

Age Determination by Willems Method in Kerala Population: A Forensic Radiographic Study.

Dr. Laxmikanth Chatra, MDS, PhD, Head of Department, Dept Of Oral Medicine And Radiology, Yenepoya Dental College, Yenepoya University, Mangalore – 575018, Karnataka

Dr. Prashanth Shenoy, MDS, Professor, Oral Medicine and Radiology, Yenepoya Dental College, Yenepoya University, Mangalore – 575018, Karnataka

Dr. Veena K M, MDS, Professor, Oral Medicine and Radiology, Yenepoya Dental College, Yenepoya University, Mangalore – 575018, Karnataka

Dr. Rachana V Prabhu, MDS, Reader, Oral Medicine and Radiology, Yenepoya Dental College, Yenepoya University, Mangalore – 575018, Karnataka

Muhsina Ch, Post Graduate, Oral Medicine and Radiology, Yenepoya Dental College, Yenepoya University, Mangalore – 575018, Karnataka

Corresponding Author: Muhsina Ch, Post Graduate, Oral Medicine and Radiology, Yenepoya Dental College, Yenepoya University, Mangalore – 575018, Karnataka

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Abstract

Aim and objectives: The aim of this study is to estimate the dental age in different age groups by assessing the developmental stages of left mandibular seven teeth by using Willems method in kerala population and to evaluate the possible correlation between Dental age and chronological age.

Materials and Methodology: Digital Orthopantomograms (OPGs) of 56 subjects were used in the study. Mandibular teeth from central incisor to the second molar were selected, and DA was assessed using Willems method and it was compared with Chronological age calculated by subtracting the date of birth from the date of radiographic exposure.

Results: The study shows mean difference between the estimated DA and CA for males was 0.346 ± 1.314 while for females, it was 0.221 ± 1.123 .

Conclusion: This study showed significant correlation between estimated DA and CA. Thus, radiographic assessment of mandibular teeth development can be used to estimate the DA by using Willems method in Kerala Population.

Keywords: Age Determination, Kerala Population, Willems Method, Chronological Age, Panoramic Radiographs.

Introduction

Estimation of age in living people is gaining its importance due to various legal responsibilities. Many parameters like hand-wrist bone ossification, fusion of cranial sutures etc are used to assess the age of a person, however many of these are influenced by environmental and genetic factors¹.

Age estimation from dental developmental stages is considered highly accurate, reliable and precise than any other methods² and use of Dental radiography is an

effective tool in estimation of dental age³. Dental age assessment can be quantified using various methods such as crown root measurements, tooth eruption into mouth, and radiographic analysis of stages of tooth formation. A number of studies have been carried out to identify the most appropriate and precise method to estimate dental age⁴.

Various methods available for age estimation before the complete dentition has erupted and matured till the root closure, stage include Nolla's stages, Demirijans method, modified Demirijan's method by Willems, Haavikko's method⁵.

Demerijan's method was used to do age estimation in Caucasian population but it was found to overestimate the age, so Willems has come forward with a modification which has been shown to be more accurate. So Willems method is the revised version of Demirijian et al method, based on modified dental maturity score to estimate age of children in years for both the gender⁵.

The aim of this study is to estimate the dental age in different age groups by assessing the developmental stages of left mandibular seven teeth by using Willems method in kerala population and to evaluate the possible correlation between Dental age and chronological age.

Materials and Methods

The present study was conducted in the department of Oral medicine & Radiology, Yenepoya (Deemed to be University) Mangalore. The radiographs were selected from the archives of the Oral medicine & Radiology Department. The sample size was 56 patients, with 30 females and 20 males, and each OPG (digital) was taken by Planmeca machine under standard protocols and Agfa NX software was used.

The study included patients aged between 5 - 15 years, with no missing mandibular left teeth and Standardised OPGs are selected with no positional errors.

The study excluded Radiographs of children with developmental anomalies or congenital anomalies, Radiographs of children with diseases affecting the bone and teeth and Radiographs with artifacts.

