

Dental Age Estimation Based on Third Molar Eruption in Indian Population.

Dr. Savita Akki, M.D.S¹, Dr R.S. Gugwad, M.D.S²

Dr. Rajeshwari Javali, M.D.S³,

¹Associate Professor, Department Of Dentistry, Bidar Institute Of Medical Sciences.
Bidar- Karnataka State, India.

²Professor & Hod, Department Of Dentistry, Bidar Institute Of Medical Sciences. Bidar- Karnataka State, India

³Assistant Professor, Department Of Oral Medicine and Radiology, S.B Patil Dental College, Bidar-karnataka

Abstract

Objective: To assess the dental age based on the stages of third molar eruption stages following the four stages (A–D) method of Olze et al.

Materials and Methods: In the present study, we determined the stages of third molar eruption in 169 females and 180 males aged 12 to 25 years based on radiological evidence from 349 digital orthopantomograms. The obtained data were analyzed by using t-test and f test.

Results: The results of this study provide data on the age of alveolar, gingival and complete eruption of the third molars in the occlusal plane.

Conclusion: The use of third molars as a marker of development is appropriate, specifically when compared with other skeletal age calculation techniques.

Keywords: Third molar eruption; Indian population; Dental age estimation.

I. Introduction

As the field of diagnostic radiology has undergone rapid expansion in technology and utilization in the past quarter century, so may the range of forensic applications burgeon in the near future. Age is one of the factors in establishing the identity of the person. It is well recognized that the estimation of the age may be attempted by examination of the maturation of primary and permanent dentition. Age estimation is of importance for identification of the living people who have no acceptable identification documents such as refugees, adopted children of unknown age, verification of chronological age required in order to be entitled to social benefits and to determine whether child has attained age of criminal responsibility. Forensic age assessment in living subjects has become increasingly important over the last few years.¹⁻⁴

Dental age estimation can be accurately assessed in the childhood as many teeth are developing simultaneously. Different techniques and numerous studies have been published for age estimation, each one demonstrating various accuracy, precision and reliability. To date insufficient knowledge has been obtained about how ethnic origin can influence tooth mineralization. This, however, constitutes a restraint on the reliability of age estimates and hence on the forensic value of information essential to legal security. The importance of ethnic variation in dental development requires population specific data for dental age evaluation. The present study is intended to present data on third molar eruption in different stages in Indian population samples by Olze's method. This is the first study in Indian population by utilizing this method.

II. Materials And Methods

A total of 349 digital orthopantomograms of 169 females and 180 males of Indian population aged 12 to 25 years were analyzed retrospectively. The orthopantomograms were made during the years 2015-2016 March. Patient's sex, age, identification number, date of exposure and eruption stages of the third molars were recorded for each individual subject. The age and sex distribution of the study population is shown in Table 1.

The eruption stages were evaluated using the classification of stages by Olze et al.

Stage A: Occlusal plane covered with alveolar bone.

Stage B: Alveolar eruption; complete resorption of alveolar bone over occlusal plane.

Stage C: Gingival emergence; penetration of gingiva by at least one dental cusp.

Stage D: Complete emergence in occlusal plane.

Exclusion criteria:

1. Impacted third molars were excluded from the analysis.

2. Pathologies involving third molars were excluded.
 3. Patients with developmental anomalies and syndrome were also excluded.
 4. Wisdom teeth with an unclear direction of eruption also were excluded.
- A statistical analysis was performed using t test and f test.

III. Results

The results of the statistical analysis for females are shown in Table 2 and for males in Table 3. For both the sexes, data show that mean of chronological age increased with increasing age within the age interval.

Between the sexes, Stage A was first achieved by 12 years in both males and females. Stage B was attained by males between 12 and 14 years and between 13 and 14 years in females. The appearance of Stage C was between the age of 14 to 18 years in females and 17 to 18 years in males. Stage D was achieved first by females between the age of 16 and 17 years and by 18 years in males. (Table 2 and table 3).

