Accuracy of Cameriere et al regression equation in Haryana population

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Abstract: Age estimation in children is not only important in clinically dentistry but also in forensic dentistry. The orthopantomograph samples of 259 healthy children aged between 5-15 years was selected and applied Cameriere et al regression equation. We observed that the median of the absolute values of the residuals was 0.6 years (interquartile range, IQR = 0.7 years) for girls and 0.7 years for boys (interquartile range, IQR = 0.8 years). The mean prediction error was 0.75 years for girls and 0.87 for boys. The concordance correlation coefficient was 0.89 between two observer rating. Hence this method can be used for age estimation in children with other method.

Key words: forensic dentistry, Cameriere et al regression equation, Haryana population.

Teeth formation is widely used to assess maturity and predict age. In clinical dentistry, this information aids in diagnosis and treatment planning [1]. The continuous patterns of tooth development can be observed on a longitudinal series of radiographs and various mineralization stages [2-6].

Previously number of methods have been proposed to determine dental age [7-15] but, the system developed by Demirjian has gained wide acceptance [9]. During developmental stages particularly in root formation, a notable difference between sexes arises with females being advanced when compared with males [9-18].

Previously Cameriere et al proposed a regression equation for age determination from Open and closed apices in children [16-17]. Recently it has been reported that Cameriere et al method more accurate than other methods [18]. It has been reported that teeth development is depend upon number of factors such as genetic factor, environmental factors, nutritional factors and geographical factors [4-7].

Hence the present study was planned to determine the accuracy of Cameriere et al equation on Haryana Population for age estimation from open and closed apices.
Material and Methods
The orthopantomographs samples of 259 healthy children aged between 5-15 years were selected. Panoramic radiographs that were unclear or that showed hypodontia, gross pathology and previous orthodontic treatment were excluded. The chronological age for each subject was calculated by subtracting the data of the radiograph from the date of birth. This was a retrospective cross-sectional study. This was a retrospective cross-sectional study, based on good quality digital panoramic radiographs. Age estimation was calculated based on the regression equation [17]:

\[
\text{AGE} = 8.387 + 0.282g - 1.692 \times 5 + 0.835 N_0 - 0.116s - 0.139s \times N_0
\]

G variable is 1 for boys and 0 for girls.

Measurements were carried out by one observer (Rai). Assessment of intra-observer and inter-observer reproducibility was checked on an independent sample of 20 panoramic radiographs (Rai and Cameriere).

Results
To evaluate the accuracy of the age estimation method, we considered the distribution of the differences between chronological and estimated ages (residuals) and the mean prediction error [19]. The median of the absolute values of the residuals was 0.6 years (interquartile range, IQR = 0.7 years) for girls and 0.7 years for boys (interquartile range, IQR = 0.8 years). The mean prediction error was 0.75 years for girls and 0.87 for boys.

The proportion of absolute value of differences between chronological and estimated ages were greater than a given value x (Fig. 1, 2).

For example, about 20% of the estimated ages for females were greater than 1 year (i.e. 80% of the errors were less than 1 year) and for boys 25% of males was estimate with an error greater than 1 year. The concordance correlation coefficient was 0.89 (sd = 0.05) indicated very good agreement between the two raters.
Discussions
The need to estimate the age of living individuals is becoming increasingly important in forensic odontology since there are increasing numbers of illegal immigrants without any identity papers. We observed that mean prediction error was 0.75 years for girls and 0.87 for boys. The inter-observer correlation was good (0.89). We found that 20 percent of females and 25 percentage of males estimated age were greater than one year. It may be due to different in geographical, genetic and environment factors.

Chronological age, as recorded by registration of birth date, is referred to throughout an individual’s life.

This information is relevant in medical and dental practice for evaluating developmental progress, for educational purposes and in legal matters, particularly in application of criminal law [9, 10].

As the results did show significant difference between European countries, so this regression equation could not be applied to Indian populations Hence, new equation will be required for Indian population. The method should be used together with other methods of age estimation in order to increase the accuracy.

Further study will be required on the accuracy of this on central and south part of India and other methods like Willems, Demirjian, Nolla, and Haavikko method.

References