Agenesis of third molars in young Czech population

Dedicated to professor MUDr. J. Mazánek, DrSc., to the 60th birthday anniversary

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Abstract: The aim of this study is to evaluate the incidence of third molars agenesis in the Czech population. One thousand patient's panoramic radiographs of the pedostomatological department of Second Stomatological Clinic of The First Faculty of Medicine, Charles University, has been analyzed. The age of probands was ranging between 12 to 21 years inclusive. Patients were divided into 10 groups according to age. In each age group were 100 individuals – 50 boys and 50 girls. Agenesis of 1–4 third molars was present in 22.5 % (25.6 % in boys and 19.4 % in girls). Intersexual difference is significant. Further, the incidence of third molars agenesis in individual dentition quadrants, upper and lower jaw and right and left side of dentition was examined. Neither in boys nor in girls were detected significant differences in these values. Agenesis of just one, any third molar occurs in 10.9 % (12.0 % in boys and 9.9 % in girls). For one individual it is mean 1.9 congenitally missing third molars in boys and 2.0 congenitally missing third molars in girls. These intersexual differences are not significant. In boys, the most frequent agenesis was of one, next of two, then of three and at last of four third molars. In girls, agenesis of two was on the first place, then that of one and lastly and equally of three and of four third molars. The results were compared with literature data.

Key words: Hypodontia – Agenesis of third molars – Incidence of third molars agenesis in population – Intersexual differences

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Introduction

If we would like to evaluate each tooth from the point of view of its importance, the third molar would be a classic example of contradictions: Its functional value is irrelevant, unfavorable topographic relations make it a source of unpleasant complications, which predetermine it for extraction. Its use for prosthodontic reconstruction of dentition is problematic. For the orthodontists its presence has once advantage, but more often it makes the therapy more difficult. From the practical point of view, the third molar presents mostly negatives.

If we are talking about its values as a source of understanding of physiological and pathological processes of tooth development, it is more misleading than a source of understanding. Among the tissues and organs of the human body we can hardly find another example of manifested variations and developmental anomalies, as we can find in the third molar. High variability in morphology, topography and even in the timing of development makes the third molar an ideal object for the study of developmental anomalies. Among these at the first place is the standing hypodontia as the highest expression of dental lamina insufficiency [28,40].

Variability in incidence of the third molar agenesis and its description according to different races, populations and also intersexual differences presented an interesting chapter, which belongs into the sphere of interest not only for dentists, but also for anthropologists and geneticists. Knowledge of these facts is the basic and essential condition for understanding connections in the study of third molar agenesis incidence in the Czech population.

If we are following the incidence of the third molar agenesis in contemporary populations and skeletal remains from different ages, our attention is attracted by the unbelievable dispersion from practical zero values, which were found by *Hellmann* [17] in the skulls of Tasmanian people, to almost 100 % incidence of third molars agenesis, which according to *Cohn* [5] distinguishes some Mexican Indian tribes. Very low incidence of 1–4 third molars agenesis (1.9 %–2.6 %) occurs according to *Hellmann* [17] in native African population. On the contrary, very frequent was the presence of such anomaly (24.5 %–30.5 %) in native inhabitants of Greenland (*Pedersen* [32]). Relatively high values (28.5 %) were found also by Chinese authors *Mok and Ho* [29] in the Singaporean children. Often quoted are curious findings, which were obtained by *Euler* [7]. This author refers about 1.6 % incidence of third molars agenesis in college students in Vratislav against 22.7 % congenitally missing third molars in skeletal remains of Stone Age populations.

To the differences caused by ethnical origin it is also possible to add values of incidence of third molars agenesis in contemporary young Greek – 19.9 % [16] and Croatian – 5.2 % [26] populations.

The question is: what standpoint to take to the values differences of third molars agenesis incidence described in ethnics closed to each other? For example, in

Table 1 – Incidence of third molars agenesis

Author	Country	Year of publication	Age	Number of examined individuals	Percentage of third molars agenesis	Remarks
Euler	Germany	1936	college students	150	1.3	–
Tanner	Switzerland	1946	13–17	534	17.6	–
Friedrich	Germany	1950	20–50	1600	5.8	lower jaw
Boehme	Germany	1957	7–12	472	26.1	–
Adler and Adler-Hradecky	Hungary	1964	18–21	591	27.6	orthodont. patients
Danneil	Germany	1965	9–14	872	19.6	–
Weise and Bruntsch	Germany	1965	12–24	669	29.3	orthodont. patients
Sonnabend	Germany	1966	15–30	2000	22.4	orthodont. patients
Weise and Schürholz	Germany	1970	9–24	1000	27.3	orthodont. patients
Hölzl	Germany	1972	31–31	486	15.8	–
Kreutzer	Germany	1973	25,2	486	15.8	–
Tröndle	Germany	1973	12–33	1068	28.5	–
Krekeler *et al*.	Germany	1974	12–33	1614	28.2	part. orthod. patients
Godt and Greve	Germany	1980	12–16	1955	20.2	orthodont. patients
Speckin	Germany	1981	15–26	750	18.9	–
Hűbenthal	Germany	1989	12–36	2061	20.7	orthodont. patients
Bredy *et al*.	Germany	1991	12–36	2550	20.7	orthodont. patients
Scherngell	Austria	1992	9–14	816	28.0	orthodont. patients
Rozkovcová *et al*.	Czech Rep.	see text	12–21	1000	22.5	–
Björk *et al*.	Sweden	1956	12–20	243	13.3	lower jaw, boys
Grahnén	Sweden	1956	17–43	1064	24.6	–
Hugoson and Kugelberg	Sweden	1988	15–30	130	22.7	–
Haavikko	Finland	1971	14–18	298	20.8	–
Elomaa and Elomaa	Finland	1973	15–22	202	33.2	–
Haralabakis	Greece	1957	19–39	553	19.9	–
Fanourakis	Greece	1986	10–15	572	27.8	–
Gravely	Great Britain	1965	school children	–	14.0	–
Pogrel	Great Britain	1967	13–13,5	–	18.0	lower jaw
Lavelle	Great Britain	1970	18–25	400	15.3	–

