



## Hypodontia and Hyperdontia of Permanent Teeth in Korean Schoolchildren

Hyock-Soo Moon<sup>1</sup> Sun-Chul Choi<sup>2</sup> Pill-Hoon Choung<sup>3</sup>

<sup>1</sup>Dept. of Preventive & Public Health Dentistry, <sup>2</sup>Dept. of Craniofacial Radiology,

<sup>3</sup>Dept. of Oral and Maxillofacial Surgery, BK21 Human Life Science,

College of Dentistry, Seoul National University, Seoul, Korea

28 Yeongun Dong, Chongro Ku, Seoul 110-749, Korea

### ABSTRACT

#### Hypodontia and Hyperdontia of Permanent Teeth in Korean Schoolchildren

Hyock-Soo Moon<sup>1</sup> Sun-Chul Choi<sup>2</sup> Pill-Hoon Choung<sup>3</sup>

*<sup>1</sup>Dept. of Preventive & Public Health Dentistry, <sup>2</sup>Dept. of Craniofacial Radiology,*

*<sup>3</sup>Dept. of Oral and Maxillofacial Surgery, BK21 Human Life Science,*

*College of Dentistry, Seoul National University, Seoul, Korea*

*28 Yeongun Dong, Chongro Ku, Seoul 110-749, Korea*

This study was performed to determine the prevalence of hypodontia and hyperdontia of permanent teeth among Korean schoolchildren, and to compare differences in the prevalence between Korea, other country, and other ethnic groups. The sample consisted of 346 girls aged 6.9~0.3 yr and 375 boys aged 6.8~0.4 yr on whom a panoramic radiograph was taken at Yeonchun-Gun community in Korea. The prevalence of congenitally missing teeth (third molars excluded) was 6.7% in boys and somewhat higher, 9.5% in girls, and 8.0% for both sexes combined. On the average, number of missing teeth per affected child was 1.9 teeth. The most commonly congenitally missing teeth were the mandibular second premolar (32.7%), followed by the mandibular incisor (28.7%), the maxillary second premolar (16.7%), and the maxillary lateral incisors (10.2%). The prevalence of supernumerary teeth was 2.1% in boys, 1.4% in girls, and 1.8% for both sexes combined. The most common supernumerary teeth were the mesiodens (76.9%), followed by the supernumerary premolar (23.1%). The affected male-female ratio was 1.6: 1.0. The prevalence of congenital missing teeth in this study

was similar to in studies of Japanese, Danish, American and German. The frequency of hyperdontia was lower in this study than in studies of Chinese children, Japanese and American.

Key words: prevalence of hypodontia, prevalence of hyperdontia, Korean schoolchildren, oral examination, panoramic radiographs

This study was supported by a grant of Korea Health 21 R & D Project, Ministry of Health & Welfare, Republic of Korea (00-PJI-PGI-CH11-0004)

Hypodontia, congenitally missing teeth, has been observed as one of the most

common human dental developmental anomalies. It may be defined as agenesis of one or more teeth. In contrast, hyperdontia is defined as any teeth or tooth substance in excess of the usual configuration of twenty deciduous or thirty-two permanent teeth <sup>(1)</sup>.

Studies concerning the prevalence of hypodontia and hyperdontia in various racial groups as (Table1) well as investigations of hypodontia in connection with other anomalies have been carried out <sup>(17-20)</sup>. Other studies also have dealt with genetic patterns of hypodontia <sup>(21)</sup> and hyperdontia <sup>(22)</sup>, with the relation between hypodontia and decreased size of crowns of the remaining teeth <sup>(23-27)</sup> and with hypodontia/hypodontia and environmental factor <sup>(28-29)</sup>.

Investigations on the prevalence of hypodontia and hyperdontia have shown discrepancies in results which can usually be attributed to differences in sampling techniques, diagnostic criteria and the racial derivation of the populations examined. Apart from the age of study subject, several authors have found that panoramic radiographs are suitable for this purpose <sup>(17, 30-31)</sup>.

Hypodontia is an important condition in that both esthetics and function can be detrimentally affected. Hyperdontia also may cause diastemata, crowding due to an increased number of erupted teeth, eruption failure of adjacent teeth, displacement and ectopic eruption of supernumerary or adjacent teeth, root resorption of adjacent teeth, malformation of adjacent teeth such as dilaceration, and loss of vitality of adjacent teeth <sup>(22, 32-34)</sup>. It is often difficult to solve clinical problems connected with hypodontia and hyperdontia, even though many treatment procedures have been proposed <sup>(34-43)</sup>. As knowledge of the

incidence of hypodontia and hyperdontia is important in the planning of dental care services, prevalence studies are needed.

