

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.

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Objective: The aim of this study was to determine the prevalence and pattern of hypodontia and the extent of congenital malformation in the permanent teeth of a sample of Jordanian adults. **Material and Methods:** Clinical examinations were carried out on 1045 dental patients aged 16 to 45 years to record any congenital absence of teeth except 3rd molars and to note any crown shape or size deformities affecting the upper lateral incisor. The congenital absence of permanent teeth was confirmed by taking complete dental history and orthopantomograms. Impacted teeth and teeth lost as a consequence of extraction or trauma were recorded as present. **Results:** The prevalence of hypodontia was found to be 5.5% of the sample and the lower second premolar was the most frequently missing tooth. The number of missing upper lateral incisors was significantly higher than that of lower lateral incisors, ($p < 0.05$). Peg-shaped and reduced size upper lateral incisors were observed in 2.3% and 2.9% of the sample respectively. There were no significant differences according to gender, location of tooth according to arch or side of the jaw and hypodontic pattern. **Conclusion:** The prevalence of hypodontia was 5.5%, that of peg-shaped lateral incisor was 2.3% and that of reduced crown size was 2.9%.

Key words: Hypodontia, Jordanians, peg-shaped, prevalence

Introduction

Hypodontia, the congenital absence of one or more teeth, is the most prevalent developmental dental anomaly in man (Shapiro and Farrington, 1983) and has been diagnosed more often in recent studies (Mattheeuws *et al.*, 2004). Various studies on the prevalence and pattern of congenitally missing teeth have produced diverse frequencies and inconsistent findings (Table 1). Most of these studies were on school children or selected samples of orthodontic patients and were based on clinical examinations (Polder *et al.*, 2004), and relatively few involved radiographs.

According to a meta analysis (Polder *et al.*, 2004) the lower second premolar was the most frequently missing tooth followed by the upper lateral incisor and upper second premolar. In contrast, some studies reported that the upper lateral incisor was the most commonly absent tooth, (Clayton, 1956; Malik, 1972).

The majority of hypodontic patterns are bilaterally symmetrical, except for the upper lateral incisors where the left tooth is missing more often than the right, (Graber, 1978).

Variation in the number of congenitally absent teeth between the maxilla and mandible remains unsettled and the preferential mandibular hypodontia reported (Hundstadbraten, 1973) is questionable in that those reports that indicated maxillo-mandibular differences also usually indicated the lower second premolar as being the most commonly missing tooth, (Graber, 1978). However, Muller *et al.*, (1970) have noted a greater incidence of partial anodontia in the maxilla.

The greater number of reports on sexual dimorphism indicated insignificant variations in the incidence of hypodontia. However, those reporting gender differences specified females as exhibiting more hypodontia than males (Mattheeuws *et al.*, 2004).

Changes in tooth size and morphology have been noted in upper lateral incisors and the most usual finding is a diminution in the mesiodistal dimension (Keene, 1971). The mesial and distal surfaces of the affected crown deviated from their normal morphology and converged incisally forming a peg-shaped crown. Peg-shaped incisors were thought to be a reduced form of the hypodontia trait (Stamatiou and Symons, 1991). The upper and lower premolars seldom exhibited this condition (Shafer *et al.*, 1983). Hypodontia on one side of the jaw is usually associated with a reduced crown size or deformity in crown shape on the other side of the jaw.

Several investigators (Clayton 1956; Al-Emran, 1990; Backman and Wahlin, 2001) have reported different frequencies of peg-shaped lateral incisors. The discrepancies in their results could be attributed to differences in sampling methodologies and to variations in original races of populations.

Our literature review revealed a lack of research on congenitally missing teeth in Jordan except for the data on missing third molars (Hattab *et al.*, 1995). Therefore, the aim of this investigation was to determine the prevalence and pattern of:

1. congenitally missing permanent teeth
2. reduced crown size of upper lateral incisor
3. peg shaped upper lateral incisors

Table 1. The prevalence of hypodontia in males and females in different populations.