Table 1 – continue

Pedersen	Greenland Southwest	1949	25–50	210	29.5	–
Pedersen	Greenland East	1949	25–50	257	30.6	–
Moorrees	Aleuts	1957	–	–	40.0	–
Goblirsch	USA	1930	17–28	2112	9.0	–
Thomas	USA	1931	16–20	200	22.0	–
Banks	USA	1934	15–22	461	19.7	orthodont. patients
Hellmann	USA	1936	adults	433	25.4	university students
Hellmann	USA	1936	adults	–	13.0	American Indians
Hellmann Americans	USA	1936	adults	–	11.0	black
Conradi psychiatric.	USA	1948	adults	181	14.5	patients
Nanda	USA	1954	18–21	200	9.0	women
Garn *et al*.	USA	1963	14 and plus	476	16.4	orthodont. patients
Keene	USA	1965	17–25	257	27.0	–
Gorgani	USA	1990	11–14	400	10.0	–
Shah and Boyd	Canada	1979	20 and plus	653	23.3	–
Levesque *et al*.	Canada	1981	school children	–	9.0	–
Hellmann	West Africa	1936	adults	–	2.6	native
Chagula	East Africa	1960	adults	–	1.9	native
Thomsen	Tristan da Cunha	1952	adults	–	21.0	native
Hamano	Japan	1926	adults	1300	18.4	–
Saito	Japan	1936	adults	–	34.0	–

seventies and eighties of twentieth century in the area of central Europe in region of present unified Germany, *Hölzl* [19] and *Hübenthal* [21] found out identically 15.8 % incidence of third molar agenesis. Practically at the same time in regional vicinity found out *Tröndle* [43] 28.5 %, *Krekeler et al.* [24] 28.2 % and *Weise and Bruntsch* [45] even 29.3 % incidence of this anomaly. The value found out by us in presented study (22.5 %) approaches the findings of *Sonnabend* (22.4 %) from former Eastern Germany [41].

In Finland, *Murtomaa et al.* [30] reported 17.0 %, *Haaviko* [14] 20.8 % while *Elomaa and Elomaa* [6] found 33.2 % incidence of third molars agenesis. Next example is from Japan, where Hamano [15] recorded 18.9 % and *Saito* [38] 34.0 % of congenitally missing third molars.

A classical example of different values was obtained from a small area inhabited by the ethnic population of Hungarian origin pointed out *Adler and Adler-Hradecky*

[1]: "In 1908 recorded Hillenbrand 13.5 % of third molars agenesis incidence." In the year 1964 Adler and Adler-Hradecky found the incidence of this anomaly to be 27.7 %. In 1936, *Hellmann* [17] published a report of about 49.0 % incidence of third molars agenesis in skeletal remains of recent Hungarian population.

Understandable are the considerable differences discovered in the ethnically non-homogenous United States of America. Lowest values (6.0 %) were found by *Nanda* [31] in a group of women working in medical field and students of medicine. On the contrary *Keene* [22], who examined only men – naval recruits, reports about 27.0 % incidence of third molars agenesis. Relatively homogenous findings can be seen in the regions of Great Britain, where *Gravely* [12] found 14.0 %, *Pogrell* [34] 18.0 % and *Lavelle* [25] 15.3 % incidence of third molars agenesis. Similar diversity between recent populations (Table 1) demonstrates also skeletal remains (Table 2) from different areas and periods.

It is probable, that a part of the mentioned differences of third molars agenesis values in ethnically closed groups can be modified by the examination methods, group selection, size of the group, proband's age and by a circumstances that can be resumed as "human factor". Very important role plays also the type of used X-ray documentation. It might be emphasized, that reliable results guarantees panoramic X-ray technique only [3,16,18,33,35,44].