Because there has been no controlled radiographic study of a Korean population relating to hypodontia and hyperdontia, the present study was performed to:

(a) determine the prevalence and distribution of hypodontia and hyperdontia in the permanent dentition of Korean schoolchildren.

compare differences in the prevalence of these dental anomalies between Korea, other countries, and other ethnic populations.

## Material and methods

All first grade children of 18 primary schools in Yeonchun-Gun community were invited to participate in the oral health survey. One hundred percent of the parents agreed to have their child participate, but participation rate was 96%. 721 children were examined (375 boys and 346 girls). The mean age of boys was 6.9 yrs, (range = 6.6 yrs -7.2 yrs); and the mean age of girls was 6.8 yrs, (range = 6.4 yrs - 7.2 yrs).

Each child was examined clinically by one of the authors. Hypodontia was not recorded until a radiographic examination of the region of a permanent tooth not visible in the mouth had been confirmed as congenitally absent. In cases in which it was difficult to distinguish between an extracted or congenitally missing tooth, the child was asked whether a tooth had been extracted. In the case of an extracted tooth, if there was the slightest doubt as to whether it had been a permanent or primary, the tooth was deemed an extracted permanent tooth.

All children had a panoramic radiograph taken, and standardization of the method and diagnosis was

Table 1. Hypodontia and hyperdontia of the permanent dentition in various populations (excluding the third molars)

Author	Country	Year	No. of subject	Subject age	% hypodontia	Most frequently missing teeth	% supernumerary teeth
Davis (2)	China	1987	1093	12	6.9	mandibular incisors	2.7
Nik-Hussein (3)	Malaysia	1989	NR	5, 15	2.8	12, 22	NR
Renkova et al. (4)	Czechoslovakia	1989	4405	7, 12	4.0	NR	NR
Lo Muzio et al. (5)	Italy	1989	1529	7, 14	5.2	second premolar	NR
Ignelzi et al. (6)	U.S.A.	1989	849	3, 9	7.8	NR	2.4
Yangida & Morris (7) (8)	Japan	1990	4009	2, 29	7.8	second premolar	3.0
Dechkunakorn et al. (9)	Thailand	1990	1160	6, 15	8.6	12, 22	NR
Legovic et al. (10)	Yugoslavia-Istria	1990	2401	6, 18	6.3	NR	1.4
Legovic et al. (10)	Yugoslavia-Slavonia	1990	2048	6, 18	2.3	NR	0.6
Locht (11)	Denmark	1980	704	9, 10	7.7	NR	1.7
O' Dowling & McNamara (12)	Ireland	1990	3056	NR	11.3	NR	NR
al-Emran (13)	Saudi Arabia	1990	500	13.5, 14.5	4.0	35, 45	NR
Lynham (14)	Australia	1990	662	16, 26	6.3	15, 25	NR
Aasheim & Ogaard (15)	Norway	1993	1953	9	6.5	35, 45	NR
Sterzik et al. (16)	Germany	1994	3238	NR	8.1	NR	NR

**Table 2. Children with congenitally missing teeth by sex and number of congenitally missing teeth in mandible and maxilla**

	Number of children examined	Number of children affected	Percentage of children affected
Both sexes	721	58	8.0
Males	375	25	6.7
Females	346	33	9.5
	Number of missing teeth		Percentage of missing teeth
Total	110		100.0
Mandible	72		65.5
Maxilla	38		34.5

Number of missing teeth per affected child = 1.9

ensured as the same operator took the radiographs and subsequently viewed them with no magnification on a light box. Third molars were not included in this study. Ten percent of the radiographs were re-examined 2 months after the original analysis and a reproducibility of 100% was found in the identification of congenitally missing permanent teeth and supernumerary teeth.

## Results

### Hypodontia

Excluding third molars, hypodontia (Table 2) was found in 6.7% of the boys and 9.5% of girls, resulting in 8.0% for both sexes. Nearly 65% of congenitally missing teeth were found in the mandible, while 35% were found in the Maxilla. The absence of these teeth could not be attributed to previous extractions. On average, each affected child was missing 1.9 teeth.

As it was not always possible to distinguish between central and lateral incisors, these teeth were non-specifically grouped as mandibular incisors. The distribution of the missing teeth is

outlined in Table 3. The most commonly missing teeth were mandibular second premolars and mandibular incisors 32.7% and 28.7%, respectively. The third most commonly missing teeth were maxillary second premolars (16.7%), followed by maxillary lateral incisors (10.2%). Absence of other teeth was less common.

