Research Article

ESTIMATION OF DENTAL AGE BY NOLLA'S METHOD USING ORTHOPANTOMOGRAPHS AMONG RURAL FREE RESIDENTIAL SCHOOL CHILDREN

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ABSTRACT

Introduction: Teeth and dental restorations are resistant to destruction by fire and the elements are therefore useful in identification. This permits accurate identification of a missing child or remains. The Rural Residential free school at Suttur houses a large number of inmates and hence dental records are kept for their identification. **Objective:** Estimation of Age of children. **Methods:** Orthopantomographs were used to study for estimation of age of children, using a Nolla's method of dental age estimation. **Results:** In this study Nolla's method underestimated the chronological age of the individuals and underestimation of age increased as the chronological age of the individuals increased. **Conclusion:** Studies involving larger sample size and population specific data needs to be developed.

Keywords: Age Estimation by teeth, Forensic Dentistry, Nolla's Method, Orthopantomographs.

INTRODUCTION

Age estimation is useful in general dentistry and in forensic dentistry. There are many methods of age estimation which are tried and tested. Dental age estimation in living individuals is done mainly by non-invasive methods such as general physical examination, intraoral examination and a panoramic radiograph.[1-3]

The sequence of development of dentition can be used in the determination of age in situations such as attainment of maturity, criminal responsibility, consent etc. in living individuals. Teeth are non-destructible and have the least turnover of its structure, hence provide a vital clue for identification of individuals in forensic Odontology. [4,5]

Nolla devised a system of dental age assessment using radiological appearances of maxillary teeth and mandibular teeth. The present study was aimed at estimation of the age of the children using Nolla's Method of Dental Age Estimation.

This study was conducted in a rural residential school at Suttur, where all the inmates are provided a similar nutrition and they shared same environment and physical activities, hence an ideal place to do such a study.

METHODOLOGY

The present study was conducted at JSS free rural residential school of Suttur, a village in southern

India. It houses 3927 children studying from primary to high school. 2801 children are free hostel children and 1126 children are day scholars, for the present study we included only free hostel children. Purposive sampling was used to select children for this study.

Ethical clearance was obtained from the Institutional Ethical Review Board prior to conducting the study. The selected subjects were explained in detail about the procedures and a written informed consent was obtained from parents/guardians to be a part of the study. The data used in the study is, one year results of a part of the longitudinal study being conducted at JSS Dental College. The date on which the orthopantomograph was taken and the Date of birth provided in school records was used for calculation of the chronological age of each subject. Calcification of permanent dentition was seen on the orthopantomograph and dental age was calculated according to Nolla's method.

Selection of sample: List of all the students of 7 years and 11 years was made from school records. Those children who met the exclusion criteria as set were excluded and met the inclusion criteria were selected for the study.

Inclusion Criteria: 1. Younger children in the age of 6½ to 7½ years and Older children in the age of 10½ to 11½ years of age. 2. Children who are inmates of residential school of Suttur. 3. Children with normal growth and development. 4. No Clinical or radiographic evidence of jaw pathologies.

Exclusion Criteria: 1. History of Extraction or missing teeth 2. History of Orthodontic treatment.

The subjects were grouped into two groups. Younger children included 7 years old, twenty individuals aged between 6½ years and 7½ years in which 10 were boys and 10 were girls. Older children included 11 years old, twenty individuals between 10½ years and 11.6 years in which ten were boys and ten were girls. The chronological age was calculated according to the data provided in the school register.

For data analysis paired samples 't' tests were applied to compare chronological age to Nolla's age values, for boys, girls and for total sample.

Nolla's method of Dental Age Estimation[6]: Nolla devised a method of age estimation by evaluating the Calcification of the permanent dentition. The Calcification of permanent dentition was divided into 10 stages such as 1) Absence of crypt. 2) Presence of Crypt. 3) Initial Calcification. 4) 1/3rd Crown completed. 5) 2/3rd crown completed. 6) Crown almost completed. 7) Crown completed 8)1/3rd root completed. 9) 2/3[rds] of Root Completed. 10) Root almost Completed – open apex. 11) Apical end of root completed for each group of teeth like incisors, canine, premolars and molars of maxillary and mandibular arches separately. The radiograph of the individual was matched with a comparative figure given by Nolla. Each tooth was recorded with a reading and a sum total is made for maxillary and mandibular teeth. Later the sum total is compared with table given by Nolla. Separate table was given for boys and girls and including or excluding third molars. [1,6,7]

The opg of the subjects of younger children and older children were matched with the figures of calcification given by Nolla. Seven mandibular teeth and seven maxillary teeth on the left quadrant were recorded for stage of calcification with a reading.

Fig 1: Orthopantomograph used in the study

A sum total is made for seven mandibular and seven maxillary teeth to derive a score for fourteen maxillary and mandibular teeth. Later the sum total is matched with the table given by Nolla's for boys and girls separately.

RESULTS

In the present study Nolla's method of dental age estimation was done and later checked with chronological age.

When boys and girls of younger children was considered together mean dental age, according to Nolla's was 6.48 ± 0.73 years and the mean chronological age was 7.3 ± 0.12 years.

