandible.*

Missing Teeth	N=167	%Missing
Maxilla	80	47.9%
Mandible	87	52.1%

The majority of the students had one congenitally missing permanent tooth 2PM in mandibular (41,3%), followed by two congenitally missing permanent teeth incisor lateral (22,8%). Two Patients (3,5%) had three congenitally missing permanent teeth. More than three missing teeth were observed among three patients (5,2%). When the percentage of students with hypodontia was compared to the number of missing permanent teeth, a statistically significant difference was noted, indicating that hypodontia with one or two missing teeth is more commonthan multiple missing teeth ($p<0.05$).

The most common congenitally missing permanent tooth was themandibular 2PM (41,35%), followed by the maxillary lateral incisor (22,8%), the maxillar second premolar (19,2%) and the mandibular central incisor (4,2%) (Table6).

The results in the present study showed that (41,3%} of the mandibular second premolar hypodontia was associated with retention of the deciduous second molar. Also, 5% of retained deciduous incisors were correlated with them absence of their permanent counterpart. When the deciduous canine was retained, the permanent canine was often present and impacted.

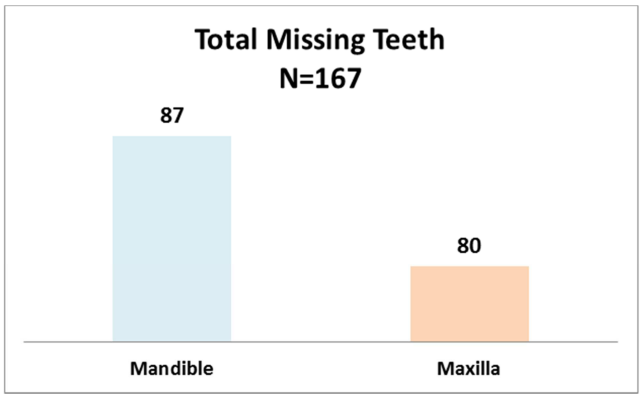

Fig. 3. *Distribution of congenitally missing permanent teeth in the maxilla and mandible.*

Table 5. *Distribution of congenitally missing permanent teeth in the left and right sides.*

Missing Teeth	N=167	%Missing
Right	86	51.5%
Left	81	48.5%

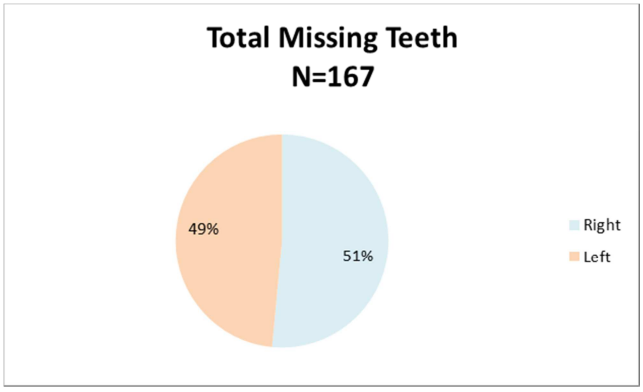

Fig. 4. *Distribution of congenitally missing permanent teeth in the left and right sides.*

Table 6. *Distribution of congenitally missing permanent teeth in the maxillary and mandibular arches.*

N=167	Maxilla			Mandibular		
Tooth	**Right**	**Left**	**Percentage**	**Right**	**Left**	**Percentage**
Central	1	0	0.6	3	4	4.2
Lateral	21	17	22.8	1	4	3.0
Canine	2	0	1.2	0	1	0.6
1. PM	3	2	3.0	1	2	1.8
2. PM	17	15	19.2	36	33	41.3
1. M	0	1	0.6	0	0	0.0
2. M	0	1	0.6	1	1	1.2
Total	44	36	47.9	42	45	52.1

4. Discussion

The population prevalence for hypodontia and the type of permanent teeth missing vary with the racial group and sample studied. Excluding the third molar population prevalence across the world varies between 3.5 and 6.5%, with a female to male ratio of 3:2 For Europeans, the mandibular second premolar is the tooth most frequently absent after the third molar, followed by the maxillary lateral incisor and second premolar.

