

Accuracy of Demirjian Age Estimation Method in South India Kadapa [A.P] Population-A Cross Sectional Study

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Abstract

Background: Demirjian's technique of age assessment based on tooth development stages has been extensively investigated in different populations of the world. **Aim:** The present study is to assess the applicability of Demirjian's modified 8-teeth technique in age estimation of population of south India (Kadapa) **Materials and Method:** Two hundred pre-treatment orthodontic radiographs of patients in an age group of 10-20 years with representation from both genders were assessed for eight left mandibular teeth and scored as per the Demirjian's criteria. Statistical analysis was performed to compare the estimated and actual age. **Results:** The results revealed that the mean value in age estimation of the entire sample was 1.39 years. The Mean value in males and females (10-20 years) was 1.33 and 1.46 respectively. **Conclusion:** significant positive correlation with estimating dental age in which chronological age is higher compared to dental age.

Keywords: Age estimation, Demirjian's method, forensic odontology, Indian-specific formulas.

Introduction

Age estimation has a particular medico legal significance. Estimation of age is one of the major components towards establishment of one's identity¹. Age estimation of the individuals play a vital role in many dental forensic as well as anthropology and archaeology disciplines. Age estimation is essential for the purpose of absolute identification in the living individual in civil cases like attainment of majority, voting rights, marriage, pension payments, inheritance, passport, driving license, insurance claims, disputed sex, missing persons, consent for operations, organ donation and criminal cases like persons accused of assault, forced prostitution, murder, rape, impersonation, kidnapping and juvenile offenders etc².

The method most frequently used in forensic dentistry was described by Demirjian et al^{3,4}. Their method described the use of tooth development stages

to calculate the dental age by using statistical equations. Further the classic Demirjian Method had divided the tooth development into 8 stages (A to H stages) of development, whereas the researchers have studied and added two more development stages between these 8 stages and have modified to give numbers to the ten developmental stages i.e. from 0 stage to 9 stages, to bring about more accuracy in the dental age estimation using Demirjian Method^{3,4}. Also these modifications in Demirjian Method studied in Indian samples have shown promising results^{5,6}.

The present study is to assess the applicability of Demirjian's modified 8-teeth technique in age estimation of population of south India (Kadapa). In this study shall be to correlate the developmental stages of all the 8 teeth Present on the lower left quadrant with chronological age evaluated on orthopantomograms [OPGs].

Materials and Method

OPGs of 200 patients of Andhra Pradesh [Kadapa] origin with known age proof between the age Group of 10-20 years were selected. The sample consisted of 100 boys and 100 girls and procured from the private diagnostics institution and clinics in Kadapa. It is a cross-

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sectional study. Approval from Ethical committee of JSS Academy of higher education and research, Mysore was obtained. Indian Formulas for Age^{7,8,9}. Estimation (developed on a sample of 165 males and 296 females aged 7 to 25 years):

1. For males, Age = $27.4351 - (0.0097 \times S2) + (0.000089 \times S3)$

2. For females, Age = $23.7288 - (0.0088 \times S2) + (0.000085 \times S3)$

All the data were analyzed using Microsoft Excel and statistical package SPSS version 20.0. Paired 't' test for mean chronological and dental ages of the selected sample was done. The date was sorted with respect to sex. Means are calculated for males and females separately. Linear correlation coefficient was calculated between each pair of chronologic age and the dental age

Inclusion Criteria

- 1) Subjects with both parents from AndhraPradesh
- 2) Having no medical history and no obvious dental pathology on the panoramic radiograph related to mandibular left teeth
- 3) Patients between the age of 10 and 20 years at the time the OPG was taken.

Exclusion Criteria

- 1) Subjects without proper age proof.
- 2) Any teeth missing in the left mandibular arch
- 3) Image deformity affecting area of study.
- 4) Impacted/malformed teeth
- 5) Orthopantomogram showing obvious dental pathology.