<i>Study</i>	<i>Location</i>	<i>Male %</i>	<i>Female %</i>	<i>Sample size</i>	<i>Age range in years</i>
Maklin <i>et al.</i> , 1979	New Orleans		7.44*	847	4-13
Rölling, 1980	Denmark	7.7	7.8	3325	9-10
Nik-Hussein, 1989	Malaysia	1.2	1.6	N.A	5 – 15
Salem, 1989	Saudi Arabia		2.2*	2393	4-12
Al-Emran, 1990	Saudi Arabia	4	N.A	500	13.5 – 14.5
O'Dowling and McNamara, 1990	Ireland		11.3*	3056	7-17
Aasheim and Ogaard, 1993	Norway	5.8	7.2	1953	9
Nordgarden <i>et al.</i> , 2002	Norway	4.0	5.1	9,532	18
Ng'ang'a and Ng'ang'a , 2001	Kenya	7.2	5.3	615	8-15
Backman and Wahlin, 2001	Sweden	6.5	8.4	739	7

* Males and females combined.

N.A. data not available

Table 2. The prevalence of hypodontia and congenitally malformed upper lateral incisors expressed as the number (n) and as the percentage (%) of affected individuals among 1,005 Jordanian adults.

<i>Tooth</i>	<i>Agenesis</i>		<i>Reduced</i>		<i>Peg</i>		<i>Normal</i>	
	<i>n</i>	<i>(%)</i>	<i>n</i>	<i>(%)</i>	<i>n</i>	<i>(%)</i>	<i>n</i>	<i>(%)</i>
Maxillary right 2nd premolar	12	(1.2)					993	(98.8)
Maxillary left 2nd premolar	13	(1.3)					992	(98.7)
Total	25	(2.5)					980	(97.5)
Maxillary right lateral incisor	15	(1.5)	24	(2.4)	17	(1.7)	949	(94.4)
Maxillary left lateral incisor	13	(1.3)	17	(1.7)	17	(1.7)	958	(95.3)
Total	28	(2.8)	41	(4.1)	34	(3.4)	902	(89.7)
Mandibular right 2nd premolar	17	(1.7)					988	(98.3)
Mandibular left 2nd premolar	17	(1.7)					988	(98.3)
Total	34	(3.4)					971	(96.6)
Mandibular right central incisor	2	(0.2)					1003	(99.8)
Mandibular left central incisor	2	(0.2)					1003	(99.8)
Total	4	(0.4)					1001	(99.6)
Mandibular right lateral incisor	1	(0.1)					1004	(99.9)
Mandibular left lateral incisor	1	(0.1)					1004	(99.9)
Total	2	(0.2)					1003	(99.8)

Table 3. Hypodontia according to gender expressed as the number of affected individuals.

<i>Tooth</i>	<i>Female</i>	<i>Male</i>	<i>Total</i>
Maxillary right lateral incisor	7	8	15
Maxillary left lateral incisor	4	9	13
Total	11	17	28
Maxillary right 2nd premolar	7	5	12
Maxillary left 2nd premolar	8	5	13
Total	15	10	25
Mandibular right 2nd premolar	8	9	17
Mandibular left 2nd premolar	9	8	17
Total	17	17	34
Mandibular right central incisor	1	1	2
Mandibular left central incisor	1	1	2
Total	2	2	4
Mandibular right lateral incisor	0	1	1
Mandibular left lateral incisor	0	1	1
Total	0	2	2
Grand total	45	48	93

Materials and Methods

Patients undergoing dental treatment in the teaching clinics of the Initial Treatment, Periodontics and Conservative units, Faculty of Dentistry, Jordan University of Science and Technology, during the course of the investigation were included in this study. The series comprised 1,045 patients aged 16-46 years. All patients included were Caucasian and had no medical syndromes. The file number, age and gender of subjects and any history of dental extraction and/or trauma were recorded in a special form, which included a section for the findings.

Prior to the investigation, calibration of both examiners, one author (Z.A) and a resident dental officer, was undertaken by means of a pilot study involving 100 patients examined during a period of two weeks until satisfactory inter-and intra examiner reliability was achieved. Using the dental chair and kit allocated for treating the subjects, the history of previous dental extractions or trauma was carefully taken and noted. Histories were based on anamnesis of patients during the interview and confirmed by checking, if available, their dental records. The clinical examinations were then performed to note absent or malformed size or shape of upper lateral incisors. Diagnostic panoramic radiographs were taken for those patients appearing to lack a permanent tooth except 3rd molars and were read by the first author. A tooth was recorded present if

1. all or any part of the crown was visible
2. a dental history revealed that it has been lost due to trauma or extracted
3. if it was demonstrated impacted in the radiograph.