Subjects and methods

For the evaluation of third molars agenesis incidence in our population we have chosen at random 1000 panoramic X-rays of patients from pedostomatological department of the Second Stomatological Clinic, First Faculty of Medicine, Charles University, who were treated in the period between 1980 and 1990. The age of

Table 2 – Third molars agenesis incidence – skeletal remains

Country	Author	Year of publication	Skeletal remains		% of third molar agenesis
			Age	Number	
Belgium	Brabant and Twiesselmann	1960	Prehistorical population	3000	6.0
Czechoslovakia	Andrik	1960	9th century	365	15.0
Czechoslovakia	Pavlíková	1960	9th century	–	30.0
Czechoslovakia	Tichá	1969	9th century	229	22.0
Denmark	Christophersen	1942	Ice Age	93	30.0
Germany	Euler	1936	Neolithic	418 (x)	26.8
Germany	Glockner and Grimm	1958	Middle Ages	213	17.3
Germany	Henkel	1962	Middle Ages	–	30.0
Sweden	Holmer and Maunsbach	1956	Paleolithic	557	14.2
USA	Hellmann	1936	Modern age--different ethnics	1049	31.3

(x)remains lower jaw only

probands was ranging between 12 and 21 years inclusive. We made 10 groups according to the age. Each group consists of 100 individuals (50 boys, 50 girls). The groups had an interval of one year between each other. Each group included individuals, who have already attained given age with range ±six months.
The lower age limit was set in agreement with the findings of our previous studies, in which we have not found difference in incidence of third molars agenesis between age groups of 12–16 and 16–20 years. Each sex was evaluated separately.

Table 3 – Agenesis of 1–4 third molars in 500 boys and 500 girls at the age 12–21 years

Age group (years)	Sex	Individuals with 1–4 third molars agenesis		Number of congenitally missing third molars
		n	%	
12	Boys	19	38.0	40
	Girls	16	32.0	33
	Boys and girls	35	35.0	73
13	Boys	12	24.0	23
	Girls	14	28.0	24
	Boys and girls	26	26.0	47
14	Boys	13	26.0	27
	Girls	11	22.0	24
	Boys and girls	24	24.0	51
15	Boys	17	34.0	29
	Girls	10	20.0	21
	Boys and girls	27	27.0	50
16	Boys	14	28.0	26
	Girls	6	12.0	13
	Boys and girls	20	20.0	39
17	Boys	15	30.0	29
	Girls	8	16.0	20
	Boys and girls	23	23.0	49
18	Boys	11	22.0	19
	Girls	4	8.0	12
	Boys and girls	15	15.0	31
19	Boys	11	22.0	19
	Girls	9	18.0	16
	Boys and girls	20	20.0	35
20	Boys	6	12.0	8
	Girls	9	18.0	19
	Boys and girls	15	15.0	27
21	Boys	10	20.0	19
	Girls	8	16.0	16
	Boys and girls	18	18.0	35
12–21	Boys	128	25.6	239
	Girls	97	19.4	198
	Boys and girls	225	22.5	437

Table 4 – Incidence of tooth 18, 28, 38, 48 ageneses in 500 boys and 500 girls at the age 12–21 years

Age group (years)	Sex	Tooth 18		Tooth 28		Tooth 38		Tooth 48		Number of congenitally missing third molars
		n	%	n	%	n	%	n	%	
12	Boys	9	18.0	8	16.0	9	18.0	14	28.0	40
	Girls	9	18.0	9	18.0	7	14.0	8	16.0	33
13	Boys	3	6.0	5	10.0	7	14.0	8	16.0	23
	Girls	8	16.0	6	12.0	4	8.0	6	12.0	24
14	Boys	6	12.0	7	14.0	7	14.0	7	14.0	27
	Girls	5	10.0	8	16.0	4	8.0	7	14.0	24
15	Boys	9	18.0	10	20.0	5	10.0	5	10.0	29
	Girls	3	6.0	2	4.0	7	14.0	9	18.0	21
16	Boys	7	14.0	10	20.0	5	10.0	4	8.0	26
	Girls	2	4.0	3	6.0	4	8.0	4	8.0	13
17	Boys	5	10.0	6	12.0	11	22.0	7	14.0	29
	Girls	4	8.0	5	10.0	6	12.0	5	10.0	20
18	Boys	7	14.0	3	6.0	5	10.0	4	8.0	19
	Girls	3	6.0	1	2.0	5	10.0	3	6.0	11
19	Boys	5	10.0	3	6.0	5	10.0	6	12.0	19
	Girls	2	4.0	3	6.0	5	10.0	6	12.0	15
20	Boys	3	6.0	1	2.0	3	6.0	1	2.0	8
	Girls	7	14.0	6	12.0	3	6.0	3	6.0	19
21	Boys	5	10.0	4	8.0	4	8.0	6	12.0	19
	Girls	4	8.0	5	10.0	4	8.0	3	6.0	16
12–21	Boys	59	11.8	57	11.4	61	12.2	62	12.4	239
	Girls	47	9.4	48	9.6	49	9.8	54	10.8	198
	Boys and girls	106	10.6	105	10.5	110	11.0	116	11.6	437

Table 5 – Number of congenitally missing third molars in individual dentition quadrants in 500 boys and 500 girls at the age 12–21 years

