# Hypodontia in Down's syndrome patients

*Nidhal H. Ghaib B.D.S., M.Sc.* [1]
*Mustafa M. Al-Khatieeb B.D.S., M.Sc.* [2]
*Dheaa H. Abd Awn B.D.S., M.Sc* [3]

## ABSTRACT

Background: The intention of this study was to quantify the occurrence of hypodontia in a group of individuals with Down syndrome.

Materials and method: The sample consisted of 164 subjects with Down syndrome with an age ranged 14-18 years, the subjects were examined clinically, when radiographs were in need, orthopantomograph, occlusal, or periapical were often taken to confirm the diagnosis.

Results: The results show a notably high prevalence of hypodontia in individuals with Down syndrome (45.2%) being higher in females (47.4%) than males (42.3%), the hypodontia in the maxilla was higher than in the mandible and on the right side of females was higher than the left side, while males show on the left side was higher than the right side though this difference was not significant. The number of congenitally missing teeth also in females was higher than in males; the most congenitally missing teeth were the lower second premolars, upper lateral incisors, lower second premolars and lower lateral incisors respectively. The distribution of peg–shaped lateral incisors was 15% and more unilaterally than bilaterally.

Conclusions: This study reveals a high prevalence of hypodontia (missing teeth and peg-shaped lateral incisors) in patients with Down syndrome. No explanation other than genetics is immediately available to explain why hypodontia should represent another phenotypic expression of this trisomy

Keyword:Down's syndrome, Hypodontia, Peg-shaped lateral incisors. (J Bagh Coll Dentistry 2009; 21(1): 98-103)

## INTRODUCTION

Many international statistical studies have been done in different countries on hypodontia, as it is the most important among the other dental anomalies.

Missing teeth (tooth agenesis) is one of the most common developmental problems in children. The congenital absence of teeth results from disturbances during the initial stages of tooth formation: initiation and proliferation, it has a much higher prevalence in certain groups. [1,2]

Missing teeth may occur in isolation, or as part of a syndrome. Isolated cases of missing teeth can be familiar or sporadic in nature. Familiar tooth agenesis is transmitted as an autosomal dominant, autosomal recessive, or X-linked genetic condition [3-6].

In addition, tooth agenesis has been associated with more than 49 syndromes. Various dental abnormalities, particularly hypodontia, have frequently been reported in children who also have a cleft lip, cleft palate or both [7], ectodermal dysplasia [8-10] and Down, Rieger and Book syndrome [11]. Specific terms are used to describe the nature of tooth agenesis.

The term hypodontia is used when one to six teeth, excluding third molars, are missing, and oligodontia when more than six teeth are absent (excluding the third molars). Anodontia is an extreme case, denoting complete absence of teeth. There is no clear definition in the literature concerning the limits of these classes. Anodontia or oligodontia is usually associated with an unusual but mild systemic abnormality, ectodermal dysplasia, or congenital syndrome. As a general rule, if only one or a few teeth are missing, the absent tooth will be the most distal tooth of any given type [12,13].

Hypodontia in the primary dentition is more common in the maxilla and is frequently associated with the lateral incisors. Hypodontia of permanent teeth occurs with equal frequency in the upper and lower arches and usually affects the third molar. The type of permanent missing teeth and the population prevalence for the anomaly vary with racial group, although females are more frequently affected excluding the third molar, population prevalences across the world vary between 1.6 and 9.6 percent [6,14-17].

In many populations it has been reported that, except for third molars, the most commonly missing teeth are the upper lateral incisor and lower second premolar. For Europeans, the mandibular second premolar is the tooth most frequently absent after the third molar, followed by the maxillary lateral incisor and upper second premolar [12].

