Applicability of Demirjian’s method of age assessment in a North Indian female population

**ABSTRACT**

**Aim** This study was conducted to determine whether the standards of dental maturation given by Demirjian et al. are applicable to North Indian children and to assess the relationship between dental age and chronological age.

**Material and methods** In this study OPGs of 100 females of 8-14 years were taken, and dental age was calculated according to the Demirjian method. Chronological age was recorded and compared to dental age. Statistical analysis: Collected data was statistically analysed. Pearson’s correlation coefficient was used to correlate the dental and chronological age of the 100 girls. The statistical analysis was done by using SPSS version 10.0 software (SPSS Inc., Chicago IL). For all tests the p-value of <0.05 was considered for statistical significance.

**Result** A strong correlation was found between chronological and dental ages.

**Conclusion** In the present pilot work it was concluded that the Demirjian method of dental age assessment showed high accuracy when applied to North Indian paediatric population.

**Keywords** Chronological age; Demirjian method; Dental age.

Introduction

Age determination plays a great role in forensic medicine, paediatric endocrinology and paedodontic treatment planning. Dental age is of particular interest to the paedodontist and orthodontist in the management of different types of malocclusion in relation to maxillofacial growth.

The concept of physiological age is based upon the degree of maturation of different tissue systems. Maturation as a dimension of development is distinct from growth in size.

Dental developmental milestones therefore can be utilised in age estimation. Estimation of dental age is based upon the rate of development and calcification of tooth buds and the progressive sequence of their eruption in the oral cavity. The tooth calcification provides a valuable indicator of dental age and serves as an index of maturation of a child.

Nolla [1960] assessed the age based on the radiographic appearance of the tooth. Demirjian et al. [1973] formulated the method of dental age assessment by reference to the radiological appearances of the seven teeth on the left side of the mandible. Hagg and Matsson [1985] found high precision and accuracy with the Demirjian’s method when applied to the younger age group rather than in older ages. The authors concluded that the estimation of age is preferably done during early childhood. Nystrom et al. [1986] found a more advanced dental maturation in Finnish children than in French-Canadian children and concluded that maturity standards should be based on studies made on the same population for which they are going to be used. Davis and Hagg [1994] stated that the Demirjian system could not be accurately applied to other population groups due to ethnic differences when it was tested on the Chinese population. Staaf et al. [1991] concluded that the Canadian studies gave an over-estimate of about 6-10 months when used on a Scandinavian population.

The aims of the present work were as follows.
1. To determine dental developmental stages in North Indian female population and to test the applicability of Demirjian’s criteria for maturity scoring in dental age assessment.
2. To determine chronological age
3. To find inter-relationship between obtained dental age and chronological age.

**Material and methods**

This study is in continuation with the study conducted to evaluate the relationship between mandibular canine calcification stages and skeletal age.

The present study has been conducted with the aim to find the applicability of the Demirjian’s method of age estimation in North Indian population.

The Ethics Committee approval was obtained before beginning of the study and written informed consents
were obtained from participating subjects. The children included in the study were in the age range of 8-14 years who visited the dental out patient department, Subharti dental college (Meerut, India) with no history of past and present systemic diseases. For this study were enrolled children with no growth disorder to avoid any irregularity in the results, as abnormal or delayed growth can have a significant effect in dental age as stated by Gulati et al. [1990]. The sample was not split into smaller age groups. Females only were enrolled to avoid gender variations.

OPGs were taken on 6˝×12˝ films. The subjects were asked to remove all the dental appliances, earrings, necklaces, and hairpins or any metallic object in the head and neck region. The child was instructed to look forward and not to follow the tube head with their eyes. The OPGs were viewed on x-ray viewer. The development of the seven permanent left mandibular teeth was determined.

Tooth formation is divided into eight stages and criteria for the stages are given for each tooth separately. Each stage of the seven teeth is given a score according to a statistical model, which has also been used for the assessment of skeletal maturity [Tanner et al., 1975]; standards are given for each sex separately. The sum of the score for the seven teeth was transferred to a dental age [Demirjian, 1973] using the reference value.

The chronological age of the subjects was calculated by subtracting the birth date from the date on which the radiographs were exposed for that particular individual. Decimal age was taken for simplicity of statistical calculation on yearly basis (e.g. 9 years 9 months as 9.75 years).

### Statistical analysis

Data was collected from 100 female children in age group of 8-14 yrs. The dental age and the chronological age of the subjects were calculated in the form of mean and standard deviation respectively.

Karl Pearson’s correlation coefficient was used to determine the association between the two types of ages, and it was found positive and significant at 5% level of significance. Furthermore, the Z-test revealed a significant difference between the two types of ages at 5% level of significance (Table 1).

Precision of any data is defined as reciprocal of standard error of mean: on behalf of this, chronological age and dental age was found to be reliable (Table 2). The statistical analysis was done by using SPSS version 10.0 software.

### Results

The interrelationship between chronological age and dental age was evaluated and accuracy of the Demirjian method was tested.

The correlation between dental age and chronological age was correlated by using the Pearson’s correlation coefficient as shown in Table 1. The interrelationship between dental and chronological ages in the total sample was significant at the 0.05 level. A strong correlation was found between chronological and dental ages (Table 1).

### Discussion

Methods for the determination of a child’s growth and development are of great value from both the medical and dental points of view. Although various methods for age determination do exist, a universal system has not been found due to the differences between ethnic populations.

The present study was undertaken to test the applicability of the Demirjian’s method in children of Meerut, district of North India. Dental age assessment was done by the Demirjian’s method and the interrelationship between dental age and chronological age was evaluated.

Chronological age and dental age showed significant positive correlation (p=0.4347). This is in agreement and support the results of with Cheraskin [1972], Malagola [1989], Jaeger [1990], and Carvalho et al. [1990]. Evaluation of tooth maturation using the method of Demirjian and Goldstein is thought to be of great value. Hagg and Matsson [1985] compared the reliability of three different methods for the assessment of dental maturity and concluded that the method described by Demirjian and Goldstein has a high degree
of reliability and precision.

Liversidge et al. [1999] found that the standards of dental maturation described by Demirjian et al. [1973] may not be suitable for British children. Koshy and Tandon [1998] found that this method gave an overestimation of the dental age in South Indian children. Prabhakar AR, Panda AK, Raju OS [2002] studied the applicability of Demirjian’s method of age assessment in children of Davangere. It was found that Davangere children were dentally more advanced. Demirjian’s method gave an overestimation of 1.20 +/- 1.02 years and 0.90 +/- 0.87 years in males and females respectively. However, in the present pilot work the Demirjian’s method of dental age assessment shows high positive correlation between dental and chronological age and it showed high accuracy when applied to our North Indian paediatric age group. Mappes et al. [1992] stated that other probable causes of dental age difference between populations are environmental factors such as the socioeconomic status, nutrition and dietary habits that vary in different population groups.

The present study was a pilot work to assess the applicability and reliability of the Demirjian’s method for determination of the correct dental age in a North Indian paediatric population, and it was concluded to be highly accurate. Further studies are advocated in children of North Indian origin in a larger sample size and with digitalised OPGs.

References