The results were analyzed with respect to the distribution of congenitally missing teeth, the symmetry of any hypodontia present and the number of missing teeth per affected individual. Distribution and pattern of hypodontia were compared between male and female patients.

Lateral incisors were also analyzed for reduced or modified tooth form according to the following criteria:

Peg- shaped crown: the mesial and distal surfaces of the affected crown deviated from normal morphology and converged incisally.

Reduced crown size: the crown maintained normal morphology but was noticeably reduced in size or the mesiodistal diameter, from one contact point on one side to the other contact point on the opposite side of the crown was less than 5.5 mm. All measurements were performed using a dental vernier with long tips (Leone, Firenze, Italy).

Missing teeth with an uncertain history of extraction and crowned lateral incisors were noted and their data were excluded from the analysis of the results.

The data was analyzed using Statistical Package for Social Sciences (SPSS, version 11). The differences in the distribution of congenitally missing teeth and crown deformities between upper and lower arches and between sides of the jaw were tested using McNemar test. The distribution and pattern of hypodontia were compared between male and female patients using the Pearson chi-square test. A p-value <0.05 was considered significant.

Results

Forty subjects were excluded from the analysis of the results due to uncertain history of dental extractions and the data on remaining 1,005 subjects, 484 females and 521 males, were analyzed. There were 93 missing teeth in 55 subjects, 28 females with 45 missing teeth and 27 males with 48 missing teeth.

The prevalence of hypodontia, the number of subjects showing at least one missing tooth, i.e. expressed as a percentage of the whole population was 5.5%.

The most frequently absent teeth were found to be the lower second premolars accounting for 3.4% of the population, followed by upper lateral incisors, 2.8%, and upper second premolars 2.5% (Table 2).

The congenital absence of upper lateral incisors was bilateral in eight individuals and unilateral in 12 persons of the population. Unilateral absence of the upper lateral incisor coincided with peg-shaped teeth on the opposite side in five persons, with reduced crown size in one individual and with normal teeth in six individuals. Hypodontia of upper second premolars was bilateral in six subjects and was unilateral in 13 individuals. The absence of lower second premolars was bilateral in 12 and unilateral in 10 individuals.

The prevalence of missing lower premolars, 3.4%, was higher than that of upper premolars, 2.5%. The proportion of missing upper lateral incisors was 2.8%, significantly more than that, 0.2% of lower lateral incisor, $p < 0.05$.

The percentage of females with hypodontia was 5.2% and that of males was 5.8%. No statistically significant differences were found between females and males in relation to side of the jaw and location according to the arch, $p > 0.05$. The number of missing teeth according to gender and tooth type is detailed in Table 3.

The frequency of reduced crown size and peg-shaped upper lateral incisors according to gender and side of the jaw is shown in Table 4. From this data it is apparent that the number of teeth with reduced crown size was higher in females, 23, than that in males, 18, and was in a ratio of 11:12 in females and 1:2 in males for the left and right sides of the jaw respectively. There were 41 lateral incisors in 29 adults with reduced crown size. The occurrence of this anomaly was unilateral in 17 adults. The opposite tooth was missing in one occasion, peg-shaped in another, and normal in 15 adults (Table 5).

The prevalence of individuals with at least one peg-shaped lateral incisor was 2.3%. The prevalence of peg-shaped laterals was similar in males and females and in left and right sides of the jaws (Table 4). The occurrence of peg-shaped lateral incisors was bilateral in 11 subjects and unilateral in 12 individuals divided equally between the right and left sides. Unilateral malformation of the tooth was associated with five missing, one reduced and six normal lateral incisors on the opposite side (Table 5). No statistically significant differences were found for variations in the size or shape of upper lateral incisors in relation to gender or the side of the arch on which they were found, $p > 0.05$.