Down syndrome, the most common chromosomal abnormality in man, is caused by

(1)Professor, Department of Orthodontics, College of Dentistry, University of Baghdad.
(2)Assistant lecturer, Department of Orthodontics, College of Dentistry, University of Baghdad
(3)Assis.Prof, Department of Orthodontics, College of Dentistry, University of Baghdad

trisomy of all or a critical portion of chromosome 21 (21q22.3). The birth prevalence of trisomy 21 syndrome is 1/650 live births, with the risk of having a child with Down syndrome increasing with maternal age [18].

Down syndrome is characterized by a combination of phenotypic features that includes typical dysmorphic features and mental retardation. Congenital malformations of the heart (30-40% of the patients) and gastrointestinal tract are common. Congenital absence of teeth has been reported in 23 to 47%, One or both primary upper lateral incisors are missing in more than 10% of the patients, and peg-shaped maxillary lateral incisors are seen in 10% [18].

The present study endeavors to achieve the following:

- To find out the prevalence of hypodontia in Down's syndrome patients.
- To find out the distribution of hypodontia according to sex, type, number, and position of missing teeth in Down's syndrome patients.
- To compare the hypodontia according to gender and site.

# MATERIALS AND METHODS

**The Sample**

This work was carried out in Iraq. The sample was selected from center of health care for Down's syndrome (Hibbat-Allah) and patients attended private dental clinic in Baghdad city. The sample consisted of 164 Down's syndrome patients who fulfill the criteria of the sample selection which are:

1. They are known cases of Down's syndrome Iraqi nationality with an age ranged 14-18 years.
2. All subjects with marked facial abnormality or asymmetry like cleft lip and palate were excluded.
3. Subjects with extracted teeth for the reason of caries or accident were excluded.
4. Third molars were excluded.
5. Differential diagnosis was done to exclude:

- Impacted teeth.
- Delayed eruption.
- Ectopic eruption.
- Retained deciduous teeth.
- Delayed mineralization.
- Gemination.

**Methods**

The congenital absence of teeth was determined by clinical and radiographic examination.

Clinical examination: All subjects (164) were subjected to clinical examination under daylight using dental mirrors and probes. Each one was seated on a chair with his head and back in straight position, supported by the wall of the examination room and they were looking forward horizontally. For all the cases that were not clearly diagnosed as hypodontia during clinical examination, radiographic examination was undertaken. A tooth was considered congenitally missing when it could not be seen in the dental arch or in the radiograph of the region and there was no history or evidence that it was lost by accident or extraction.

Radiographical examination: All subjects with impaction, retained deciduous teeth, gemination, and delayed development or with space in the arch were subjected to radiography (periapical, occlusal and O.P.G.).Radiographs were retaken if it was not clear. The radiographs were viewed on a light-box without magnification.

# RESULTS AND DISCUSSION

**The distribution of hypodontia**: Out of 164 subjects with Down's syndrome resembling the total sample, 74 cases had hypodontia giving a percentage of 45.12 % (Males 42.3% and females 47.4%) as shown in table and figure 1. It was deduced that hypodontia increased 20 folds in Down syndrome individuals if compared with other studies [19,20] on normal individuals. While other study [21] found that the percentage was 59%, this may be due to smaller number of the sample if compared with the high number of the present study and difference in ethnic group. The hypodontia (dental reduction in number or size) could be the expression of a known decrease in number (rather than size) of cells in many body organs due to the slower intermitotic period in trisomic cells [22,23]. This phenomenon has been held responsible for the general growth retardation in Down syndrome [24].

According to the site, table 2 shows that the prevalence of hypodontia in the maxilla was greater than the mandible this is in agreement with other study [19]. In the maxilla males show high prevalence of hypodontia on the left side, while females show high prevalence on the right side. In the mandible both males and females show high prevalence on the right side than the left side. Some investigators have speculated that blood circulation is impaired in Down syndrome individuals [25] and an inadequate blood supply to the upper jaw could hamper its growth and cause degeneration of the odontoblasts leading to smaller missing teeth [26], perhaps it is no coincidence that there are several phenomena that occur frequently together and appear to be concentrated in the anterior maxilla, namely missing teeth and peg-shaped lateral incisors. On

other hand, other investigators have made an association between missing teeth and prenatal peripheral nerve tissue development [27], where the more severe neurological disturbance disturbance in Down syndrome individuals the more missing teeth will occur [28].