The prevalence of hypodontia in this study was 2,6%, which was within the range reported in the literature. However, no statistical differences between both sexes were found, but this was in agreement with some other studies. It might also be expected that the majority of hypodontia cases would be identified in the mixed dentition stage, since the recognition of the younger patient with hypodontia usually discovered either by chance or family history.

Hypodontia is generally defined as the developmental absence of one or more teeth excluding the third molars. It is more common in the permanent dentition. The prevalence of hypodontia in the primary dentition is found to be very low.

The range has generally been between 0.1% and 0.9% of the population.(24) Researchers have used a variety of terminology to describe the condition, such as a reduction in teeth number, teeth aplasia, congenitally missing teeth, absence of teeth, agenesis of teeth, and lack of teeth.

The most frequently missing teeth, in our study were maxillary lateral incisors. Some studies have also reported the upper laterals to be the most frequently missing teeth However, the most commonly missing teeth in other studies were the lower second premolars. Comparison between our study and some other studies is shown in (Table7).

A distinct genetic influence on the development of teeth has been demonstrated, with a high proportion of individuals with hypodontia coming from families with previous hypodontia[27] and Environmental factors have also been implicated in the etiology of hypodontia.

The result of this study showed prevalence of 2,6% of hypodontia in orthodontic patients in Arabs population in Israel state which was lower than that documented in other similar studies.[2,16,17] However, a very high prevalence was reported in two German studies (12.6%)[16] and (11.3%)[2] when compared to this study result. Further, in Japanese orthodontic patients, a lower percentage value of 8.5% was noted,[11] when compared to the German study and higher than the results of our study. Furthermore, the prevalence observed in this study was relatively higher than that in Turkish orthodontic patients (4.6%).[10]

Analyses of this sample demonstrated a large number of patients with hypodontia involving the anterior teeth. Treatment is increasingly being sought as social awareness of dental disease increases. This was of great concern to children and their parents and for that reason they actually attended our clinics. It was also found that 16.4% had hypodontia of two or more teeth in the same quadrant, which needed .

Table 7. *The Prevalence of Hypodontia in the Permanent Dentition in Various Published Studies*

Author	Year	Country	N=	Prevalence (%)
Werther and Rotheberg	1939	USA	1000	2.3
Byrd	1943	USA	2835	2.8
Pederson	1949	Greenland Eskimos	603	3
Clayton	1956	UK	3557	6
Grahnen	1956	Sweden	1066	6.1
Davis	1968	Australia	2179	5.9
Thilander and Myrberg	1973	Sweden	5459	6.1
Brook	1974	UK	1115	4.4
Magnússon	1977	Iceland	1641	7.9
Rølling	1980	Denmark	3325	7.8
Davis	1987	Hong Kong	725	7.3
Davis	1987	Hong Kong	1093	6.9
Al-Emam	1990	Saudi Arabian	500	4
O'Dowling and McNamara	1990	Ireland	3056	11.4
Ng'ang'a and Ng'ang'a	2001	Kenya	618	6.3
Bäckman and Wahlin	2001	Sweden	739	7.4
Goren et al.	2005	Israel	226	5.3
Fekonja	2005	Slovenia	212	11.3
Albashaireh and Khader	2006	Jordan	1045	2.6
Endo et al.	2006	Japan	3358	8.5
Altug-Atac and Erdem	2006	Turkey	3403	2.6
Young Ho	2010	Korea	3055	8.85
Tallón-Walton et al	2010	Spain	1518	9.48
Owais Khaild Durrania,	2010	Pakistan	500	9
Mammon	2011	Jordan	3660	8.85
González-Allo et al.	2012	Portugal	2888	6.1
G. Trakinienė et al.	2013	Lithuania	824	17.11
Abu Affan & Serour	2013	Sudan	2401	2.66
Hayder A Hashim	2014	Sudan	1069	5.1
Our Research	2015	Israel	2200	2.6

Fekonja evaluated the prevalence of hypodontia in orthodontically treated children from the records of 212 orthodontic patients. Of these, 24 patients; 9 males and 15 females had agenesis of one or more teeth (11.3%). Patients with more severe hypodontia showed a tendency to a Class III relationship and an increased overbite.(29)

In Germany; a retrospective study was performed in 1353 patients by Behr et al.(30)at the Regensburg University Medical Center.