Discussion

This study was conducted to determine the prevalence of hypodontia in the permanent dentition excluding third molars and to examine variations in crown size and shape of upper lateral incisors in a Jordanian population. The age range of the population, 16 - 47 years, eliminated the possibilities of post-investigation tooth formation (Graber, 1978) and limited the use of radiography to the subjects who had hypodontia.

The prevalence of hypodontia found in other studies varied from 2.2 to 11.3%, (Table 1) and the prevalence found in the present study, 5.5%, is near the middle of the reported range. These variations could be ascribed to differences in the racial derivations of the groups examined, sampling methodologies, diagnostic criteria and sample sizes.

The present study found no significant difference between the prevalence of unilateral hypodontia and that of bilateral hypodontia. These results are consistent with the results, 3rd molars excluded, of Silva Meza (2003).

The most frequently absent teeth in this sample were lower second premolars followed by upper lateral incisors, and upper second premolars. A number of reports (Rölling, 1980; Al-Emran, 1990, Polder *et al.*, 2004) describe a similar sequence, but others do not, (Maklin, *et al.*, 1979; Aasheim and Ogaard, 1993).

There was no significant difference between the number of missing teeth in the left and right sides of the jaw. This is in accord with the findings of one study (Maklin *et al.*, 1979) but not with those of others (Silverman and Ackerman, 1979; Stamatiou and Symons, 1991). The differences between hypodontia in the mandible and that in the maxilla, except for lateral incisors were insignificant, and this finding is consistent with two reports, (Maklin *et al.* 1979; Silverman and Ackerman, 1979).

There were no significant differences between the prevalence of hypodontia in females and that in males. This finding is in accordance with the reports of Maklin

et al., (1979); Rölling, (1980); Aasheim and Ogaard (1993), but at variance with other reports (Nordgarden *et al.*, 2002; Polder *et al.*, 2004) which reported more hypodontia in females.

Hypodontia of the lateral incisors was significantly more frequent in the upper than in the lower arch $p < 0.05$; this is consistent with previous studies on Caucasians (Graber 1978) but not with similar studies on Chinese (Davis and Darvell, 1993). Four lower central incisors in two subjects, two lower lateral incisors in another were found missing in the total population. No first or second molars in both arches were confirmed congenitally missing in our population.

Reduced crown size and peg-shaped upper lateral incisors were the main forms of malformation studied in this investigation. The average crown size of upper lateral incisor is 6.6 mm ranging between 5 – 9 mm, Woelfel (1990) and that of the same tooth in Jordanians was 6.8 ranging from 5.3 – 8.86 mm (Hattab *et al.*, 1996). The mesiodistal diameter of 5.5 mm, the mean minus two standard deviations, was considered a logical lower limit for normal crown size (Hattab *et al.*, 1996). Peg-shaped upper lateral incisors were reported as being present in 0.3% of U.S.A subjects, 0.6% of Swedish schoolchildren and in 4% of Saudi Arabian schoolchildren, (Clayton, 1956, Thilander and Myrberg, 1973; Al-Emran, 1990). The frequency of peg-shaped teeth in Jordanian adults (2.3%) is within this range.

Conclusions

Prevalence of hypodontia was 5.5% and lower second premolars were the most frequently missing tooth. The number of missing upper lateral incisors was significantly higher than that of lower lateral incisors. The prevalence of peg-shaped upper lateral incisors was 2.3%. There were no significant differences in the pattern of hypodontia amongst males and females, between left and right sides of the jaws, or between the upper and lower jaws.

Table 4. The frequency of Absent, Reduced crown size and Peg-shaped upper lateral incisors according to the side of the jaw in females (F) and males (M), expressed as the numbers of affected individuals.

Gender Side	F		M		Total	
	Left	Right	Right	Left	Left	Right
Absent	4	7	8	9	13	15
Reduced	11	12	12	6	17	24
Peg	8	8	9	9	17	17
Total	23	27	29	24	47	56

Table 5. The anomaly status of the opposite upper lateral according to anomaly category

Category	Reduced	Peg-shaped	absent	Normal	Subjects
Reduced	12*	1	1	15	29
Peg-shaped	1	11*	5	6	23
Absent	1	5	8*	6	20

* Bilateral anomaly

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