

## THIRD MOLAR DEVELOPMENT EVALUATION OF CHILDREN IN MIXED DENTITION ACCORDING TO AGE IN THE WESTERN MEDITERRANEAN REGION IN TURKEY

Zuhal KIRZIOĞLU, ZülfikarZahit ÇİFTÇİ, Ayşegül SARITEKİN, CeylanÇağıl YETİŞ



1. Professor in Süleyman Demirel University, Faculty of Dentistry, Department of Pediatric Dentistry Isparta/Türkiye.
2. Doctor in Akdeniz University, Faculty of Dentistry, Department of Pediatric Dentistry, Antalya/Türkiye.
3. Research Assistant in SüleymanDemirel University, Faculty of Dentistry,
4. Department of Pediatric Dentistry, Isparta/Türkiye, Research Assistant in SüleymanDemirel University, Faculty of Dentistry,

### Article Info

#### Corresponding author:

**Dr. Z. Zahit ÇİFTÇİ**  
Akdeniz Üniversitesi,  
Diş Hekimliği Fakültesi,  
Pedodonti Anabilim Dalı,  
Konyaaltı \ Antalya \ TÜRKİYE  
[zzahitciftci@gmail.com](mailto:zzahitciftci@gmail.com)

**Key words:** Third molar; Tooth Age; Mixed Dentition; Demirjian Method



DOI: <http://dx.doi.org/10.15520/ijmhs.2016.vol6.iss5.139>

### Abstract

**Introduction:** The last erupted teeth are third molar teeth and eruption times, eruption levels and positions of third molar teeth observed differences. Third molars caused various problems such as caries and distal root resorption of neighboring second molars and crowding of anterior teeth.

**Material and method:** 770 children ages between 8-13 have panoramic radiographs evaluated. The classification determined by Demirjian was modified and used in our study to determine the existence and development levels of third molars. The radiographies were examined by two researchers. Mann-Whitney U and Wilcoxon tests were carried out in order to determine the relationship between gender and age. The relationship of each Demirjian development period with age was calculated. McNemar test was used in order to determine the developmental period distribution differences between the lower and upper third molars.

**Results:** No statistically significant difference was observed in terms of gender between the patients who have none of the third molars in radiographies and patients who have all third molars in radiographies. It has been observed that there is no statistically significant difference between males and females according to mineralization stages.

**Conclusion:** It is important to know the development periods of third molars which are important for the pedodontic treatment planning in mixed dentition period.

©2016, IJMHS, all right reserved

### INTRODUCTION

The last erupted teeth are third molar teeth and eruption times, eruption levels and positions of third molar teeth observed differences. Third molars caused various problems such as caries and distal root resorption of neighboring second molars and crowding of anterior teeth.

The existence and development of third molars have long term effects in the pedodontic, orthodontic and surgical treatment planning of children in mixed dentition period. With radiological examination of third molar, determined the existence, position and development levels of these teeth, valuable information is provided to clinicians for treatment plan. In early periods of mixed dentition lost of first and second molars due to caries, the evaluation of the development levels of these teeth play a critical role about eruption for place of first and second molars, determination of the ideal times for orthodontic treatments and transplantation cases. In addition to the clinical importance of these teeth, age determination can also be made in forensic cases by determining the development levels<sup>1,2</sup>. However, the differences observed in the

formation times and agenesis of these teeth, leads to difficulties in clinical or forensic applications.

It is known that third molars can be congenitally missing frequently. It has been reported that the ratio for one or more missing third molars varies between 9-20 %.<sup>3</sup> In addition, it is stated that the formation of third molars is observed earliest by the age of 6 and latest by the age of 16 and that the ratio for missing molars in cases when the formation has not occurred until the age of 10 is 50 %.<sup>4</sup> While it is stated that the third molar crypt appearance age varies between 5 years 10 months to 14 years 8 months,<sup>5</sup> there is also a study stating that teeth should develop latest by 13 years of age.<sup>6</sup>

Differences in populations are observed in studies examining teeth development. Hence, populity specific studies gain importance. The objective of our study is to assess the third molar development of children in mixed dentition period in Western Mediterranean Region with Demirjian Method<sup>7</sup> to determine developmental ages.