For stage A, the means varied for both the sexes between 12.1 and 14.4 years. The means of stage B were between 14.9 and 17.5 years. The means of stage C showed a range between 18.9 and 21 years. For stage D mean is 22 years.

The occurrence of stage A was found to be more significant in females than males while the occurrence of stage B was found to be significant in both sexes. The occurrence of stage C and D was found to be insignificant in both sexes as shown in Table 4.

Between the third molars, earliest appearance was attained by mandibular right 3 rd molar.

Table 1: Age and gender distribution of the study population.

Age (years)	Number Male	Number Female
12	21	15
13	9	11
14	4	11
15	4	7
16	3	4
17	5	10
18	12	17
19	11	7
20	19	14
21	14	5
22	27	13
23	10	11
24	23	18
25	18	26

Table 2 : The results of the statistical analysis for females.

Tooth	Stage	Number of cases	Minimum age	Maximum age	Mean	Median	SD
18	A	33	12	18	14.4	14	2.3
18	B	22	14	23	17.5	17.5	2.7
18	C	12	14	23	19.3	19.5	2.6
18	D	72	17	25	22.6	23	2.2
28	A	34	12	18	13.4	13.5	1.6
28	B	24	14	20	16.9	17.5	2.0
28	C	12	17	24	21.8	21.5	2.3
28	D	74	17	25	22.7	24	2.3
38	A	27	12	15	12.6	12	0.7
38	B	31	13	21	15.9	16	1.8
38	C	08	18	23	19.5	18.5	2
38	D	96	16	25	22.4	23	2.4
48	A	28	12	15	12.6	12	0.7
48	B	29	13	20	15.7	15	1.8
48	C	10	17	21	18.9	18.5	1.2
48	D	97	16	25	22.2	23	2.6

Table 3: The results of the statistical analysis for females.

Tooth	Stage	Number of cases	Minimum age	Maximum age	Mean	Median	SD
18	A	25	12	17	12.8	12	1.35
18	B	15	14	19	16.8	17	1.6
18	C	18	18	24	19.8	19.5	1.8
18	D	84	18	25	22.3	22	2
28	A	29	12	16	12.5	12	1.1

28	B	23	14	19	16.7	17	1.6
28	C	21	17	23	19.4	19	1.7
28	D	111	18	25	22.3	22	2
38	A	29	12	13	12.3	12	0.4
38	B	15	12	17	15.1	15	1.4
38	C	24	17	22	19.7	20	1.6
38	D	109	18	25	22.2	22	2
48	A	24	12	13	12.1	12	0.3
48	B	19	12	18	14.9	15	1.8
48	C	20	17	22	19.5	19	1.6
48	D	118	18	25	22	22	2.1

Table 4: Probability values of stages A, B, C and D between the males and females.

	Male Tooth 18,28,38 &48		Female Tooth 18,28,38 &48	
	f value	p value	f value	p value
Stage A	2.32	p>0.05	9.39	p<0.001
Stage B	6.71	p<0.001	3.15	p<0.05
Stage C	0.29	p>0.05	2.21	p>0.05
Stage D	0.34	p>0.05	0.57	p>0.05

Table 5: probability values between the third molars.

	Tooth 18 Between male & female		Tooth 28 Between male & female		Tooth 38 Between male & female		Tooth 48 Between male & female	
	t- value	p value	t- value	p- value	t value	p value	t value	p value
Stage A	3.14	P<0.01	2.30	P<0.05	1.61	p>0.05	2.49	p<0.05
Stage B	0.89	p>0.05	0.41	p>0.05	1.54	p>0.05	1.47	p>0.05
Stage C	0.69	p>0.05	2.16	P<0.05	0.40	p>0.05	1.03	p>0.05
Stage D	0.71	p>0.05	1.30	p>0.05	0.60	p>0.05	0.55	p>0.05

Note: -p >0.05 insignificant

P < 0.05 or 0.01 significant

P < 0.001 highly significant.