Age group (years)	Sex	Tooth 18	Tooth 28	Tooth 38	Tooth 48	Number of congenitally missing third molars
12	Boys	9	8	9	14	40
	Girls	9	9	7	8	33
13	Boys	3	5	7	8	23
	Girls	8	6	4	6	24
14	Boys	6	7	7	7	27
	Girls	5	8	4	7	24
15	Boys	9	10	5	5	29
	Girls	3	2	7	9	21
16	Boys	7	10	5	4	26
	Girls	2	3	4	4	13
17	Boys	5	6	11	7	29
	Girls	4	5	6	5	20

Table 5 – continue

18	Boys	7	3	5	4	19
	Girls	3	1	5	3	11
19	Boys	5	3	5	6	19
	Girls	2	3	5	6	15
20	Boys	3	1	3	1	8
	Girls	7	6	3	3	19
21	Boys	5	4	4	6	19
	Girls	4	5	4	3	16
12–21	Boys	59	57	61	62	239
	Girls	47	48	49	54	198
	Boys and girls	106	105	110	116	437

Table 6 – Third molars agenesis in upper and lower jaw without consideration of third molars agenesis incidence in the opposite jaw in 500 boys and 500 girls at the age 12–21 years

Age group (years)	Sex	Upper jaw			Lower jaw		
		Number of individuals with agenesis missing of 1–2 molars		Number of congenitally with agenesis third molars	Number of individuals missing of 1–2 molars		Number of congenitally third molars
		n	%		n	%	
12	Boys	11	22.0	17	16	32.0	23
	Girls	13	26.0	18	10	20.0	15
13	Boys	5	10.0	8	9	18.0	15
	Girls	12	24.0	14	6	12.0	10
14	Boys	8	16.0	13	9	18.0	14
	Girls	8	16.0	13	9	18.0	11
15	Boys	13	26.0	19	6	12.0	10
	Girls	4	8.0	5	10	20.0	16
16	Boys	11	22.0	17	6	12.0	9
	Girls	3	6.0	5	5	10.0	8
17	Boys	7	14.0	11	13	26.0	18
	Girls	5	10.0	9	7	14.0	11
18	Boys	7	14.0	10	7	14.0	9
	Girls	3	6.0	4	5	10.0	8
19	Boys	5	10.0	8	7	14.0	11
	Girls	4	8.0	5	8	16.0	11
20	Boys	4	8.0	4	3	6.0	4
	Girls	8	16.0	13	3	6.0	6
21	Boys	6	12.0	9	6	12.0	10
	Girls	6	12.0	9	5	10.0	7
12–21	Boys	77	15.4	116	82	16.4	123
	Girls	66	13.2	95	68	13.6	103
	Boys and girls	143	14.3	211	150	15.0	226

Besides global percentage of 1–4 third molars agenesis incidence in both sexes, we were interested in the possible differences in agenesis occurrence in individual quadrants of dentition, lower and upper jaw and left and right side of dentition. We have also traced, from the clinical point of view, very important symmetry in third molars agenesis incidence. Next we have found out the degree of agenesis according to the number of congenitally missing third molars. Finally, we have determined agenesis percentage of one, whichever third molar and the number of congenitally missing molars of a single proband.

All statistical tests were performed on a 5 % level of significance.

Table 7 – Third molar agenesis only in upper jaw, only in lower jaw and in both jaws in 500 boys and 500 girls at the age 12–21 years

Age group (years)	Sex	Upper jaw			Lower jaw			Upper and lower jaw		
		Number of individuals with agenesis of 1–2 molars		Number of congenitally missing third molars	Number of individuals with agenesis of 1–2 molars		Number of congenitally missing third molars	Number of individuals with agenesis of 1–2 molars		Number of congenitally missing third molars
		n	%		n	%		n	%	
12	Boys	3	6.0	3	8	16.0	10	8	16.0	26
	Girls	6	12.0	7	3	6.0	4	7	14.0	22
13	Boys	3	6.0	4	7	14.0	12	2	4.0	7
	Girls	8	16.0	9	2	4.0	3	4	8.0	12
14	Boys	4	8.0	7	5	10.0	7	4	8.0	13
	Girls	2	4.0	3	3	6.0	3	6	12.0	18
15	Boys	10	20.0	14	4	8.0	5	3	6.0	10
	Girls	0	0.0	0	6	12.0	10	4	8.0	11
16	Boys	8	16.0	12	3	6.0	4	3	6.0	10
	Girls	1	2.0	2	3	6.0	5	2	4.0	6
17	Boys	2	4.0	3	8	16.0	11	5	10.0	16
	Girls	1	2.0	1	3	6.0	5	4	8.0	14
18	Boys	4	8.0	6	4	8.0	5	3	6.0	8
	Girls	0	0.0	0	1	2.0	2	3	6.0	9
19	Boys	4	8.0	7	6	12.0	9	1	2.0	3
	Girls	2	4.0	2	5	10.0	8	2	4.0	5
20	Boys	3	6.0	3	2	4.0	3	1	2.0	2
	Girls	6	12.0	9	1	2.0	2	2	4.0	8
21	Boys	4	8.0	6	4	8.0	6	2	4.0	7
	Girls	3	6.0	5	2	4.0	3	3	6.0	8
12–21	Boys	45	9.0	65	51	10.2	72	32	6.4	102
	Girls	29	5.8	38	28	5.6	45	37	7.4	113
	Boys and girls	74	7.4	103	79	7.9	117	69	6.9	215

Results

Results are summarized in the tables. Calculations of values in Tables 3, 4, 5, 6, 7, 8, 10 and 12 come out from the whole sample group, while Tables 9, 11 and 13 refer only to those individuals with 1–4 molars agenesis.