The prevalence of congenitally missing of mandibular second premolars, mandibular incisors, maxillary second premolars, and maxillary lateral incisors was 3.5%, 2.8%, 1.9% and 1.0%, respectively.

### Hyperdontia

Hyperdontia (Table 4), supernumerary teeth, was found in 2.1% of the boys and 1.4% of girls, giving 1.8% for both sexes combined. The affected male-female ratio was 1.6: 1.0.

The most common supernumerary teeth were the mesiodens (76.9%), followed by the supernumerary premolar (23.1%). The prevalence of mesiodens was 1.4% and of supernumerary premolar was 0.4%. On average, each affected child had 1.0 supernumerary tooth.

**Table 3. Distribution and location of congenitally missing teeth**

Tooth involved	Number of missing teeth	Number of affected children	Percentage of missing teeth	Percentage of affected children	Prevalence of missing (%) sample(721)
35, 45	36	25	32.7	43.1	3.5
31, 32, 41, 42	31	20	28.7	34.5	2.8
15, 25	18	14	16.7	24.1	1.9
12, 22	11	7	10.2	12.1	1.0
17, 27	5	3	4.6	5.2	0.4
13, 23	4	3	3.7	5.2	0.4
37, 47	4	2	3.7	3.4	0.3
34, 44	1	1	0.9	1.7	0.1
Total	110	75* (58)	100.0	129.3* (100.0)	10.4* (8.0)

\* : Multiple missing teeth result 75 instead of 58, 129.3% instead of 100%, and 10.4% instead of 8.0%.

The tooth numbers are indicated by the FDI two-digit system.

**Table 4. Children with supernumerary teeth by sex and location of supernumerary teeth**

	Number of children examined	Number of children affected	Percentage of children affected
Both sexes	721	13	1.8
Males	375	8	2.1
Females	346	5	1.4
Mesiodens		10	1.4
Supernumerary premolar		3	0.4

Ratio (male : female) = 1.6 : 1

### Discussion

Hypodontia (excluding the third molar) is a relatively common finding in different population. Its prevalence varies from 2.3 to 11.3% (Table 1). The prevalence of congenitally missing teeth in Korea (8.0%) was within this range. The population of Korea is fairly homogeneous from a genetic perspective. Therefore, the frequency of hypodontia in this study may be considered to apply to the country as a whole.

The prevalence of hypodontia in Korea proved to be approximately the same as found by Yanagida and Mori among Japanese children (7.8%), Lochter among Danish children (7.7%), Ignellzi, Fields and Vann among asymptomatic pediatric patients (7.8%), Sterzik, Steinbicker and Karl among German orthodontic patients (8.1%), and Dechkunakorn, Chaiwat and Sawaengkit among Thailand population (8.6%).

Among other studies of hypodontia in children, those of O' Dowling and McNamara (11.3% for Irish

orthodontic patients) have shown a higher prevalence. However, those of Davis (6.9% for Chinese children in Hong Kong), Aasheim and Ogaard (6.5% for Norwegian orthodontic patients), Lynham (6.3% for Australian Defence Force recruits), Legovic, Ceranic and Cehich (6.3% for orthodontic patients of Istria and 2.3% for orthodontic patients of Slavonia in Yugoslavia), Lo Muzio, Mignogna, Bucci and Sorrentino (5.2% for Italian children), al-Emran (4% for Saudi Arabian male children), Renkerova, Badura, Manicova and Jambor (4% for Czechoslovakian orthodontic patients), Nik-Hussein (2.8% for Malaysian children), have shown a lower prevalence.

The teeth most frequently missing in Korean children were mandibular second premolars. The mandibular second premolars or maxillary second premolars were the most frequently missing teeth in Japanese, Italian, Australian, Saudi Arabian and Norwegian children. The Korean children differs from Chinese, Malaysian and Thailander population with mandibular second premolars being the most frequently missing teeth (Table 1).

Some studies reported no gender difference in hypodontia prevalence (2,7,9,15). There also was no significant difference in the prevalence of hypodontia between Korean males and females (chi-square = 1.877,  $P > .05$ ).

The prevalence of hyperdontia varies from 0.1 to 3.6% (2,6,8,10,11,44). The survey results suggest that prevalence of hyperdontia (1.8%) be within this range. The prevalence of hyperdontia in Korea proved to be approximately the same as that found by Legovic et al. among orthodontic patients of Istria (1.4%) in Yugoslavia and Locht among Danish children (1.7%). Among other studies of hyperdontia in children, those of Davis (2.7% for Chinese children in Hong Kong), Yangida and Moris (3.0% for

Japanese children), and Ignelzi et al (2.4% for American pediatric patients) have shown a higher prevalence. However, those of Legovic, Ceranic and Cehich (0.6% for orthodontic patients of Slavonia in Yugoslavia) have shown a lower prevalence.