Missing permanent teeth were found in 171 (12.6%); of these 64.3% had one or two missing teeth, three to five teeth

were missing in 19.9%, and oligodontia was found in 15.8% of the patients. The percentage was equally distributed between the females and males. Further, the most frequently missing teeth were lower second premolar (5.9%), lower right second premolar (5.1%), upper left lateral incisor (4.0%), upper right lateral incisor (3.6%), upper right second premolar (3.1%), and upper left second premolar (3.0%).

Ajami et al.(31) Investigated the prevalence of hypodontia in 600 Iranian children between 9 and 14 years old at Mashhad School of Dentistry. The result showed that, a total of 54 (9%) children were affected with hypodontia where 31 (9.2%) were girls and 23 (8.8%) were boys. Furthermore, the prevalence of hypodontia in girls was higher than in boys.

Chung et al.(4) studied the prevalence of hypodontia in the Korean population as well as its association with the congenital absence of the third molar. Casts, panoramic radiographs, and lateral cephalographs of 1622 Korean subjects (611 males, 1011 females) were used. The percentage of hypodontia was 11.2%. They noticed that hypodontia was higher in the mandible more than in the maxilla and the most commonly affected tooth was lateral incisors (40%) followed by second premolar (20.4%) in the mandible.

Albashaireh and Khader(32) have reported 5.5% of hypodontia of the permanent teeth, crown size and shape deformity affecting upper lateral incisors in a Jourdan sample of 1045 dental patients aged 16-45 years. On the other hand, al Emran et al. found that hypodontia prevalence among the Saudi male school children was 4%. Whereas Afifiy and Zawawi(33) have reported a very high prevalence (25.7%) of congenitally missing teeth in the Western region of Saudi Arabia.(33)

Polder et al.(2) did a study using the meta‐analysis to gain more insight into the prevalence of dental agenesis and stated that agenesis differs by continent and gender, The prevalence for both sexes was higher in European population (males 4.6% and females 6.3%), and also the same was observed in an Australian sample (males 5.5%; females 7.6%) than for the North American Caucasians (males 3.2%; females 4.6%).

Further, the prevalence of dental agenesis in females was almost 1.4 times higher than in males. The mandibular second premolar was the most affected tooth, followed by the maxillary lateral incisor and the maxillary second premolar.

Endo et al.(34) investigated the association of hypodontia patterns and variations in craniofacial morphology in Japanese orthodontic patients, a total of 50 girls with hypodontia were selected and categorized into anterior, posterior, and anterior posterior groups according to the location of the congenitally missing teeth. Every hypodontia group showed shorter anterior‐mandibular incisors, and a larger interincisal angle than the control group.

None of the participants in the present study showed oligodontia. According to Celikoglu (35), the prevalence of oligodontia in Turkish population was 0.3% and 0.16% among Danish school students (36).

Previous published results revealed that the most common congenitally missing teeth were either the maxillary lateral incisor (12, 14, 16, 17), the mandibular second premolar (15, 19, 20, 23, 24)or the mandibular incisor (20). In contrast, the present results showed that the most common congenitally missing tooth was the mandibular lateral incisor, followed by the maxillary lateral incisor and the maxillary and mandibular second premolars.

This difference can be related to ethnic and racial differences in the studied populations.

Further, Lai and Seow(37) stated that in patients with missing permanent teeth, clinicians should be alert to the possibility of these associated anomalies and their accompanying clinical implications. Thus, with early detection of hypodontia, alternative treatment modalities can be planned and performed with a multidisciplinary team approach to restore the esthetic and function.(37,38)

The result of this study warrants further multicenter investigations to include different parts of Arabs populations in Israel. This will increase the sample size and be more representative. The information obtained from such investigation will be of great value not only for the orthodontist, but also to the prosthodontist in diagnosis and treatment plan.