The overview of incidence of 1–4 third molars agenesis in both sexes at the age between 12–21 years inclusive is shown in Table 3. It shows, that agenesis of one to four third molars was present in boys' group in 128 cases out of 500, that is 25.6 %, in the girls' group in 97 cases out of 500, that is in 19.4 %. The difference between these two groups is statistically significant (Chi-square=4.763). In the group of boys and girls together, we found the agenesis of one to four third molars in 225 cases, which is 22.5 %.

Hundred and twenty-eight boys had 239 congenitally missing third molars, 97 girls had 198 of congenitally missing third molars. On average each boy has 1.9 congenitally missing third molars, each girl has 2.0 congenitally missing third molars.

Table 8 – Agenesis of both third molars in upper jaw, lower jaw and both jaws in 500 boys and 500 girls at the age 12–21 years

Age group (years)	Sex	Number of individuals with agenesis of 1–4 third molars	Number of individuals					
			Upper jaw		Lower jaw		Upper and lower jaw	
			n	%	n	%	n	%
12	Boys	19	6	12.0	7	14.0	4	8.0
	Girls	16	5	10.0	5	10.0	3	6.0
13	Boys	12	3	6.0	6	12.0	1	2.0
	Girls	14	2	4.0	4	8.0	1	2.0
14	Boys	13	5	10.0	5	10.0	1	2.0
	Girls	11	5	10.0	2	4.0	2	4.0
15	Boys	17	6	12.0	3	6.0	1	2.0
	Girls	10	1	2.0	6	12.0	1	2.0
16	Boys	14	6	12.0	3	6.0	1	2.0
	Girls	6	2	4.0	3	6.0	1	2.0
17	Boys	15	4	8.0	5	10.0	2	4.0
	Girls	8	4	8.0	4	8.0	2	4.0
18	Boys	11	3	6.0	2	4.0	1	2.0
	Girls	4	1	2.0	3	6.0	1	2.0
19	Boys	11	3	6.0	4	8.0	0	0.0
	Girls	9	1	2.0	3	6.0	0	0.0
20	Boys	6	0	0.0	1	2.0	0	0.0
	Girls	9	5	10.0	3	6.0	2	4.0
21	Boys	10	3	6.0	4	8.0	1	2.0
	Girls	8	3	6.0	2	4.0	0	0.0
12–21	Boys	128	39	7.8	40	8.0	12	2.4
	Girls	97	29	5.8	35	7.0	13	2.6
	Boys and girls	225	68	6.8	75	7.5	25	2.5

Incidence of agenesis of just one, whichever third molar, is 12.0 % in boys and 9.9 % in girls.

Incidence of third molars agenesis in individual quadrants of dentition according to different age groups and according to sexes is shown in Tables 4 and 5. In boys, the most often is affected the lower right quadrant (62 ageneses of M_3); upper left quadrant is minimally affected (57 ageneses of M_3). In girls, the highest incidence is also in the lower right quadrant (54 ageneses of M_3), and the lowest incidence is in the upper right quadrant (47 ageneses of M_3). The differences are not statistically significant.

The incidence of third molars agenesis in the upper and lower jaw is shown in Tables 6 and 7. In both sexes, the agenesis is demonstrated with slight ascendancy in lower jaw.

Table 9 – Agenesis of both third molars in upper jaw, lower jaw and both jaws in 128 boys and 97 girls with 1–4 third molars agenesis at the age 12–21 years

Age group (years)	Sex	Number of individuals with agenesis of 1–4 third molars	Number of individuals					
			Upper jaw		Lower jaw		Upper and lower jaw	
			n	%	n	%	n	%
12	Boys	19	6	31.6	7	36.8	4	21.1
	Girls	16	5	31.3	5	31.3	3	18.8
13	Boys	12	3	25.0	6	50.0	1	8.3
	Girls	14	2	14.3	4	28.6	1	7.1
14	Boys	13	5	38.5	5	38.5	1	7.7
	Girls	11	5	45.5	2	18.2	2	18.2
15	Boys	17	6	35.3	3	17.6	1	5.9
	Girls	10	1	10.0	6	60.0	1	10.0
16	Boys	14	6	42.9	3	21.4	1	7.1
	Girls	6	2	33.3	3	50.0	1	16.7
17	Boys	15	4	26.7	5	33.3	2	13.3
	Girls	8	4	50.0	4	50.0	2	25.0
18	Boys	11	3	27.3	2	18.2	1	9.1
	Girls	4	1	25.0	3	75.0	1	25.0
19	Boys	11	3	27.3	4	36.4	0	0.0
	Girls	9	1	11.1	3	33.3	0	0.0
20	Boys	6	0	0.0	1	16.7	0	0.0
	Girls	9	5	55.5	3	33.3	2	22.2
21	Boys	10	3	30.0	4	40.0	1	10.0
	Girls	8	3	37.5	2	25.0	0	0.0
12–21	Boys	128	39	30.5	40	31.3	12	9.4
	Girls	97	29	29.9	35	36.1	13	13.4
	Boys and girls	225	68	30.2	75	33.3	25	11.1