A slight difference in the relative frequency of different supernumerary teeth is reported. Upper lateral incisors were the most common supernumerary teeth in Luten's study (45); where as upper central incisors were the most common in the report of Shapira and Kufinec (29). The most frequent supernumerary teeth in Korean children were mesiodens. The frequency of mesiodens was higher than supernumerary premolars.

Sexual dimorphism of hyperdontia is reported by most authors (2,8,22,32,45,46) with males being more commonly affected. The male to female ratio of hyperdontia (1.6:1) proved to be approximately the same as that found by Mitchell (2:1), Hogstrum and Anderson (2:1), and Luten (1.3:1). However, among other studies of hyperdontia in Asian, those of Davis (6.5:1 for Chinese in Hong Kong), Tay (5.5:1 for Chinese in Hong Kong), and Saito (5.5:1 for Japanese) have shown a higher male to female ratio than the ratio found among Korean children. Nevertheless, there was no significant difference in the prevalence of supernumerary teeth between male and female in Korean children (chisquare = 0.483,  $P > .05$ ).

## References

1. Schulze C. Developmental abnormalities of the teeth and jaw. In: Gorlin, Goldman HM, eds. Thoma's oral pathology. St Louis: CV Mosby, 1970:112-22.
2. Davis PJ. Hypodontia and hyperdontia of permanent teeth in Hong Kong

- schoolchildren. *Community Dent Oral Epidemiol* 1987;15:218-20.
3. Nik-Hussein NN. Hyperdontia in the permanent dentition: a study of its prevalence in Malaysian children. *Aust Orthod J* 1989;11:93-5.
  4. Renkerova M, Badura S, Manicova H, Jambor J. A contribution to anomalous number of teeth in children in the Zilina District. *Prakt Zahn Lek* 1989;37:12-8.
  5. Lo Muzio L, Mignogna MD, Bucci P, Sorrentino F. Statistical study of the incidence of agenesis in a sample of 1529 subject. *Minerva Stomatol* 1989;38:1045-51.
  6. Ignelzi, Jr MA, Fields HW, Vann, Jr WF. Screening panoramic radiographs in children: prevalence data and implications. *Pediatric Dent* 1989;11:279-85.
  7. Yanagida I, Mori S. Statistical studies on numerical anomalies of teeth in children using orthopantomograms-congenital hypodontia. *Osaka Daigaku Shigaku Zasshi* 1990;35:580-93.
  8. Yanagida I, Mori S. Statistical studies on numerical anomalies of teeth in children using orthopantomograms? congenital hyperdontia. *Osaka Daigaku Shigaku Zasshi* 1990;35:564-79.
  9. Dechkunakorn S, Chaiwat J, Sawaengkit P. Congenital absence and loss of teeth in an orthodontic patient group. *J Dent Assoc Thai* 1990;40:165-76.
  10. Legonic M, Ceranic I, Cehich A. Anomalies in the number of permanent teeth in orthodontic patients in 2 localities in Croatia. *Schweiz Monatsschr Zahnmed* 1990;100:286-90.
  11. Loch S. Panoramic radiographic examination of 704 Danish children aged 9-10 years. *Community Dent Oral Epidemiol* 1980;8:375-80.
  12. O' Dowling IB, McNamara TG. Congenital absence of permanent teeth among Irish school children. *J Ir Dent Assoc* 1990;36:136-8.
  13. Al-Emran S. Prevalence of hypodontia and developmental malformation of permanent teeth in Saudi Arabian schoolchildren. *Br J Orthod* 1990;17:115-8.
  14. Lynham A. Panoramic radiographic survey of hypodontia in Australian Defense Force recruits. *Aust Dent J* 1990;35:19-22.
  15. Aasheim B, Ogaard B. Hypodontia in 9-year-old Norwegians related to need of orthodontic treatment. *Scand J Dent Res* 1993;101:257-60.
  16. Stezik G, Steinbicker V, Karl N. The etiology of hypodontia. *Fortschr Kieferorthop* 1994;55:61-9.
  17. Bergstrom K. An orthopantomographic study of hypodontia, supernumeraries and other anomalies in school children between the age of 8-9 years. *Swed Dent J* 1977;1:145-57.
  18. Helm S. Malocclusion in Danish children with adolescent dentition. An epidemiological study. *Am J Orthod* 1968;54:352-366.
  19. Magnusson TE. Prevalence of hypodontia and malformations of permanent teeth in Iceland. *Community Dent Oral Epidemiol* 1977;5:173-178.
  20. Thilander B, Myrberg N. The prevalence of malocclusion in Swedish schoolchildren. *Scand J Dent Res* 1973;81:12-21.
  21. Lyngstadaas SP, Nordbo H, Gedde-Dahl T Jr,