According to its presence unilaterally or bilaterally, table 3 shows that the maxillary dental arch has more unilateral hypodontia than bilateral, and more in males than females, while the mandibular dental arch has more bilateral hypodontia than unilateral and more in females than males, this is probably due to the females mandible is smaller than of males, therefore it is more liable to bilateral hypodontia than unilateral.

According to number of missing teeth in both genders, table 4 shows that the number of congenitally missing teeth in females was higher than in males (Male/female ratio is 0.6:1),this probably that females had smaller jaw size than males. Table 5 shows that almost half the sample (54.05%) had only one congenitally missing tooth, males had higher percentage of hypodontia of one tooth, while females had higher percentage of hypodontia when it involved more than one tooth missing, this could be due to that all the skeletal dimensions which harbored the teeth are smaller in females than males Down syndrome individuals [29], therefore females were more liable to hypodontia of more than one tooth..

According to tooth type for both genders, table 6 shows that maxillary second premolar is the tooth the most affected with hypodontia followed by maxillary lateral incisor,mandibular second premolar and then mandibular lateral incisor respectively. But the present study does not pursue the same agenesis pattern of missing teeth as in the normal individuals, presumably indicating a more severe teeth genesis (tooth formation, timing of calcification, order of tooth eruption and delay in tooth development) in Down syndrome individuals.

Regarding the reduced in size and/or peg-shaped maxillary lateral incisors, table 7 shows the percentage was 15%. It was deduced that this percentage increased 37 times in Downs syndrome if compared with other studies [30,31] on normal individuals. The same table revealed that males had higher percentage of peg-shaped maxillary lateral incisors than females with more occurrence unilaterally than bilaterally; the distribution on the left side was higher than the right side (table8), the left side preference of dental anomalies in Down's syndrome patients is a finding supported elsewhere in literatures and is reminiscent of other anomalies such as cleft lip and palate [32,33] .

Table 9 revealed that 25 cases (15%) of maxillary lateral incisors were reduced in size and/or peg-shaped, 4 cases (2%) associated with hypodontia of the opposite lateral incisor, and in 21 cases (13%) the other lateral incisor was present. The great prevalence of peg-shaped maxillary lateral incisors in Down's syndrome patients in present study could agree with other study [34].This provides a strong argument for a genetic basis to this conditions.

**Comparison of hypodontia frequency according to gender and site for the teeth:**

Significant difference was detected between females and males with regared to maxillary and mandibular lateral incisors at $p<0.05$ as shown in table 10. Because females showed higher percentage than males, this may be due to the jaws dimensions harboring the teeth in females were smaller then males or may be due to x-linked genetic condition [3-6], while there was no significant difference between females and males with regard to maxillary and mandibular second premolars at $p>0.05$. Such findings have been used as a persuasive argument for a significant genetic basis for this condition in both arches, and the genetic modes of transmission may play a further role for gender distribution of this condition.