5. Conclusions

a.The prevalence of hypodontia in this study (2,6%) was within the range that reported in the literature

b.The findings of this study implicate the need for a thorough radiographic evaluation of all patients prior to extraction of either deciduous or permanent teeth, and also reiterate the need for early diagnosis and orthodontic treatment if needed.

c. The incidence of hypodontia in the anterior segment requires great need for orthodontic and prosthodontic treatment

d. With early detection of hypodontia, alternative treatment modalities can be planned and performed with a multidisciplinary team approach to restore the esthetic and function.

References

[1] Sisman Y, Uysal T, Gelgor IE. Hypodontia. Does the prevalence and distribution pattern differ in orthodontic patients? Eur J Dent. 2007;1(3):167–173.

[2] Polder BJ, Van't Hof MA , Van der Linden FP , Kuijpers-Jagtman AM . A meta-analysis of the prevalence of dental agenesis of permanent teeth. Community Dent Oral Epidemiol. 2004;32(3):217–226.

[3] Altug-Atac AT, Erdem D. Prevalence and distribution of dental anomalies in orthodontic patients. Am J Orthod Dentofacial Orthop. 2007;131(4):510–514.

[4] Chung CJ, Han JH , Kim KH . The pattern and prevalence of hypodontia in Koreans. Oral Dis. 2008;(7):620–625.

[5] Medina AC. "Radiographic study of prevalence and distribution of hypodontia in a pediatric orthodontic population in Venezuela.". Pediatr Dent. 2012,34 (2): 113–116..

[6] Vahid-Dastjerdi E, Borzabadi-Farahani A, Mahdian M, Amini N. "Non-syndromic hypodontia in an Iranian orthodontic population.". J Oral Sci.2010, 52 (3): 455–461.

[7] Aasheim B, Ögaard B. Hypodontia in 9-year-old Norwegians related to need of orthodontic treatment. Scand J Dent Res 1993,101:257- 260.

[8] Ahmad W, Brancolini V, ul Faiyaz MF, Lam H, ul Haque S, Haider M et al. A locus for autosomal recessive hypodontia with associated dental anomalies maps to chromosome 16q12.1.Am J Hum Genet1998, 62:987-991.

[9] Al-Khateeb T, Salako NO. The incidence of taurodontism in permanent molars in Saudi Arabian dental patients. Ped Dent J 1997,7:69- 72.

[10] Burgersdijk R, Tan HL. Oral symptoms of the Wolf syndrome. ASDC J Dent Child 45:488-489. Chi DD, Hing AV, Helms C, Steinbrueck T, Mishra SK, Donis-Keller H (1992). Two chromosome7dinucleotide repeat polymorphisms at gene loci epidermal growth factor receptor (EGFR) andprology2(I)collagen (COL1A2). Hum Mol Genet1978, .1:135.

[11] Chosack A, Eidelman E, Cohen T. Hypodontia: A polygenic trait, a family study among IsraeliJews. J Dent Res .1975,54:16-19.

[12] Garn SM, Lewis AB. The gradient and the pattern of crownsize reduction in simple hypodontia. Angle Orthod .1970, 40:51-58.

[13] Lavelle C L B, Ashton E H, Flinn R M Cusp pattern, tooth size and third molar agenesis in the human mandibular dentition. Archives of Oral Biology .1970,15: 227–237

[14] Grahnén H Hypodontia in the permanent dentition. Odontologisk Revy. 1956,Supplement 7: 1–100

[15] Haavikko K Hypodontia of permanent teeth. An orthopantomographic study. Suomen Hammaslaakariseuran Toimituksia. 1971,67: 219–225

[16] Arte S Phenotypic and genotypic features of familial hypodontia. Thesis, 2001,University of Helsinki

[17] Brook AH. Dental anomalies of number, form and size: their prevalence in British schoolchildren. Journal of the International Association of Dentistry for Children 1974,5:37-53.