Table 1: Results of Younger children

Sex		Younger children (7year Old)				Older children(11year old)			
	Age	Mean ±SD	Mean diff	't' value	'p' value	Mean ±SD	Mean diff	't' value	'p' value
Boys	Chronological	7.31±0.12	0.61	4.12	.003**	11.30±0.16	2.45	8.518	.000**
	Nolla's	6.70±0.42				8.85±0.88			
Girls	Chronological	7.29±0.13	1.04	3.65	.005**	11.32±0.15	1.77	5.053	.001**
	Nolla's	6.25±0.92				9.55±1.17			
Total	Chronological	7.30±0.12	0.82	5.03	.000**	11.31±0.15	2.11	9.019	.000**
	Nolla's	6.48±0.73				9.20±1.07			

Note : ** significant at p< .01 level

The mean dental age, according to Nolla's in Younger children Boys was 6.70 ± 0.42 years while the mean chronoloical age was 7.31± 0.12 years. In younger children Girls the mean dental age, according to Nolla's was 6.25 ± 0.92 years and mean chronological age was 7.29 ± 0.13 years.

In Younger children Nolla's method underestimated the age of subjects by 0.82 years, which was very significant with p value of 0.000.

The mean dental age, according to Nolla in Older children, boys, was 8.85 ± 0.88 years and the mean chronological age was 11.30± 0.16 years.

In Older children Girls the mean dental age, according to Nolla was 9.55 ± 1.77 years and mean chronological age was 11.32± 0.15 years.

In older children, Nolla's method underestimated the age of subjects by 2.11 years, which was very significant with p value of 0.000.

When boys and girls of older children was considered together mean dental age, according to Nolla was 9.20 ± 0.15 years and the mean chronological age was 11.31 ± 0.15 years.

The results of the study showed that the dental age of Nolla's underestimated the age of the individuals very significantly with p value of 0.000 in both the groups.

DISCUSSION

Identification of an individual has been the mainstay of civilization. Not only is identification of the diseased a necessity, but also the living an important integral part of our daily life.

It may be necessary to estimate an individual's age in situations such as identification, criminal responsibility, judicial punishment, consent, rape, criminal abortion, employment, attainment of majority, kidnapping and prostitution, etc. for legal requirements. [8,9] In India due to lower literacy status, parents and their children do not have accurate knowledge of their date of birth records which would be required in legal matters concerning the age of the individual.

The timing and sequence of various stages of tooth development from first appearances of cusps to root apical closure follow a rigid pattern. Hence the developing dentition can be used for assessment of age.

The bone development, secondary sexual characteristics and stature or weight are other developmental indicators apart from dentition, but can be applied only after the inception of puberty. [1,5]

Age estimation using dentition could be done by two methods such as 1) atlas method, where development (mineralization) of dentition is compared with published standards. 2) Scoring method, where the development of dentition is divided into various stages and are assigned scores and evaluated through statistical analysis.

Nollas method[6] is a scoring system for age estimation by studying the calcification of permanent teeth. He divided the calcification of permanent dentition into stages such as 1) Absence of crypt. 2) Presence of Crypt. 3) Initial Calcification. 4) 1/3rd Crown completed. 5) 2/3rd crown completed. 6) Crown almost completed. 7) Crown completed 8)1/3rd root completed. 9) 2/3rds of Root Completed. 10) Root almost Completed – open apex. 11) Apical end of root completed.

This is a realistic & no invasive method of age estimation which was followed in this study and later compared with chronological age.

In younger children among boys the underestimation of Chronological age was 0.61 years and girls were 1.04 years.

In older children among boys the underestimation of Chronological age was 2.45 years and girls were 1.77 years.

The dental age derived in this study was significantly lower than the chronological age of the individuals in both the groups and there was a difference between boys and girls within the groups.

In both the groups, Nolla's underestimated the chronological age of the individual. The underestimation of age increased as the chronological age of the individual increased.

The causes for underestimation of age could be:

The timing of tooth development is highly heritable and also population specific. Two different populations were compared in a study concluded that, distinct stages in tooth development differ remarkably up to two years between different ethnicities.[10,11] Nolla's method may not be applicable to this population hence a population specific data should be used for age estimation.

The possible influences of environment and hereditary on dental age is also debatable. Consistently low correlations indicate the lack of a clear association between tooth formation and parameters like social status, nutritional effects and somatic development. [12,13] Dental development shows no significant relationships with maturity indicators such as menarche, peak height velocity or skeletal maturity.[14] These results imply that the mechanisms controlling dental growth and development are independent of general growth mechanisms but closely approximate chronological age.

Odontological age estimation is dependent on three factors such as 1) the subject of age estimation. 2) Appropriately chosen dental developmental survey & 3) legal consideration. Hence, to position an individual upon a practical time scale, two or more methods of age estimation should be considered judiciously, giving wattage to the above trident factors.

CONCLUSION

Nolla's method of age estimation was not found to be accurate in both the age groups. Studies involving larger sample size and a population specific data for the children of southern India for dental age estimation should be developed.

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