IV. Discussion

A single reason to rely on third molar formation to estimate chronological age is that there are very few alternative methods during the interval between the mid-teens and early 20s. Age estimation in adults would be challenging as the development of dentition completes by this age and there is no clue which could be reliable to assess the age. The two criteria that can be utilized for age determination in adults are assessment of volume of pulp cavity and of third molar development.⁵

The chronological age can be estimated based on the sequence of eruption of deciduous and permanent teeth between the ages of 5 years to 12 years. However from the age of 12-13 years till the early 20's, age estimation is based on the third molar eruption. In this study we applied Olze's method in subjects from Bidar and it showed good correlation with chronological age of the individual.

In this study, the clinical appearance of third molars in the oral cavity is first attained in females at the mean age of 18.9 years and in males at the mean age of 19 years. Complete occlusion is achieved at the median age of 22 years in males and 23 – 24 years in females.

It is also observed that the third molars are erupted in to occlusion early in males compared to females.

A study conducted by Mullerto analyze third molar emergence in 823 German subjects aged between 16 to 40 years. In this study third molars emerged by the age of 17 years and more than 50% of the complete set of third molars had emerged by 21 years of age.⁶

Another study was carried out by Rantanen to investigate the clinical emergence of third molars in 2218 Finnish subjects ranging from 16 to 24 years. According to this study, male subjects showed third molar emergence roughly 1.5 years earlier than those of the females. The median age of maxillary and mandibular third molar eruption in the males was in the age range of 21.7 to 21.8 years and 23.0 to 23.3 years in females.⁷

The age of alveolar, gingival eruption and mineralization state of third molars was studied by Levesque et al in 2278 male and 2362 female Franco-Canadians of ages ranging from 7 to 25 years. This study based on orthopantomograms revealed that alveolar eruption occurred at a mean age of 17.7 years in females and 17.2 years in the male subjects. Complete clinical emergence of the wisdom teeth occurred at the age of 19.0 years in the female subjects and 18.5 years in the males.⁸

Olze et al analyzed and compared the chronological course of third molar eruption in German, Japanese, and South African populations. They found that the investigated German population has an intermediate rate of dental development as determined by comparing the different ages of third molar eruption.

The defined eruption stages occurred at earlier ages in the investigated South African population, and at later ages in the Japanese population. Statistically significant population differences were observed in males at stages A and B. The South African males were a mean of 3.0 to 3.2 years younger than the German males at these stages of development, and the Japanese males were a mean of 3.1 to 4.2 years older than their South African counterparts. The females exhibited statistically significant population differences at stages A, B and C. The South African women reached the target stages a mean of 1.6 to 1.8 years earlier than the German women, whereas the Japanese women were a mean of 0.9 to 3.3 years older than their German counterparts.⁹

Olze et al conducted a radiological study based on 605 conventional orthopantomograms to determine the stages of third molar eruption in 347 female and 258 male First Nations People of Canada aged 11-29 years. This study presented data on the age of alveolar, gingival, and complete eruption of the third molars in the occlusal plane that can be used for forensic estimation of the minimum and most probable ages of investigated individuals.¹⁰

The results obtained by our present study shows that stage A (occlusal plane covered with alveolar bone) to estimate age was found to be more reliable in females than males, whereas the stage B (Alveolar eruption; complete resorption of alveolar bone over occlusal plane) to estimate age was found to be more reliable in both males and females.

V. Conclusion

The results of our study using Olze's method showed a good assessment of dental age in young adults. Statistically there is significant difference found between females and males. Olze's method can be clinically accepted with regard to accuracy and ease of assessment. This study provides essential data on the age of alveolar, gingival, and complete eruption of the third molars in the occlusal plane that can be utilized with ease for dental age estimation which plays a vital role in forensic dentistry.

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