Symmetry of agenesis incidence in upper and lower jaw is recorded in Tables 8 and 9. Symmetry of agenesis in one jaw was judged without respect of agenesis in the opposite jaw. In the upper jaw, the symmetry holds in both sexes equally at about 30 %, in the lower jaw the values were a little bit higher – 31.3 % in boys and 36.8 % in girls (Table 9). Agenesis of all four third molars is recorded in Tables 8, 9, 10 and 11. In boys it was found to be 9.4 % and in girls 13.4 % (Table 9 and 11).

Coincidence of third molars agenesis on right or left side of dentition, disregarding the agenesis of contralateral third molars, can be seen in Tables 10 and 11. In boys, the coincidence of third molar agenesis on the right side of dentition was found to be 14.8 %, and on the left side of dentition 21.9 %. In girls the corresponding values are 21.6 % on the right side of dentition and 17.5 % on the left side. The differences are not statistically significant (Table 11).

Table 10 – Agenesis of both third molars in the right side, left side and in both sides of dentition in 500 boys and 500 girls at the age 12–21 years

Age group (years)	Sex	Number of individuals with agenesis of 1–4 third molars	Number of individuals					
			Right side of dentition		Left side of dentition		Both sides of dentition	
			n	%	n	%	n	%
12	Boys	19	8	16.0	4	8.0	4	8.0
	Girls	16	4	8.0	4	8.0	3	6.0
13	Boys	12	2	4.0	1	2.0	1	2.0
	Girls	14	2	4.0	2	4.0	1	2.0
14	Boys	13	1	2.0	3	6.0	1	2.0
	Girls	11	4	8.0	3	6.0	2	4.0
15	Boys	17	1	2.0	3	6.0	1	2.0
	Girls	10	2	4.0	1	2.0	1	2.0
16	Boys	14	2	4.0	2	4.0	1	2.0
	Girls	6	1	2.0	1	2.0	1	2.0
17	Boys	15	2	4.0	4	8.0	2	4.0
	Girls	8	3	6.0	2	4.0	2	4.0
18	Boys	11	1	2.0	1	2.0	1	2.0
	Girls	4	2	4.0	1	2.0	1	2.0
19	Boys	11	1	2.0	0	0.0	0	0.0
	Girls	9	1	2.0	0	0.0	0	0.0
20	Boys	6	0	0.0	1	2.0	0	0.0
	Girls	9	2	4.0	2	4.0	2	4.0
21	Boys	10	1	2.0	1	2.0	1	2.0
	Girls	8	0	0.0	1	2.0	0	0.0
12–21	Boys	128	19	3.8	28	5.6	12	2.4
	Girls	97	21	4.2	17	3.4	13	2.6
	Boys and girls	225	40	4.0	45	4.5	25	2.5

The number of cases with agenesis of one, two, three and four third molars in individual age groups are shown in Tables 12 and 13. In boys, the most frequent agenesis is of one single molar (43.0 %), followed by agenesis of two (36.7 %), three (10.9 %) and four third molars (9.4 %). In girls, the sequence of agenesis is a little different. The most frequent is the agenesis of two (37.1 %), then one (36.1 %), while agenesis of three and four third molars occurs equally frequently (13.4 %) (Table 13).

Discussion

The original findings of the study concerning the difference of both sexes in the incidence of third molars agenesis have brought a surprise. Generally, the

Table 11 – Agenesis of both third molars in the right side, left side and both sides of dentition in 128 boys and 97 girls with 1–4 molars agenesis at the age 12–21 years

Age group (years)	Sex	Number of individuals with agenesis of 1–4 third molars	Number of individuals					
			Right side of dentition		Left side of dentition		Both sides of dentition	
			n	%	n	%	n	%
12	Boys	19	8	42.1	4	21.1	4	21.1
	Girls	16	4	25.0	4	25.0	3	18.8
13	Boys	12	2	16.7	1	8.3	1	8.3
	Girls	14	2	14.3	2	14.3	1	7.1
14	Boys	13	1	7.7	3	23.1	1	7.7
	Girls	11	4	36.3	3	27.3	2	18.2
15	Boys	17	1	5.9	3	17.6	1	5.9
	Girls	10	2	20.0	1	10.0	1	10.0
16	Boys	14	2	14.3	2	14.3	1	7.1
	Girls	6	1	16.7	1	16.7	1	16.7
17	Boys	15	2	13.3	4	26.7	2	13.3
	Girls	8	3	37.5	2	25.0	2	25.0
18	Boys	11	1	9.0	1	9.0	1	9.0
	Girls	4	2	50.0	1	25.0	1	25.0
19	Boys	11	1	9.1	0	0.0	0	0.0
	Girls	9	1	11.1	0	0.0	0	0.0
20	Boys	6	0	0.0	1	16.7	0	0.0
	Girls	9	2	22.2	2	22.0	2	22.0
21	Boys	10	1	10.0	1	10.0	1	10.0
	Girls	8	0	0.0	1	12.5	0	0.0
12–21	Boys	128	19	41.8	28	21.9	12	9.4
	Girls	97	21	21.6	17	17.5	13	13.4
	Boys and girls	225	40	17.8	45	20.0	25	11.1

