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# Original Research

## Comparative evaluation of dental age and chronological age between 7-18 yrs aged children in Jammu and Kashmir population

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***ABSTRACT:***
**Background-** The importance of the age estimation is not only for identifying unknown dead bodies in the context of criminal situations or mass disasters but also for living individuals in medicolegal/criminal cases. Dental development is more reliable as an indicator of biological maturity in children. Dental maturity is more relevant as it is less affected by nutritional and endocrine status. **Objective-** The objective of this study was to find correlation among dental maturity and chronological age in the same population and to compare the age by using the different method of age estimation. **Methodology-** The cross-sectional study was conducted in Oral Medicine and Radiology Department in Indira Gandhi Government Dental College Jammu . Fifty patients were selected by simple random sampling. 28 were males and 22 were females between the aged 7-18 yrs. The orthopantogram was done for the selected patients to estimate the dental age by Demirijian method and SchourMasseler. The chronological age was assessed of the same patients after analyzing their specific identity proofs, date of birth certificate. **Result-** The mean age difference between the chronological age and age estimated by Demirjian method was found 2.16 yrs and -2.22 yrs among males and females respectively and statistically significant among males( p value 0.002). The mean age difference between the chronological age and age estimated by Schour and Masslermethod was found -0.99 yrs and -1.27 yrs among males and females respectively and statistically not significant among males and females. **Conclusion-** The Schour and Massler method of age estimation is found more reliable among male and female children in Jammu and Kashmir population. Although the Demirjian method for age estimation is more reliable for female children rather than the male children in the same population.
**Keywords-** Demirjian method, Schour and massler method, Chronological age

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### INTRODUCTION

The importance of the age estimation is not only for identifying unknown dead bodies in the context of criminal situations or mass disasters but also for living individuals in medicolegal/criminal cases such as child labor, rape,accidents and child marriage, in cases of legal immigrants. In a forensic situation, age estimation is a preliminary step in the identification of an individual[1]. Dental records when properly maintained with complete data can help identification, e.g. through radiographs [such as pantomogram and lateral cephalograms], casts, and prostheses. There are various age-estimating systems available for the determination of chronological age, dental age, skeletal age, and sexual age[1]. Ideally, age estimation should be a conclusion of the critical outcome of all the available possible data put into the systems and considered separately, if the forensic situation provides enough such evidence. Often, dental age estimation is considered superior owing to its lower variability, the ease of the procedure, and especially when the availability of other evidence/remains is scarce [1].

In many cases, chronological age and biological age may not be the same, due to the developmental variations. Hence, different parameters such as dental age, bone age, mental age, and other factors such as menarche, voice change, height, and weight are considered as proxy indicator for biological age and body development [2]. Dental development is more reliable as an indicator of biological maturity in children. Dental maturity is more relevant as it is less affected by nutritional and endocrine status [2]. The aim of this study was to find correlation among dental maturity and chronological age in the same population and to compare the age by using the different method of age estimation. According to our knowledge , this is the first study done in Jammu and Kashmir where different dental age estimation methods were compared.

## METHODOLOGY

The cross-sectional study was conducted in Oral Medicine and Radiology Department in Indira Gandhi Government Dental College Jammu .Fiftypatients were selected by simple random sampling. 28 were males and 22 were females between the aged 7-18 yrs. The orthopantogram was done for the selected patients to estimate the dental age by Demirijian methodand SchourMasseler. The chronological age was assessed of the same patients after analyzing their specific identity proofs, date of birth certificate. The kappa coefficient was 0.83 for intra-investigator agreement .The patients included were 7-18 years of age, with normal overall growth and development, absence of any congenital anomalies or bone lesions, no systemic illness, and no previous extraction of permanent teeth.

## DEMIRJIAN, GOLDSTEIN AND TANNER METHOD

Demirjian, Goldstein and Tanner rated seven mandibular permanentteeth in the order of second molar (M2), first molar (M1), second premolar (PM2), first premolar (PM1), canine (C), lateral incisors (I2) and central incisor (I1) and determined eight stages (A to H) of tooth mineralization together with stage zero for nonappearance.

The relationship between dental and skeletal ages has been evaluated in order to correlate the two ages for the purpose of diagnosis. The difference between dental, skeletal and known chronological age is of interest in indicating an advancement or delay compared to standard growth.

**AGE ESTIMATION BY DEMIRJIAN METHOD**

| Tooth number | Developing stage | Maturity score |
|---|---|---|
| 31 | H | 11.8 |
| 32 | H | 13.7 |
| 33 | H | 11.9 |
| 34 | H | 13.5 |
| 35 | H | 14.4 |
| 36 | H | 19.3 |
| 37 | H | 15.4 |

TOTAL SCORE= 100

**ESTIMATED AGE =** $(0.000055 \times S^3) - (0.0095 \times S^2) + (0.6479 \times S) - 8.4583$

$= (0.000055 \times 100^3) - (0.0095 \times 100^2) + (0.6479 \times 100) - 8.4583$

