

Age Estimation using Orthopantomogram and Willems Method in the Population of Chitwan

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ABSTRACT

Background: Utilization of age estimation has increased manifold in recent years. Various methods available for age estimation before the complete dentition has erupted and matured till the root closure stage include Nolla's stages, Demirijian's method, modified Demirijian's method by Willems, Haavikko's method. So, in this study we have tested that on Chitwan population of Nepal. **Materials and Methods:** 60 patients between the ages 6-16 were selected and digital orthopantomograms of each of the patients was taken and then Demirijian method was applied and age estimation done by Willems method. Whereas the chronological age was known and the reliability of this method on this population checked. **Results:** The study shows correlation between chronological age CA and estimated dental age DA in males -.861 while in females -.965 and it is statistically significant. **Conclusion:** There was an underestimation of age i.e., the dental age was found out to be less than the actual chronological age of the sample. This shows the dental growth lag in the Chitwan population. It was also found that when a comparison is done between the males and females it is found out that the females mature earlier than the males.

Keywords: age estimation; Chitwan; Demirijians method; forensic odontologist; OPG Willems method.

INTRODUCTION

Dental age estimation can serve as a very important tool in the identification of remains when done by a forensic odontologist.¹ Forensic sciences deal with acquisition, documentation and evaluation of the evidence available so as to be presented in the court of trial.² The word forensic has been derived from a Latin word Forensus and it relates to law and the evidence to be presented in court or a debate. In recent years there are many cases which need the age estimation to be done to find out the real age of the perpetrator of the crime so as to find out the law and the sections under which he falls as the laws and punishments are usually less for children before a certain age.³ These cases include burglary, rape, certain civil cases etc. Also when in case of murders or mass disasters, dead bodies or the skeletal remains are found age estimation can be done by dental methods so it is necessary that we find how reliably dental age is close to the chronological age. Various methods available for age estimation before the complete dentition has erupted and matured till the root closure stage include Nolla's stages, Demirijians method, modified Demirijian's method by Willems, Haavikko's method.⁴⁻⁸

Demirijian's method was used to do age estimation in Caucasian studies but was found to overestimate

the age so Willems⁸ has come forward with a modification which has been shown to be more accurate. So, in this study we are going to test that on Chitwan population of Nepal.

MATERIALS AND METHODS

This study was conducted in the department of Pedodontics, College of Medical sciences, Bharatpur, Chitwan, Nepal. The radiographs were done with the cooperation of the Oral medicine & Radiology Department. The sample size was 60 patients and the age ranging from 6-16 were taken and digital orthopantomograms of each of the patients was made by GENDEX ORTHORALIX 9200 following all the standard protocols and radiographs. These OPGs were done by a single radiographer to avoid any bias. Informed consent was taken from all the individuals taken in the study.

An inclusion criteria was selected and satisfied while taking the individuals for the study.

1. with non contributory medical history of systemic diseases or nutritional disorders
2. absence of any missing left mandibular teeth.

Whereas the exclusion criterion was taken to be

- any serious psychiatric problems or endocrine

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Kapoor. Age estimation using Orthopantomogram and Willems method in Chitwan..

diseases

- history of extraction of permanent teeth,
- Trauma to the face,
- impacted or ankylosed teeth,
- congenital developmental abnormalities.

All the 60 patients were examined clinically and the name, sex, birthdate and the date at which radiograph is taken was recorded by an individual not involved in doing the examination and performance of Willems Method on radiograph.

Then the digital panoramic radiographs were used to assess the calcification stages of the permanent teeth in left mandibular side from the central incisor to the second molar, using the Demirijan’s method modified by Willems. Using the Willems criterion, the age was calculated by summing up the various values and the dental age was calculated by this method (Table 1) (Table 2).

The chronological age was calculated by subtracting the date of birth from the date on which the OPG is taken.

RESULTS

This study took the sample size to be 60 individuals amongst which 36 were females and 24 males. The mean chronological age of 60 samples – 13.75, while the mean estimated age of 60 samples-13.36 (Table 3). The difference that have been found out between the actual chronological age and the estimated dental age is statistically significant with a p value <0.05.

The correlation between chronological age CA and estimated dental age DA in males - .861 while in females - .965 and it is statistically significant [p value < 0.05] (Table 4).

Table 1. The tooth formation stages as given by Demirijan.	
A	Calcified cusp tips that are not fused.
B	Calcified cusp tips that are fused with well-defined occlusal surface outline.
C	Complete formation of enamel at occlusal surface. Commencement of dentinal deposition.
D	Completion of crown formation upto cement enamel junction. Root formation is seen and pulp horns begin to differentiate.
E	Pulp horns and pulp chamber are more differentiated. Root length is less than crown length. Radicular bifurcation is visible in molars.
F	Funnel shaped apex is seen. Crown length is equal and greater than root length.
G	Root canal walls are parallel and the apical ends are still open.
H	Apical ends are closed and uniform periodontal ligament space is seen around the tooth.