### Material and method

In our study, children ages between 8-13 have panoramic radiographies with sufficient diagnostic quality retrospectively evaluated. 770 children among examined panoramic radiographies, 770 children who live in the same region, have no disease that could have any systemic effects on teeth development, have no growth or developmental problems, have no dental anomaly and malocclusion and have full records and panoramic radiographies of sufficient quality were included in the study. Already taken consent forms were acquired from the parents of patients and the ethical approval for our study was taken from the clinical studies ethical council of our university.

Data such as age, gender, date of birth and date of radiography were recorded and with panoramic radiographies, development levels of all third molars were assessed.

The classification determined by Demirjian et al. (1973)<sup>7</sup> was modified and used in our study to determine the existence and development levels of third molars. The classification was modified (Figure 1) by adding scores of 0 (no formation is observed) and 1 (radiolucent bud).

The radiographies were examined by two researchers and randomly selected 50 panoramic radiographies were assessed and their Kappa values were determined. Mann-Whitney U and Wilcoxon tests were carried out in order to determine the relationship between gender and age. The relationship of each Demirjian development period with age was calculated. McNemar test was used in order to determine the developmental period distribution differences between the lower and upper third molars. Statistical analyses were carried out using SPSS 17.0 software.

### Results:

It was determined as a result of the rescoring of the randomly selected 50 radiographies that there was no statistically significant difference for inter-observers and intra-observers ( $p > 0,05$ ). Inter-observer agreement was determined as 94 % whereas intra-observer agreement was determined as 92 %. In our study, panoramic radiographies were examined for 770 patients whose ages varied between 8-13 (avg:  $9,82 \pm 1,49$ ) 457 (59,4 %) of whom were male and 313 (40,6 %) of whom were female. Table 1 shows the distribution of the third molar teeth determined in radiographies according to jaws.

Either all of the third molars or none are observed radiographically in about four thirds of the cases. Of the 770 patients, 346 (44,9 %) have all third molars. None of the third molars are observed in 219 (28,4 %) of the patients. The distribution of the observance of third molars in radiographies according to gender can be seen in Table 2. No statistically significant difference was observed in terms of gender between the patients who have none of the third molars in radiographies and patients who have all third molars in radiographies.

The number of cases according to the mineralization stages of the teeth numbered 18, 28, 38 and 48 for males and females along with minimum, maximum, average value and standard deviation have been given with middle, lower and upper quarter values in Tables 3 and 4. It has been observed that there is no statistically significant difference between males and females according to mineralization stages.

### Discussion

In this study, the existence and development status of the third molars in the panoramic films of children in the age group 8-13 born and living in the Western Mediterranean Region have been evaluated by modified Demirjian classification. This method was preferred because it has been stated to be simple and practical by researchers<sup>9,15</sup>, because it has a high comparability since it is frequently used in researchers and because it has high inter and intra observer agreement<sup>16</sup>. Patients in the 8-13 age group were included in the study due to the fact that the treatments planned with the extraction of primary molars along with orthodontic treatments are preferred in this age group.

In our study, there is a total of 219 (28.4 %) patients for whom no third molars are observed in their radiographies, however there is no statistically significant difference regarding gender and no observation. It is known that agenesis of third molar due to genetic reasons. In addition, it has been stated that there is a relationship in children between inferior alveolar nerve block and the agenesis of third molars and a statistically significant importance determined with agenesis of third molars in children with a history of anesthesia.<sup>8</sup> The fact that agenesis of third molars are frequently observed causes limitations in studies that examine the development of these teeth.

The difference in ethnic groups and age range in the studies that have been carried out has resulted in variations for the earliest age when crypta formation of third molars is observed. While this age is 5 years 10 months for Spanish<sup>3</sup>, it is 6-8<sup>9,10</sup> for Americans, 7<sup>11</sup> for British, 7,5<sup>12</sup> for Irish and 9<sup>13</sup> for Swiss. While in a study carried out in the Central Anatolia Region of Turkey, Uzamış et al.<sup>14</sup> report that the earliest crypta formation of maxilla third molars is during age 8, they have reported that this age decreased to 7 for mandibular teeth. In our study, Western Mediterranean Region which warmer part of our country, this value has been determined as 7,7 and 7,6 for females and males respectively and no difference between maxilla and mandibular were observed.