- Thrane PS. On the genetics of hypodontia and microdontia : synergism or allelism of major genes in a family with six affected members. *J Med Genet* 1996;33:137-42.
22. Mitchell L. Supernumerary teeth. *Dent Update* 1989;16:65-9.
23. Wisth PJ, Thunold K, Boe OE. Frequency of hypodontia in relation to tooth size and dental arch width. *Acta Odontol Scand* 1974;32:201-206.
24. Baum BJ, Cohen MM. Studies on agenesis in the permanent dentition. *Am J Phys Anthropol* 1971;35:125-128.
25. Garn SM, Lewis AB. The gradient and the pattern of crown size reduction in simple hypodontia. *Angle Orthod* 1970;40:51-56.
26. Garn SM, Lewis AB, Kerewsky RS. Sex difference in tooth size. *J Dent Res* 1964;43:306.
27. Keene HJ. The relationship between third molar agenesis and the morphologic variability of the molar teeth. *Angle Orthod* 1965;34:289-298.
28. Bruce KW. The effect of irradiation on the developing dental system of the Syrian hamster. *Oral surg* 1950;3:1468-1477.
29. Shapira Y, Kuftinec MM. Multiple supernumerary teeth: report of two cases. *Am J Dent* 1989;2:28-30.
30. Haavikko K. Hypodontia of permanent teeth. An orthopantomographic study. *Suom Hammaslaeaeak toim* 1971;67:219-225.
31. Ravn JJ, Nielsen LA. Supernumerary teeth and aplasia among Copenhagen school children. *Tandlaegebladet* 1973;77:12-22.
32. Hogstrum A, Andersson L. Complications related to surgical removal of supernumerary teeth in children. *J Dent child* 1987;54:341-3.
33. Nik-Hussein NN. Anterior maxillary supernumerary teeth: a clinical and radiographic study. *Aust Orthod J* 1990;11:247-50.
34. Scheiner MA, Sampson WJ. Supernumerary teeth: a review of the literature and four case reports. *Aus Dent J* 1997;42:160-5.
35. Jeseffsson E, Brattstrom V, Tegsijo U, Valerius-Olsson H. Treatment of lower second premolar agenesis by autotransplantation: four-year evaluation of eighty patients. *Acta Odontol scand* 1999;57:111-5.
36. Guckes Ad, Roberts MW, McCarthy GR. Pattern of permanent teeth present in individuals with ectodermal dysplasia and severe hypodontia suggests treatment with dental implants. *Pediatr Dent* 1998;20:278-80.
37. Lewis AM. Aesthetic restorations for congenitally missing teeth - a case study. *Dent Today* 1996;15:74, 76-7.
38. Rosenberg J. Conservative anterior reconstruction: a combined technique approach. *Dent Today* 1997;6:90, 92-3.
39. Bassett JL. Replacement of missing mandibular lateral incisors with a single pontic all-ceramic prosthesis: a case report. *Pract Perodontics Aesthet Dent* 1997;9:455-61; quiz 462.
40. Peden M, McSherry P, Burden D. Re: The use of pressure formed retainers in cases of hypodontia (Letter). *Br J Orthod* 1997;24:257-8.
41. Witsenberg B, Boering G. Eruption of impacted permanent incisors after removal of supernumerary teeth. *J Oral Surg* 1981;10:423-31.
42. Becker A, Bimstein E, Shteyer A. Interdisciplinary treatment of multiple unerupted supernumerary teeth: a case report. *Am J Orthod* 1982;81:417-22.
43. Acton CHC. Multiple supernumerary teeth and



- possible implications. Aust Dent J 1987;32:48-9.
44. Yusof WZ. Non-syndromal multiple supernumerary teeth: literature review. J Can Dent Assoc 1990;56:147-9.
45. Luten JR, Jr. The prevalence of supernumerary teeth in primary and mixed dentitions. J Dent Child 1967;34:48-9.
46. Tay F, Pang A, Yuen S. Unerupted maxillary anterior supernumerary teeth - report of 204 cases. J Dent Child 1984;2:289-94.

---

저자 연락처

서울시 종로구 연건동 28번지 서울대학교 치과대학 구강악안면외과 문혁수, 정필훈 우편번호) 110-744  
전화: 02-760-3477 E-mail: choungh@snu.ac.kr