Results

The radiographic evaluation of the tooth developmental stages was determined according to the 10 stage criteria given by Modified Demerjans Method. The results showed significant correlation between the chronological age and the estimated dental age.

Table 1: Age wise distributionof subjects used for the study

Age group	Boys	Girls	total
10-11	12	14	26
11-12	12	18	30
12-13	11	6	17
13-14	10	10	20
14-15	9	6	15
15-16	11	8	19
16-17	16	19	35
17-18	2	7	9
18-19	17	12	29
Total	100	100	200

Table 2: T-Test: Overalltable

Mean Chronilogical And Dental Ages Of The Entire Sample					
		Mean	N	Std. Deviation	Std. Error Mean
Pair 1	dental age	12.5802	200	2.04465	.14458
	chron_age	13.9794	200	2.69597	.19063

[Table 03] Results of paired 't' test for mean chronologiactal and dental ages of the entire sample						
Mean		Paired Differences		T	Df	Sig. (2-tailed)
		Std. Deviation				
Pair 1	dental_age - chron_age	-1.39925	1.91603	-10.328	199	.000

The mean dental age was 12.5802 years with the standard deviation of 2.04465, where as the mean chronological age was 13.9794 with the S.D value of 2.69597. When Independent samples 't' test was applied for the mean difference of 1.39925, t value of 10.328 was found to be significant at .000 level. From the mean values it is clear that chronological age was significantly higher than the dental age.

Table 4 : T –Test[Males]

MEAN CHRONOLOGICAL AND DENTAL AGES OF THE MALE SAMPLE					
		Mean	N	Std. Deviation	Std. Error Mean
Pair 1	dental_age	12.7312	100	1.89189	.18919
	chron_age	14.0616	100	2.70011	.27001

[Table 5]: Results of paired samples 't' test for mean chronological and dental ages of the male sample						
Mean		Paired Differences		T	df	Sig. (2-tailed)
		Std. Deviation				
Pair 1	dental_age - chron_age	-1.33040	2.07253	-6.419	99	.000

The mean dental age was 12.7312 years with the standard deviation of 1.89189, where as the mean chronological age was 14.0616 with the S.D value of 2.70011. When Independent samples 't' test was applied for the mean difference of 1.33040, t value of 6.419 was found to be significant at .000 level. From the mean values it is clear that chronological age was significantly higher than the dental age.

Table 6 : T –Test [Females]

Mean chronologiactal and dental ages of the female sample					
		Mean	N	Std. Deviation	Std. Error Mean
Pair 1	dental_age	12.4291	100	2.18588	.21859
	chron_age	13.8972	100	2.70290	.27029

Summary

The determination of dental age is of great importance in the field of dentistry, forensic medicine, anthropology etc. Many researchers have studied and analyzed dental age using the classic Demirjian method which had originally been formulated on French-Canadian population^{12,13}. Later on modifications were done in this method like addition of two extra teeth developmental stages making it to total 10 stages in place of 8 stages. Similarly due to effects of many external factors like different population groups, caste, culture, gender, environments etc, the area specific studies were conducted by many scholars. The present study has used the India specific Formula for the south Indian study group to know its reliability. The easy availability of panoramic radiographs in dental disciplines for various Clinical purposes can also help in age estimation through assessment of the different stages of tooth development are considered the best way to estimate the age in individuals^{14,15}.

This shall also indicate the skeletal maturity in the subjects under test, thereby reducing the radiation exposure towards obtaining multiple hand-wrist radiographs. More over the estimation of dental age using the Modified 10 Scale Demirjian's Method gives the reliable results¹⁶.

Thus, the present study indicates that this population specific age estimation method can have valid clinical as well as forensic applications for south Indian KADAPA population. The results of our study have concluded that the Demirjian method showed high accuracy when applied to Andhrapradesh Kadapa population. The results demonstrated that Demirjian method produced significant differences between dental age and chronological age in the study group. Significant positive correlation with estimated dental age in which chronological age is higher compared to dental age.

Ethics committee approval: Taken

Conflict of Interest: None declared

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