Table 2. Developmental tooth stages with corresponding age scores expressed directly in years for each of the seven left mandibular teeth in boys and girls.

GENDER	TOOTH	A	B	C	D	E	F	G	H
BOYS	CENTRAL INCISOR	-	-	1.68	1.49	1.5	1.86	2.07	2.19
	LATERAL INCISOR	-	-	0.55	0.66	0.74	1.08	1.32	1.64
	CANINE	-	-	-	0.04	0.31	0.47	1.09	1.9
	FIRST BICUSPID	0.15	0.56	0.75	1.11	1.48	2.03	2.43	2.83
	SECOND BICUSPID	0.08	0.05	0.12	0.27	0.33	0.45	0.4	1.15
	FIRST MOLAR	-	-	-	0.69	1.14	1.6	1.95	2.15
	SECOND MOLAR	0.18	0.48	0.71	0.8	1.31	2	2.48	4.17
GIRLS	CENTRAL INCISOR	-	-	1.83	2.19	2.34	2.82	3.19	3.14
	LATERAL INCISOR	--	-	-	0.29	0.32	0.49	0.79	0.7
	CANINE	-	-	0.6	0.54	0.62	1.08	1.72	2
	FIRST BICUSPID	-0.95	-0.15	0.16	0.41	0.6	1.27	1.58	2.19
	SECOND BICUSPID	-0.19	0.01	0.27	0.17	0.35	0.35	0.55	1.51
	FIRST MOLAR	-	-	-	0.62	0.9	1.56	1.82	2.21
	SECONDMOLAR	0.14	0.11	0.21	0.32	0.66	1.28	2.09	4.04

Table 3. Mean chronological age and mean estimated age of 60 samples.

		Mean	SD
Chronological Age	60	13.75	2.86
Estimated Age	60	13.36	2.11

Table 4. Mean chronological age and mean estimated age of males and females.

Gender		N	Mean	Std. Deviation	Corelation	P-value
Male	CHRONOLOGICAL AGE	24	13.83	1.63	0.861	0.000
	ESTIMATED AGE	24	13.14	2.10		
Female	CHRONOLOGICAL AGE	36	13.82	2.12	0.965	0.000
	ESTIMATED AGE	36	13.56	1.72		

DISCUSSION

Neonatal Age estimation has become an indispensable part of forensics these days because of its role in many different types of crimes and in times of mass disasters like Tsunami. Forensic odontologists use the dentition to estimate the age of the deceased. Though there are many different methods for age estimation in adults like amino acid estimation mainly d-amino acid estimation, Gustafson's method, dental cementum increment analysis etc but developing teeth can be used to give a dental age estimation by seeing the developing teeth. Ages 6 years till 12-13 years comprises the mixed dentition period when the teeth are developing and thus by seeing the mineralization of these teeth, the age estimation techniques have been used.⁹

Digital orthopantomograms are a reliable source where a single radiograph can be effectively used to see the developmental status of whole dentition and use it for the purpose of dental age estimation. Certain problems like systemic diseases such as endocrine problems which can lead to delay in the eruption or mineralization of teeth have been excluded from the studies. Also, patients were asked for a history of previous trauma in the region which could have impeded the growth in some way. The methods presently available for the age estimation seeing the various methods of age assessment using the tooth development show an

ethnic variation. In 2001, Willems et al., evaluated the accuracy of Demirjian's method on a Belgian population and they concluded that no two individuals grow and develop at the same rate.⁸ So it can be concluded that there are variation in tooth development amongst populations and ethnic

groups.¹⁰⁻¹¹ So, this study was performed to compare the DA assessment in children of Chitwan district in Nepal.

In this study it was found out there was an underestimation of age i.e., the dental age was found out to be less than the actual chronological age of the sample.¹² This shows the dental growth lag in the Nepalese population. It was also found that when a comparison is done between the males and females it is found out that the females mature earlier than the males.¹³⁻¹⁵

We should always keep in mind that till date there is no method of estimation of age which is totally accurate since the development varies between individuals naturally. DA is not same for all the people in the same chronological age.

CONCLUSION

There was an underestimation of age i.e. the dental age was found out to be less than the actual chronological age of the sample. This shows the dental growth lag in the population of Chitwan. It was also found that when a comparison is done between the males and females it is found out that the females mature earlier than the males. However, the limitation of this study is that, being a hospital based study; it cannot perfectly represent the whole population of Chitwan.

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Kapoor. Age estimation using Orthopantomogram and Willems method in Chitwan..

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