# REFERENCES


1. Šutalo J. A text book of pathology. 1994; Naklada Zadro,Zagreb, p. 3.
2. Anita Fekonja. Hypodontia in orthodontically treated children. Euro J of Orthod 2005; 27(5): 457-60.
3. Castaldi CR. Incidence of congenital anomalies in permanent teeth of a group of children aged 6–9. J Canad Dent Assoc 1966; 32(3): 154–9.
4. Stewart RE, Poole AE. The orofacial structures and their association with congenital abnormalities. Pediatric Clinics of North America 1982; 29(3): 547–51.
5. Graber LW. Congenital absence of teeth: a review with emphasis on inheritance patterns. J Am Dent Assoc 1987; 96(2): 266–75.
6. Slavkin HC. Entering the era of molecular dentistry. J Am Dent Assoc 1999;130(3): 413–7.
7. Shapira Y, Lubit E, Kuftinec M. Hypodontia in children with various types of clefts. Angle Orthodontics 2000; 70(1): 16–21
8. Kerwetzki R, Homever H. Uber die ektodermale Dysplasie aus Kiferorthopädischer Sicht. Fortschritte der Kieferorthopädie1974; 35: 33–9.
9. Marković M. Kongenitalne anomalije. In: Antolic I Ortodoncija.Mladinska knjiga, Ljubljana.1982; p. 128
10. Parsche E, Wegscheider WA, Mileder P, Bantleon HP. Die Behandlung der Hypodonti bei ektodermeler Dysplasie. Zeitung der Stomatologie 1990; 87(8): 437–44.
11. Uthoff D. Christ-Siemens-Touraine-Syndrom-Odontologie-Kinderheilkunde-HNO-Dysraphie. Zahnarztliche. Praxis 1989; 40(1): 13–5.

12. Jorgenson RJ. Clinicians' view of hypodontia. J Am Dent Assoc 1980 ;101(2): 283–6.
13. Schalk van der Weide Y, Beemer FA, Faber JAJ, Bosman F. Symptomatology of patients with oligodontia. J Oral Rehab 1994; 21(3): 247–61.
14. Thilander B, Myrberg N. The prevalence of malocclusion in Swedish schoolchildren. Scand J Dent Res 1973; 81(1): 12–20.
15. Rølling S. Hypodontia of permanent teeth in Danish schoolchildren. Scand J Dent Res 1980; 88(5): 365–9.
16. Aasheim B, Ögaard B. Hypodontia in 9-year-old Norwegians related to need of orthodontic treatment. Scand J Dent Res 1993;101(5): 257–60.
17.Symons AL, Stritzel F, Stamation J. Anomalies associated with hypodontia of the permanent lateral incisor and second premolar. J Clin Pediatric Dent 1993; 17(2): 109–11.
18. Gorlin R, Cohen M, Levin S. Syndromes of the head and neck, 3rd ed New York: Oxford University Press, 1990.
19.Pederson PO. The east Greenland Eskmo dentition.1949; Copenhagen CA Reitzel.
20.Renkerova M, Badura S, Manikova H, Jambor J. A contribution to anomalous number of teeth in children in the Zilina District.Parakt Zubn Lek 1989; 37(1): 12-8.
21.Shapira J, Chaushu S, Becker A. Prevalence of tooth transposition, third molar agenesis, and maxillary canine impaction in individuals in individuals of Down syndrome. Angle Orthodontics 2000; 70( 4):290–6.
22.Naeye RL. Prenatal organ and cellular growth with various chromosomal disorders. Biol Neonat 1967; 11: 248-60.
3. Paton GR, Silver MF, Allison AC. Comparison of cell cycle time in normal and trisomic cells. Humangenetik. 1974; 23:173–82.
4. Penrose LS. Biology of Mental Defect. London: Sidwick & Jackson Ltd. 1963;
25. Dow RS. A preliminary study of periodontoclasia in mongolian children at Polk State School. Am J Ment Def 1951; 55:535–8.
26. Jensen GM, Cleall JF, Yip AS. Dentoalveolar morphology and developmental changes in Down's syndrome (trisomy 21). Am J Orthod 1973; 64:607–18.
27. Kjaer I. Neuro-osteology. Crit Rev Oral Biol Med 1998; 9:224–44.
28. Russell BG, Kjaer I. Tooth agenesis in Down's syndrome. Am J Med Genet 1995; 55:466–71.
29.Al-O'obaidy BA. Skeletal measurements in a sample of Iraqi Down syndrome patient aged 9-20 years old.2003;A master thesis, Orthodontic Department. Dentistry College, Baghdad University.
30. Clayton JM. Congenital dental anomalies occurring in 3557 children. J Dent Child 1956; 23:206-8.
31. Al-Emran S. Prevalence of hypodontia and developmental malformation of permanent teeth in Saudi Arabian schoolchildren. Brit J Ortho1990;17(2):115-8.
32. Joshi MR, Bhatt NA. Canine transposition. Oral Surg Oral Med Oral Pathol 1971; 31, 49-54.
33.Kallen B, Mastroiacovo P, Robert E. Major congenital malformations in Down syndrome. Am J Med Genet 1996;16:65,160-6.
34. Meskin LH, Gorlin RJ. Agenesis and peg-shaped permanent maxillary lateral incisors. J Dent Res1963; 42: 1476–9.