Richardson,<sup>4</sup> stated that in cases when third molar formation is not observed until the age of 10, qualified third molar teeth agenesis by a ratio of 50 % while Engström<sup>14</sup> and Gravelly<sup>12</sup> indicated the appearance ratio of these teeth decrease after the age of 14. There are researchers supporting the view that the latest crypta formation age can be up to 16.<sup>4,10,11,13</sup> In our study, this value was determined latest for female as 12 years 3 months and as for males as 13 years 4 months. Hence, it can be stated that the relationship between the development level of third molars and age is 'independent' and 'variable'.

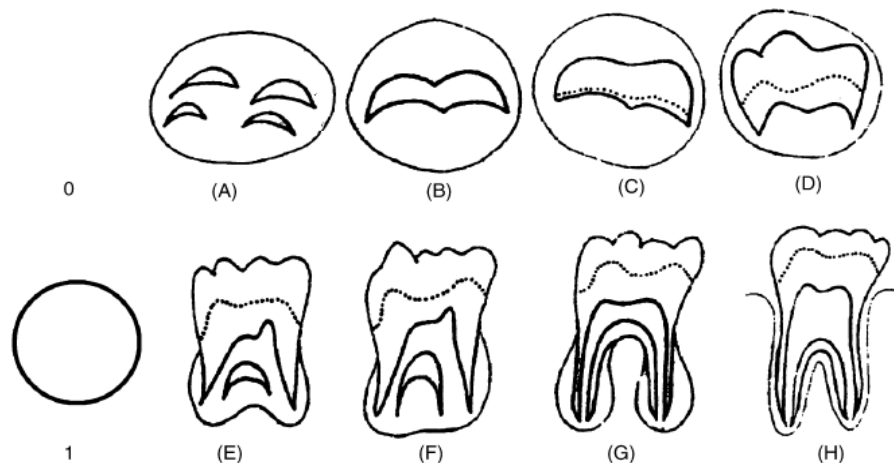
When the relationship between the third molar development level and gender is evaluated, some researchers have not determined a change in crypta formation due to gender whereas some researchers have determined that mandibular third molar crypta formation occurs earlier in males while maxilla third molar crypta formation occurs earlier in females.<sup>5,9,13,14</sup> No statistically significant difference was determined in this study as well when the relationship between crypta formation and gender is evaluated.

When the relationship between crypta formations of third molars with jaws is evaluated, it has been determined that the mandibular development occurs earlier. This results is the same with those of Uzamış et al.<sup>14</sup>,

Gorgani,<sup>9</sup>and Bolones<sup>5</sup>et.al.. However, this result may be due to radiographic techniques used in taking the images of maxilla third molars as well as the superpositions of the crypta of these teeth with the anatomic structures.On the other hand, Uzamişet.al.<sup>14</sup>stated that third molars can be

observed in radiographies only after ¼ of their crown sections have developed and that this period is 1 year after the period during which the crypta formations of third molars can be observed in radiographies.

**Figure 1: Modified Demirjian Classification**



**TeethNumber**

Gender	Total	18 n(%)	28 n(%)	38 n(%)	48 n(%)
Male	457 (%100)	239 (% 52,3)	234 (%51,2)	306 (%67)	301 (%65,9)
Female	313 (%100)	154 (%49,2)	162 (%51,8)	202 (%64,5)	200 (%63,9)
<b>Total</b>	<b>770 (%100)</b>	<b>393 (%51,0)</b>	<b>396 (%51,4)</b>	<b>508 (%65,9)</b>	<b>501 (%65)</b>

**Table 1:**Distribution of the third molar teeth determined in radiographies according to jaws

Observance of Third Molars	Male N (%)	Female N (%)	Total N (%)
1 toothmissed	26 (% 5,7)	20 (%6,4)	46 (%5,9)
2 teehmissed	68 (% 14,8)	51 (%16,2)	119 (%15,4)
3 teehmissed	19 (% 4,1)	21 (%6,8)	40 (%5,1)
Agenesis of maxillary third molars	58 (% 12,7)	42 (% 13,4)	100 (%12,9)
Agenesis of mandibular third molars	6 (% 1,3)	6 (% 1,9)	12 (%1,5)
Agenesis of allthirdmolars	132 (% 28,9)	87 (%27,8)	219 (%28,4)
Allmolarspresent	212 (% 46,4)	134 (%42,8)	346 (%44,9)