opinion prevails, supported by former experience, that third molars agenesis as well as hypodontia are more frequent in women [23,36,37]. Even the authors who did not find significant intersexual differences show a little predominance in females. Among these authors are, for example, *Grahnén* [11], *Adler and Adler-Hradecky* [1], *Speckin* [42], *Hölzl* [19], *Mok and Ho* [29]. From the available literature only three authors – *Lynham* [27], *Haaviko* [14] and *Murtomaa et al.* [30] – have recorded more frequent incidence of third molars agenesis in males, significant findings are just from the first one. Very low percentage of agenesis in females (6 %) without possible comparison to males gave BANKS [2].

In our study, the incidence of third molars agenesis is more frequent in boys than in girls. The difference is statistically significant at the level of 5 %. Considerable differences exist between individual age groups, numerous superiority of girls we find just in the group of thirteen and twenty years old. It does not seem, that this result is an accidental finding. In this context, it might be possible to come up with

Table 12 – Agenesis of one, two, three and four third molars in 500 boys and 500 girls at the age 12–21 years

Age group (years)	Sex	Individuals with 1–4 third molar agenesis		Individuals with congenitally missing 1, 2, 3, 4 third molars							
				1 molar		2 molars		3 molars		4 molars	
		n	%	n	%	n	%	n	%	n	%
12	Boys	19	38.0	8	16.0	5	10.0	2	4.0	4	8.0
	Girls	16	32.0	7	14.0	4	8.0	2	4.0	3	6.0
13	Boys	12	24.0	4	8.0	6	12.0	1	2.0	1	2.0
	Girls	14	28.0	8	16.0	3	6.0	2	4.0	1	2.0
14	Boys	13	26.0	4	8.0	5	10.0	3	6.0	1	2.0
	Girls	11	22.0	4	8.0	3	6.0	2	4.0	2	4.0
15	Boys	17	34.0	9	18.0	5	10.0	2	4.0	1	2.0
	Girls	10	20.0	2	4.0	6	12.0	1	2.0	1	2.0
16	Boys	14	28.0	6	12.0	5	10.0	2	4.0	1	2.0
	Girls	6	12.0	1	2.0	4	8.0	0	0.0	1	2.0
17	Boys	15	30.0	7	14.0	4	8.0	2	4.0	2	4.0
	Girls	8	16.0	2	4.0	2	4.0	2	4.0	2	4.0
18	Boys	11	22.0	5	10.0	5	10.0	0	0.0	1	2.0
	Girls	4	8.0	1	2.0	2	4.0	1	2.0	1	2.0
19	Boys	11	22.0	4	8.0	6	12.0	1	2.0	0	0.0
	Girls	9	18.0	5	10.0	4	8.0	1	2.0	0	0.0
20	Boys	6	12.0	4	8.0	2	4.0	0	0.0	0	0.0
	Girls	9	18.0	3	6.0	4	8.0	0	0.0	2	4.0
21	Boys	10	20.0	4	8.0	4	8.0	1	2.0	1	2.0
	Girls	8	16.0	2	4.0	4	8.0	2	4.0	0	0.0
12–21	Boys	128	25.6	55	11.0	47	9.4	14	2.8	12	2.4
	Girls	97	19.4	35	7.0	36	7.2	13	2.6	13	2.6
	Boys and girls	225	22.5	90	9.0	83	8.3	27	2.7	25	2.5

interesting finding that each individual gets in boys 1.9, in girls 2.0 of third molars agenesis. The difference is caused by a higher number of three to four tooth agenesis in girls while in boys 1–2 tooth agenesis are predominant.

Graber [10], whose major point of interest is the way genetic transfer of tooth number anomalies, gives intersexual differences in the hypodontia incidence considerable importance. But he concedes, that: "The explanation for how the diversities in gender are inherited remains a muffled secret for the time being."

If we follow the incidence of the third molar agenesis according to individual quadrants of dentition (Table 4 and 5), we find the most frequent agenesis in the lower right quadrant in both sexes. However, the differences are not statistically significant. It is probably an coincidental finding, as it is possible to find in papers of other authors, from whom only *Garn* [8] has finding similar to ours. The upper right quadrant ageneses is comparatively the most frequent (*Sonnabend* [41], *Speckin* [42], *Krekeler et al.* [24], *Hölzl* [19]). The lower left quadrant stays on first place in *Hübenthal's* [21] and also *Scherngell's* [39] findings.