= 16 years

**Fig1: Orthopantogram of the patient exhibiting teeth in various stages.**

**Fig2: Demirjian's stages of tooth calcification**

| Stage | Characteristics |
|---|---|
| Stage A | Calcification of single occlusal points without fusion of different calcifications. |
| Stage B | Fusion of mineralization points; the contour of the occlusal surface is recognizable. |
| Stage C | Enamel formation has been completed at the occlusal surface, and dentin formation has commenced. The pulp chamber is curved, and no pulp horns are visible. |
| Stage D | Crown formation has been completed to the level of the cementoenamel junction. Root formation has commenced. The pulp horns are beginning to differentiate, but the walls of the pulp chamber remain curved. |
| Stage E | The root length remains shorter than the crown height. The walls of the pulp chamber are straight, and the pulp horns have become more differentiated than in the previous stage. In molars, the radicular bifurcation has commenced to calcify. |
| Stage F | The walls of the pulp chamber now form an isosceles triangle, and the root length is equal to or greater than the crown height. In molars, the bifurcation has developed sufficiently to give the roots a distinct form. |
| Stage G | The walls of the root canal are now parallel, but the apical end is partially open. In molars, only the distal root is rated. |
| Stage H | The root apex is completely closed (distal root in molars). The periodontal membrane surrounding the root and apex is uniform in width throughout. |

## STATISTICAL ANALYSIS

Statistical analysis was done using SPSS version 19. Descriptive analysis was done by determining the means and standard deviation of the chronological age and the estimated dental age of both males and females and then t – test was applied for further analysis.

## RESULT

### DEMIRJIAN METHOD

The mean age difference between the chronological age and age estimated by Demirjian method was found 2.16 yrs and -2.22 yrs among males and females respectively. However the age difference among males is statistically significant ( p-value 0.002) whereas the age difference among females is not statistically significant ( p value 0.412) [Table 2].

### SCHOUR AND MASSLER METHOD

The mean age difference between the chronological age and age estimated by Schour and Masslermethod was found -0.99 yrs and -1.27 yrs among males and females respectively.

However the age difference is statistically not significant among both males and females[Table 3].

### COMPARISON BETWEEN AGE ESTIMATION DONE BY DEMIRJIAN METHOD AND SCHOUR MASSLER METHOD

The mean age difference between the age estimated by Demirjian method and SchourMassler method was found -3.15 yrs and 0.95 yrs among males and females respectively and this age difference was not statistically significant ( p value 0.243 and 0.203 respectively) [Table 4].

**Table 2: Comparison between the chronological age and dental age estimation by Demirjian method**

| Gender | Mean chronological age( SD) | Mean Demirjian age(SD) | Mean age difference | p-value |
|---|---|---|---|---|
| Male | 11.31 | 13.47( 1.63) | 2.16 | 0.002 |
| Female | 12.43 | 10.21( 1.12) | -2.22 | 0.412 |

**Table 3: Comparison between the chronological age and dental age estimation by Schour and Massler method**

| Gender | Mean chronological age | Mean Schour and Massler age(SD) | Mean age difference | p-value |
|---|---|---|---|---|
| Male | 11.31 | 10.32(1.32) | -0.99 | 0.342 |
| Female | 12.43 | 11.16 (1.53) | -1.27 | 0.212 |

**Table 4: Comparison between the Dental age estimation by Demirjian method and Schour and Massler method**

| Gender | Mean Demirjian age | Mean Schour and Massler age | Mean age difference | p-value |
|---|---|---|---|---|
| Male | 13.47 | 10.32 | -3.15 | 0.043 |
| Female | 10.21 | 11.16 | 0.95 | 0.203 |

**Table 5: An agreement between chronological age and dental age**

| Gender | ICC ( Demirjian method) | ICC ( Schour and Massler) |
|---|---|---|
| Male | 0.74 | 0.77 |
| Female | 0.82 | 0.84 |

## DISCUSSION

The current study assessed the age estimation by the Demirjian method and Schour and Massler method. The results showed that there is difference in age between age estimated by Demirjian method and the chronological age in males whereas Schour and Massler did not show any significant difference between age among males and females.

Numerous studies have been done to evaluate the age estimation by various methods.The statistically significant differences between chronological age and dental age, with differences of 0.73 and 0.51 years,[3] 0.68 and 0.62 years,[4] 0.4 and 0.6 years,[5] and 0.25 and 0.23 years[6] among boys and girls, respectively were revealed in previous studies.

In the current study, a mean difference of 2.16 yrs in males and -2.22 yrs in females between estimated dental and chronological age was found but the age difference was statistically significant in males and was insignificant among females. Our study results were in concordance with the previous study done by Gupta et al. [1]. Although Demirjian method of age estimation has good reproducibility[6]and is based on the stages of tooth development which are unaffected by systemic or endocrinal factors[7]. However according to our study results, Demirjianmethod is not reliable for age estimation of male children of Jammu and Kashmir population .

The present study also showed no age difference between chronological age and age estimation by Schour and Masslerwhich is not statistically significant among male and female. Ebrahim et al. in 2014 conducted a study in 25 patients and showed strong correlation between estimated age by Schour and Massler and chronological age[8]. Rai et al. also conducted a study in 2014 to investigate relation between dental age estimated by Schour and Masslerand chronological age of children and efficacy of age estimation methods. The results showed correlation between the dental and chronological age and found Schour and Massler a reliable method for age estimation[9]. Their result supported the present study result showing no age difference between dental age and chronological age.

George et al. conducted a study to test the precision and accuracy of Schour and Massler method and the reported the results which were in agreement with the present study[10].

## CONCLUSION

The Schour and Massler method of age estimation is more reliable among male and female children in Jammu and Kashmir population. Although the Demirjian method for age estimation is more reliable for female children rather than the male children. So according to the present study Schour and Massler is more acceptable for the dental age estimation and can act as crucial step for the forensic experts.

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