**Table 2:**The distribution of the observance of third molars in radiographies according to gender.

Toothno	Stage	N	Min	Max	Mean	SD	LQ	Median	UQ
18	0	218	7.6	13.6	9.4	1.3	8.3	9.2	10.2
	1	23	7.6	12.9	9.8	1.3	9	9.4	10.7
	A	34	7.8	13.4	9.5	1.2	8.8	9.5	9.9
	B	71	8	13.3	10.3	1.3	9.4	10.3	11.3
	C	58	8.3	13	10.8	1	10	10.9	11.6
	D	52	8.8	13.5	11.9	1	11.1	12.1	12.9
28	E	1	12.8	12.8	12.8		12.8	12.8	12.8
	0	223	7.6	13.6	9.4	1.3	8.3	9.2	10.2
	1	20	7.6	12.2	9.5	1.2	8.9	9.3	9.9
	A	40	7.8	13.4	9.7	1.1	9	9.5	10.7
	B	60	8	13.2	10.2	1.2	9.4	10.3	10.9
	C	60	8.8	13.4	10.9	1	10.1	11	12
38	D	53	8.8	13.5	11.8	1.1	11	12.1	12.8
	E	1	12.8	12.8	12.8		12.8	12.8	12.8
	0	151	7.6	13.2	9.3	1.2	8.2	9	10
	1	65	7.6	13.4	9.3	1.2	8.3	9.3	10.1
	A	63	7.8	13.3	9.7	1.1	9.1	9.7	10.1
	B	80	8.1	13.4	10.5	1.1	9.7	10.5	11.1
48	C	56	8.9	13.3	11.1	1.1	10.1	11.1	12
	D	37	7.6	13.6	12	1.2	11.4	12.3	12.9
	E	3	11.8	12.1	12	0.1	11.8	12.1	12.1
	F	2	12.8	13	12.9	0.1	12.8	12.9	13
	0	156	7.6	13.3	9.2	1.2	8.2	9	10
	1	56	7.6	12.2	9.4	1.3	8.1	9.4	10.5

**Zuhal et.al/Third Molar Development Evaluation of Children in Mixed Dentition According to Age In The Western Mediterranean Region in Turkey**

	A	71	7.8	12.8	9.7	0.9	9.1	9.7	10.1
	B	79	8.1	13.4	10.6	1.2	9.8	10.5	11.3
	C	53	8.8	13	11.1	1.1	10.1	11.1	12
	D	38	7.6	13.6	12.1	1.2	11.5	12.4	12.9
	E	2	12.1	12.1	12.1		12.1	12.1	12.1
	F	2	12.8	13	12.9	0.1	12.8	12.9	13

**Table 3:**The number of cases according to the mineralization stages of the third molar teeth for males.

Tooth No	Stages	N	Min	Max	Mean	SD	LQ	Median	UQ
18	0	159	7.6	13.1	9.4	1.2	8.4	9.2	10
	1	8	8	11	9.3	1.1	8.4	8.8	10.6
	A	34	7.7	12.3	9.8	1.1	8.9	9.8	10.4
	B	43	7.9	13.4	9.8	1.2	9	9.5	10.5
	C	38	8.8	13.4	10.7	1.2	9.8	10.5	11.9
	D	28	9.9	13.2	11.3	0.9	10.7	11.2	12
	E	3	12.2	13.3	12.9	0.6	12.2	13.3	13.3
28	0	151	7.6	12.9	9.3	1.2	8.4	9.2	10
	1	7	8	10.9	8.9	0.9	8.3	8.8	9
	A	28	7.7	12.2	9.6	1	9	9.5	10.2
	B	54	7.9	13.4	9.9	1.3	9	9.8	10.5
	C	40	8.8	13.4	10.6	1.1	9.6	10.4	11.5
	D	29	9.9	13.2	11.4	0.9	10.8	11.4	12
	E	4	12.2	13.3	12.9	0.5	12.3	13.1	13.3
38	0	111	7.6	13	9.5	1.3	8.4	9.3	10.1
	1	41	7.7	11	9	1	8.1	8.8	9.9
	A	56	7.7	13.1	9.6	1.1	8.9	9.5	10.1
	B	42	8.1	13.4	10	1.2	9	9.7	10.6
	C	42	8.8	13.4	11	1.1	10	11	12
	D	18	9.4	13	11.1	0.9	10.3	11	11.8
	E	3	12.9	13.3	13.1	0.2	12.9	13.3	13.3
48	0	113	7.6	13.1	9.4	1.2	8.3	9.2	10.1
	1	49	7.7	12.3	9.5	1.2	8.5	9.3	10.3
	A	49	7.8	13	9.5	1	8.9	9.4	10
	B	38	8.1	13.4	10	1.2	9	9.7	10.6
	C	45	8.8	13.4	11	1.1	10	11	12
	D	16	10	13	11.3	0.9	10.4	11.2	12
	E	3	12.9	13.3	13.1	0.2	12.9	13.3	13.3