**Table 1: Distribution of hypodontia in the examined sample.**

| Gender | Subjects examined | Subjects with hypodontia | % Of hypodontia |
|---|---|---|---|
| **Males** | 71 | 30 | 42.3 % |
| **Females** | 93 | 44 | 47.4 % |
| **Total** | 164 | 74 | 45.12 % |

**Figure 1: Prevalence of hypodontia in the examined sample.**

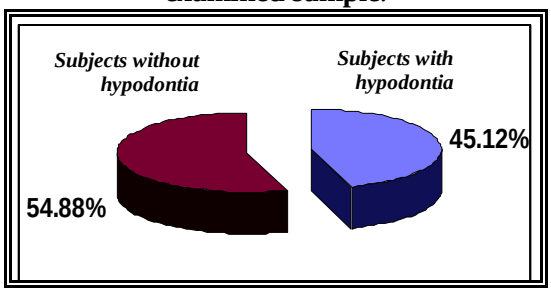


**Table 2: Frequency and prevalence of hypodontia according to site**

| Arch | Right | | Left | | Total N=164 | |
|---|---|---|---|---|---|---|
| | Males N=71 | Females N=93 | Males N=71 | Females N=93 | Males N=71 | Females N=93 |
| **Maxilla** | 9(31.03%) | 35(59.32%) | 20(68.97%) | 24(40.68%) | 29(53.70%) | 59(65.56%) |
| **Mandible** | 14(56.00%) | 18(58.06%) | 11(44.00%) | 13(41.94%) | 25(46.30%) | 31(34.40%) |
| **Total** | 23(42.60%) | 53(59.00%) | 31(57.40%) | 37(41.00%) | 54(100%) | 90(100%) |

**Numbers refer to missing teeth**

**Table 3: Distribution of hypodontia according to its presence unilaterally or bilaterally.**

| Arch | Tooth | Males | | Females | | Total | |
|---|---|---|---|---|---|---|---|
| | | Unilat. | Bilat. | Unilat. | Bilat. | Unilat. | Bilat. |
| **Maxillary** | **Lateral Incisor** | 4 | 1 | 2 | 17 | 6 | 18 |
| | **Second premolar** | 17 | 3 | 13 | 5 | 30 | 8 |
| **Mandibular** | **Lateral Incisor** | 6 | 6 | 4 | 1 | 10 | 7 |
| | **Second premolar** | 3 | 2 | 1 | 12 | 4 | 14 |

**Numbers refer to missing teeth**

**Table 4 : Distribution of hypodontia according to number of missing teeth in both genders.**

| | Number of affected subjects | Number of missing teeth | Average number of missing t eeth per subject |
|---|---|---|---|
| **Males** | 30 | 54 | 1.80 |
| **Females** | 44 | 90 | 2.05 |
| **Male/Female Ratio** | 0.69:1 | 0.60:1 | |
| **Total** | 74 | 144 | 1.95 |

**Table 5: Distribution of the subjects with hypodontia by gender and number of missing teeth.**

| | Number of congenitally missing teeth | | | | | Total |
|---|---|---|---|---|---|---|
| | One tooth [n(%)] | Two teeth [n(%)] | Three teeth [n(%)] | Four teeth [n(%)] | More than four teeth [n(%)] | |
| **Males** | 24(80%) | 3(10%) | 3(10%) | | | 30(100%) |
| **Females** | 16(36.36%) | 18(40.91%) | 4(9.09%) | 5(11.36%) | 1(2.28%) | 44(100%) |
| **Total** | 40(54.05%) | 21(28.38%) | 7(9.46%) | 5(6.76%) | 1(1.35%) | 74(100%) |