[18] Mostowska A, Kobielak A, Biedziak B, Trzeciak WH . Novel mutation in the paired box sequence of PAX9 gene in a sporadic form of oligodontia. European Journal of Oral Sciences 2003,111:272-276.

[19] Burzynski NJ, Escobar VH. Classification and genetics of numeric anomalies of dentition. Birth defects original article series 1983,19:95-106.

[20] Van der Weide YS, Prahl-Andersen B, Bosman F . Tooth formation in patients with oligodontia. Angle Orthodontist 1993M63:31-37.

[21] Vastardis H. The genetics of human tooth agenesis: new discoveries for understanding dental anomalies. American Journal of Orthodontics and Dentofacial Orthopedics 2000,117:650.

[22] Brook AH, Elcock C, al-Sharood MH, McKeown HF, Khalaf K, Smith RN. Further studies of a model for the etiology of anomalies of tooth numberand size in humans. Connective Tissue Research2002, 43:289-295.

[23] Tan SP, van Wijk AJ, Prahl‐Andersen B. Severe hypodontia: Identifying patterns of human tooth agenesis. Eur J Orthod 2011;33:150‐54.

[24] Jorgenson RJ. Clinician's view of hypodontia. J Am Dent Assoc 1980;101:283‐86

[25] Popa M, Dinu S, Bratu E. Interceptive treatment in hypodontia. Jurnalul Pediatrului 2010;10:43-46.

[26] Hobson RS, Carter NE, Gillgrass TJ, Jepson NJ, Meechan JG, Nohl F, Nunn JH. The Interdisciplinary management of hypodontia the relationship between an interdisciplinary team and general dental practitioner. Br Dent J 2003;194(9):479-82.

[27] Lazzara R et al. Retrospective multicenter analysis of 3i endosseous dental implants placed over a five year period. Clin Oral Implant Res1996;7(1) :76-84.

[28] Kirzioğlu Z, Sentut TK, Ozay Ertürk OS, Karayilmaz H. Clinical features of hypodontia and associated dental anomalies: a retrospective study. Oral Diseases 2005;11:399–404.

[29] Fekonja A. Hypodontia in orthodontically treated children. Eur J Orthod 2005;27:457‐60.

[30] Behr M, Proff P, Leitzmann M, Pretzel M, Handel G, Schmalz G, et al. Survey of congenitally missing teeth in orthodontic patients in Eastern Bavaria. Eur J Orthod 2011;33:32‐36.

[31] Ajami BA, Shabzendedar M, Mehrjerdian M. Prevalence of hypodontia in nine‐to fourteen‐year‐old children who attended the Mashhad School of Dentistry. Indian J Dent Res 2010;21:549‐51.

[32] Albashaireh ZS, Khader YS. The prevalence and pattern of hypodontia of the permanent teeth and crown size and shape deformity affecting upper lateral incisors in a sample of Jordanian dental patients. Community Dent Health 2006;23:239‐43.

[33] Afify AR, Zawawi KH. The prevalence of dental anomalies in the Western region of Saudi Arabia. ISRN Dent 2012;2012:837270.

[34] Endo T, Ozoe R, Yoshino S, Shimooka S. Hypodontia patterns and variations in craniofacial morphology in Japanese orthodontic patients. Angle Orthod 2006;76:996‐1003.

[35] Celikoglu M, Kazanci F, Miloglu O, Oztek O, Kamak H, Ceylan I.Frequency and characteristics of tooth agenesis among an orthodontic patient population. Med Oral Patol Oral Cir Bucal 2010;15:e797‐801

[36] Abuaffan AH. Malocclusion and dental development in 12‐years‐old Sudanese children from the Khartoum area, Master of Science Thesis Faculty of Dentistry University of Bergen; 1987, ISBN 82‐7249‐078‐1.

[37] Lai PY, Seow WK. A controlled study of the association of various dental anomalies with hypodontia of permanent teeth. Pediatr Dent 1989;11:291‐96

[38] Amini F, Rakhshan V, Babaei P. Prevalence and pattern of hypodontia in the permanent dentition of 3374 Iranian orthodontic patients. Dent Res J (Isfahan) 2012;9:245‐50.