**Table 4:**The number of cases according to the mineralization stages of the third molar teeth for females.

**Conclusion**

It is important to know the development periods of third molars which are important for the pedodontic treatment planning in mixed dentition period. In this study, the appearance times of third molars were tried to be determined for Turkish children living in the Western Mediterranean Region of Turkey.

It was observed when females and males were examined that the observance time of third molars were 7,7 and 7,6 respectively and no difference was observed between the jaws.

Pedodontics can be directed if studies on this topic are supported with similar studies carried out on different populations.

**REFERENCES**

1. Cantekin K, Yilmaz Y, Demirci T, Celikoglu M. Morphological analysis of third-molar mineralization for eastern Turkish children and youth. *J Forensic Sci.* 2012;57(2):531-4.
2. Li G, Ren J, Zhao S, Liu Y, Li N, Wu W, Yuan S, Wang H. Dental age estimation from the developmental stage of the third molars in western Chinese population. *Forensic Sci Int.* 2012;219(1-3):158-64.
3. Bishara SE, Andreasen G. Third molars: a review. *Am J Orthod.* 1983;83(2):131-7.
4. Richardson M. Late third molarogenesis: its significance in orthodontic treatment. *Angle Orthod.* 1980;50(2):121-8.
5. Bolaños MV, Moussa H, Manrique MC, Bolaños MJ. Radiographic evaluation of third molar development in Spanish children and young people. *Forensic Sci Int.* 2003;133(3):212-9.
6. Garn SM, Lewis AB, Vicinus JH. Third molarogenesis and reduction in the number of the other teeth. *J Dent Res* 1962;41(3):717.
7. Demirjian, A., Goldstein, H., Tanner, J.M, 1973. A new system of dental age assessment. *Hum. Biol.* 45, 221-227.
8. Swee J, Silvestri AR Jr, Finkelman MD, Rich AP, Alexander SA, Loo CY. Inferior alveolar nerve block and third-molar agenesis: a retrospective clinical study. *J Am Dent Assoc.* 2013 Apr;144(4):389-95
9. Gorgani RE, Sullivan L, DuBois A. A radiographic investigation of third molar development. *ASDC J Dent Child* 57 (1990) 106-110
10. Silling G. Development and eruption of the mandibular third molar and its response to orthodontic therapy. *Angle Orthod.* 1973 Jul;43(3):271-8.
11. Gravelly JF. A radiographic survey of third molar development. *Br Dent J.* 1965 Nov 2;119(9):397-401.

12. Richardson ER, Malhotra SK, Semanya K. Longitudinal study of three views of mandibular third molar eruption in males. *Am J Orthod.* 1984 Aug;86(2):119-29.
13. Engström C, Engström H, Sagne S. Lower third molar development in relation to skeletal maturity and chronological age. *Angle Orthod.* 1983 Apr;53(2):97-106.
14. Uzamiş M, Kansu O, Taner TU, Alpar R. Radiographic evaluation of third-molar development in a group of Turkish children. *ASDC J Dent Child.* 2000 Mar-Apr;67(2):136-41, 83.
15. Garamendi PM, Landa MI, Ballesteros J, Solano MA. Reliability of the methods applied to assess age minority in living subjects around 18 years old. A survey on a Moroccan origin population. *Forensic Sci Int.* 2005 Nov 10;154(1):3-12.
16. Dhanjal KS, Bhardwaj MK, Liversidge HM. Reproducibility of radiographic stage assessment of third-molars. *Forensic Sci Int.* 2006; 159:74-77).