Table 13 – Agenesis of one, two, three and four third molars in 128 boys and 97 girls at the age 12–21 years

Age group (years)	Sex	Individuals with 1–4 third molar agenesis	Individuals with congenitally missing 1, 2, 3, 4 third molars							
			1 molar		2 molars		3 molars		4 molars	
		n	n	%	n	%	n	%	n	%
12	Boys	19	8	42.1	5	26.3	2	10.5	4	21.1
	Girls	16	7	43.7	4	25.0	2	12.5	3	18.8
13	Boys	12	4	33.4	6	50.0	1	8.3	1	8.3
	Girls	14	8	57.2	3	21.4	2	14.3	1	7.1
14	Boys	13	4	30.8	5	38.4	3	23.1	1	7.7
	Girls	11	4	36.3	3	27.3	2	18.2	2	18.2
15	Boys	17	9	52.9	5	29.4	2	11.8	1	5.9
	Girls	10	2	20.0	6	60.0	1	10.0	1	10.0
16	Boys	14	6	42.9	5	35.7	2	14.3	1	7.1
	Girls	6	1	16.7	4	66.6	0	0.0	1	16.7
17	Boys	15	7	46.7	4	26.7	2	13.3	2	13.3
	Girls	8	2	25.0	2	25.0	2	25.0	2	25.0
18	Boys	11	5	45.5	5	45.5	0	0.0	1	9.0
	Girls	4	1	25.0	2	50.0	1	25.0	1	25.0
19	Boys	11	4	36.3	6	54.6	1	9.1	0	0.0
	Girls	9	5	55.5	4	44.4	1	11.1	0	0.0
20	Boys	6	4	66.6	2	33.4	0	0.0	0	0.0
	Girls	9	3	33.4	4	44.4	0	0.0	2	22.2
21	Boys	10	4	40.0	4	40.0	1	10.0	1	10.0
	Girls	8	2	25.0	4	50.0	2	25.0	0	0.0
12–21	Boys	128	55	43.0	47	36.7	14	10.9	12	9.4
	Girls	97	35	36.1	36	37.1	13	13.4	13	13.4
	Boys and girls	225	90	40.0	83	36.9	27	12.0	25	11.1

When comparing incidence of third molars agenesis in upper and lower jaws (Table 6 and 7), our group displays a little domination of the lower jaw. A similar situation is given by *Garn et al.* [8]. These results are sporadic, majority of authors refer about dominancy in the upper jaw when talking about incidence of this anomaly. Here belong with their results *Sonnabend* [41], *Krekeler et al.* [24], *Hölzl* [19], *Grahnén* [11]. Approximately equal findings are described by *Bredy et al.* [4], *Adler and Adler-Hradecky* [1], *Hübenthal* [21] and *Speckin* [42].

The symmetry in incidence of third molars agenesis has considerable clinical importance. As opposed to other authors we find symmetrical incidence in approximately 30 % in both jaws and in both sexes (Table 9). In the upper jaw show *Adler and Adler-Hradecky* [1] symmetry in 42.9 %, *Grahnén* [11] in 46.0 % and *Sonnabend* [41] in 41.0 %, in the lower jaw than in 56.3 %, 57.0 % and 35.0 %. The works of all the authors confirms tendency to symmetry in incidence of third molars agenesis. *Gülzow and Peters* [13] explain this fact with the symmetrical bodily structure.

Contrary to the frequent horizontal symmetry, the coincidental vertical incidence of both third molars agenesis on the right and left side of dentition (Table 11) is much less common. This finding is in accordance with the literature [19,21,41,43,45,46).

The reality that the term agenesis of third molar means in every individual four possibilities, that means congenitally missing of one, two, three or four third molars, very complicates any evaluation. Common term “agenesis of one to four third molars”, taken to an individual is for exact analysis of this anomaly not suitable. This problem is mainly important for observation of the mutual relationships between third molar agenesis and agenesis of other teeth. In every study it is therefore necessary to consider not only the number of monitored individuals, but also the number of congenitally missing third molars.

Variability of the third molar development, gives every group a unique character. Considering it, differences in close populations can be explained. To achieve significance of these differences would require very high number of probands would be necessary.

Differences between both sexes always exist. They are given not only by the different frequency of agenesis incidence, but also by its relevancy. It is therefore desired to refer all values for each sex separately. Only this might enable to find causes of these differences. Our exceptional findings on the sexual differences might become a stimulation for other studies of this problem.

Conclusion

Data, concerning the incidence of third molars agenesis, belong to the essential characteristics of the dentition’s status of the given population. Dental developmental anomalies can indicate the degree of genetic load of individuals and relatives. By analyzing the global term “agenesis of one to four third molars” it is

possible to receive data, which are significant for the orthodontic therapy plan. Regular monitoring of the third molars agenesis incidence should become an integral part of the appropriate oral health care in the given group of population.

Because of the considerable differences in the incidence of the third molars agenesis shown in individual studies, results cannot be transferred from one to other ethnic group or population. To get reliable data on the third molars agenesis, we had to study a sample of the Czech population. Detailed study on a valid material, which considers all aspects of the third molars agenesis, has not been yet published in our country.

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