**Numbers refer to cases with hypodontia**

**Table 6: Frequency and prevalence of hypodontia according to tooth type for both genders.**

| Arch | Tooth | Right | | | Left | | | Total |
|---|---|---|---|---|---|---|---|---|
| | | Males N=71 | Females N=93 | Total N=164 | Males N=71 | Females N=93 | Total N=164 | |
| Maxillary | Lateral Incisor | 5 (7.04%) | 18 19.35%) | 23 (14.02%) | 1 (1.40%) | 18 (19.35%) | 19 (11.59%) | 42 (25.61%) |
| | Second premolar | 4 (5.63%) | 17 (18.27%) | 21 (12.80%) | 19 (26.76%) | 6 (6.45%) | 25 (15.24%) | 46 (28.04%) |
| Mandibular | Lateral Incisor | 12 (16.90%) | 5 (5.37%) | 17 (10.37%) | 6 (8.45%) | 1 (1.08%) | 7 (4.27) | 24 (14.64%) |
| | Second premolar | 2 (2.81%) | 13 (13.98%) | 15 (9.15%) | 5 (7.04%) | 12 (12.90%) | 17 (10.37%) | 32 (19.52%) |

**N= Number of the sample**

**Table 7: Distribution of reduced in size and /or peg shaped maxillary lateral incisors by gender occurrence and presence unilaterally or bilaterally.**

| | N(%) | Unilaterally | Bilaterally |
|---|---|---|---|
| **Males** | **17 (10%)** | **16** | **1** |
| **Females** | **8 (5%)** | **7** | **1** |
| **Total** | **164 (15%)** | **23** | **2** |

**N: refers to number of subjects**

**Table 8: Distribution of reduced in size and /or peg shaped maxillary lateral incisors according to gender in each side.**

| Gender | 17 Males | | 8 Females | | Total | |
|---|---|---|---|---|---|---|
| Side | Right | Left | Right | Left | Right | Left |
| N(%) | 4 (15%) | 14 (52%) | 2 (7%) | 7 (26%) | 6 (22%) | 21 (78%) |
| Total | 18 (67%) | | 9 (33%) | | 27 (100%) | |

**N= Number of the peg lateral .**

**Table 9: Prevalence and frequency of reduced in size and /or peg shaped maxillary lateral incisors.**

| | Males | Females | Total |
|---|---|---|---|
| **Other side absence** | 3 On right side (4%) | 1 On left side (1%) | 4 (2%) |
| **Other side present** | 14 On left side (20%) | 7 On right side (8%) | 21 (13%) |
| **Total** | 17 (24%) | 8 (9%) | 25 (15%) |

**Table 10: Comparison of frequency of hypodontia according to gender for the teeth.**

| Arch | Tooth | Males | Females | Total | $\chi^2$ | Significance |
|---|---|---|---|---|---|---|
| **Maxillary** | **Lateral Incisor** | 6 (11.11%) | 36 (40%) | 42 (29.16%) | 9.656 | * |
| | **Second premolar** | 23 (42.59%) | 23 (25.55%) | 46 (31.94%) | 3.066 | NS |
| **Mandibular** | **Lateral Incisor** | 18 (33.33%) | 6 (6.66%) | 24 (16.66%) | 14.400 | * |
| | **Second premolar** | 7 (12.96%) | 25 ( 27.77%) | 32 (22.22%) | 3.333 | NS |
| **Total missing teeth** | | 54 (100%) | 90(100%) | 144(100%) | …….. | …….. |

*** =Significant "p<0.05", NS=Not Significant "P>0.05", d.f. =1**