

# Accuracy of the Demirjian Method for the Haryana Population

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## Abstract

Age estimations of living individuals are increasingly important in medical and dental practice for evaluating developmental progress, for educational purposes, and in legal matters, particularly in the application of criminal law. The study was designed to determine dental age from orthopantomograph using the Demirjian method to investigate applicability of the Demirjian method for estimation of chronological age in north Indian population. The sample for study consisted of 325 subjects between 6 years to 17 years of age with a healthy dentition & without any dental lesions. Demirjian method showed high accuracy when applied in Haryana population.

## INTRODUCTION

Accurate age data are needed in medicine and dentistry, being relevant to the timing of treatment procedures in endocrinology, pediatric dentistry and orthodontics. This information is also important in area of forensic science, when matters of consent or criminal ability arise, or in the identification of deceased persons. In developing countries reliable registration of birth details is often not a priority. Individuals may not have accurate information as their date of birth, or they may choose to suppress such information. In such circumstances age determination technique i.e. estimation of chronological age, may be required.<sup>1</sup> The main criteria for forensic age determination in the relevant age group based on odontological examination are tooth eruption and tooth mineralization, both developmental biological features. Tooth mineralization is evaluated based on what is known as an orthopantomogram, a radiograph of the complete dentition. Tooth mineralization begins with the development of the crown at the occlusal surface and continuous to the root. It ends when the root is fully developed and the apex closed, i.e. reduced to the mature pore. For the evaluation of tooth mineralization, various stages of classifications have been put forward.<sup>2,3,4,5</sup> The classification of stages proposed by Demirjian appears to be best suited for forensic purpose, since stages are defined by changes in form and independent of possibly speculative length estimates. The degree of mineralization of second molars allows estimates on age approximately until the age of 16 years.<sup>6</sup> the continuous patterns of tooth development

can be observed on a longitudinal series of radiographs and various mineralization stages have been described.<sup>7,8,9,10</sup>

The aim of this study was to generate dental maturity scores for a population of Haryana children, using the revised system of Demirjian.<sup>2</sup> Ages estimated from these scores were compared with chronological ages of subjects, to determine if the system provides accurate results that could be used for Haryana children; or whether new population specific standards needed to be generated.

## MATERIAL AND METHOD

The study was conducted at Department of Orthodontics Govt. Dental College, Pt. B.D. Sharma Postgraduate Institute of Medical Sciences (Rohtak), Haryana. The data used in this study were obtained from copies of orthopantomographs required for clinical purposes for a sample of 325 Haryana children, 168 female and 157 males, between 6 years to 17 years of age.

The development of the left quadrant is determined. For any subject with an absent left permanent mandibular tooth, with the exception of third molar, the equivalent tooth on the subject's right was used. Tooth formation is divided into eight stages and criteria for this stages are given for each tooth separately. Each stage of the seven teeth is given score. The sum of score for the seven teeth is transferred to a dental age.

The parent or guardian of each subject was required to

submit the copy of birthday certificate for accurate age estimation. Dental age assessment was done by Demirjian methods.

## RESULTS

In the present study 325 subject i.e. (168 F : 157 M) were selected from Department of Orthodontics which was divided into 14 groups, in intervals of one years.

**Figure 1**

Table 1: Mean, Standard Deviation (Mean  $\pm$  SD) in the Chronological and Dental Age in 6 to 17 years in both gender

Group	Mean $\pm$ SD	
	Chronological	Dental age
6 year	5.14 $\pm$ 0.13 M	5.23 $\pm$ 0.35 M
	5.07 $\pm$ 0.12 F	5.02 $\pm$ 0.32 F
7 year	6.23 $\pm$ 0.12	6.27 $\pm$ 0.42
	6.13 $\pm$ 0.15	6.19 $\pm$ 0.37
8 year	7.28 $\pm$ 0.13	7.35 $\pm$ 0.39
	7.03 $\pm$ 0.07	7.23 $\pm$ 0.43
9 year	8.19 $\pm$ 0.14	8.37 $\pm$ 0.42
	8.17 $\pm$ 0.12	8.09 $\pm$ 0.29
10 year	9.39 $\pm$ 0.21	9.12 $\pm$ 0.63
	9.13 $\pm$ 0.13	9.15 $\pm$ 0.72
11 year	10.29 $\pm$ 0.18	10.39 $\pm$ 0.67
	10.17 $\pm$ 0.15	10.23 $\pm$ 0.89
12 year	11.13 $\pm$ 0.19	10.49 $\pm$ 0.34
	11.07 $\pm$ 0.07	10.39 $\pm$ 0.28
13 year	12.39 $\pm$ 0.03	12.75 $\pm$ 0.42
	12.02 $\pm$ 0.13	12.42 $\pm$ 0.39
14 year	13.07 $\pm$ 0.27	13.29 $\pm$ 0.67
	13.36 $\pm$ 0.16	13.38 $\pm$ 0.72
15 year	14.16 $\pm$ 0.08	14.28 $\pm$ 0.87
	14.07 $\pm$ 0.32	14.27 $\pm$ 0.72
16 year	15.18 $\pm$ 0.18	15.42 $\pm$ 0.67
	15.17 $\pm$ 0.12	15.26 $\pm$ 0.59
17 year	16.38 $\pm$ 0.13	16.47 $\pm$ 0.87
	16.42 $\pm$ 0.17	16.97 $\pm$ 0.62

(P > .01).

When chronological age was compared with dental age using Demirjian method male and female sample showed statistically significant difference (P < 0.01).

## DISCUSSION

Tooth development shows less variability than other developmental features and also low variability in relation to

chronological age.<sup>12</sup> Hertz observed a greater degree of association between dental age and chronological age than between dental and skeletal age.<sup>13</sup> A number of methods have been proposed to determine dental age,<sup>14,15</sup> but the system developed by Demirjian<sup>11</sup> has gained wide acceptance.

In the study chronological and dental age showed significant positive correlation between male and female sample i.e. (P<0.01) as earlier reported.<sup>16,17</sup> When Demirjian methods was applied to north Indian population, mean difference between chronological age and dental age was minimal as reported earlier.<sup>18,19</sup> The study supports use of Demirjian method for assessment of dental age in Haryana population with few modifications.

## CONCLUSION

The results of our study have concluded that the Demirjian method showed high accuracy when applied to Haryana population. Significant positive correlation was found between chronological and dental age (P<0.01)

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