The CA of each individual is calculated by subtracting the birth date from the date on which the radiographs were exposed for that particular individual. Digital OPG of all children were used to assess the status of maturation on the basis of calcification of the permanent teeth in the left side of mandible, from central incisor to the second molar using Demirijian et al method (figure 1),

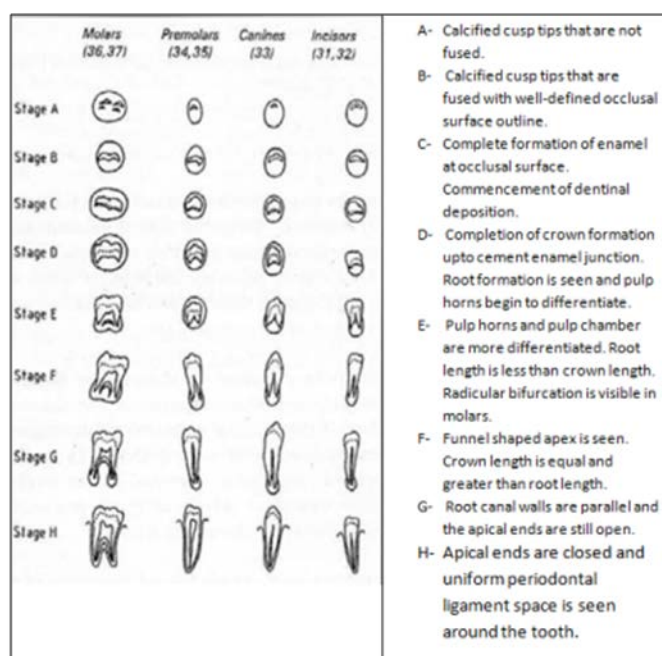


Fig: 1

After noting all stages of teeth from central incisor to the second molar , the developmental status of a particular tooth was calculated in years on the basis of tables given by Willems et al (figure 2).

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	0.63	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
	Second molar	0.14	0.11	0.21	0.32	0.66	1.28	2.09	4.04

Fig: 2

All the values from central incisor to the second molar were summed to obtain an overall maturity score, which indicates the DA of that particular patient. And correlation analysis was carried out. P value less than 0.5 is considered as significant.

Results

Pearson’s test to correlate between estimated age and chronological age:-

Here we observe that there is significant correlation between estimated age and chronological age ($r=0.908, p<0.001$).

Table 1: In entire sample

	N	Correlation	p-value
estimated age & chronological age	56	.908	<0.001

Here we observe that there is significant correlation between estimated age and chronological age ($r=0.908, p<0.001$).

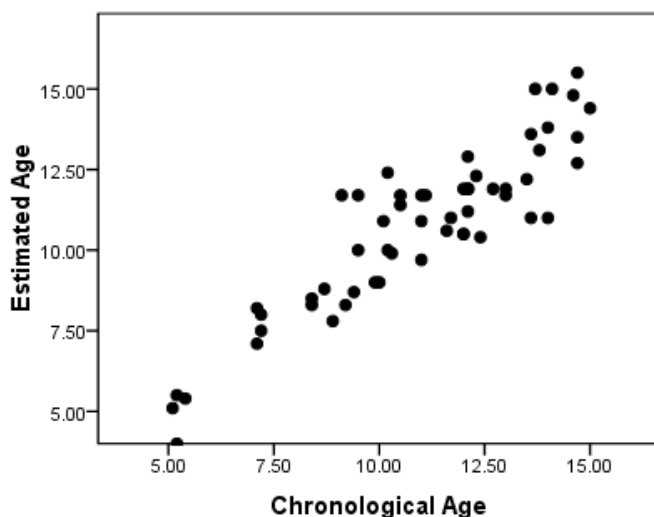


Table 2: Gender - Female

	N	Correlation	p-value
estimated age & chronological age	30	.931	<0.001

Here we observe that there is significant correlation between estimated age and chronological age ($r=0.931, p<0.001$) in female population.

Table 3: Gender - Male

	N	Correlation	p-value
estimated age & chronological age	26	.890	<0.001

Here we observe that there is significant correlation between estimated age and chronological age ($r=0.890, p<0.001$) in male population.

Discussion

One of the interesting applications of Forensic Odontology is age estimation by means of teeth. Teeth may be better preserved than other parts of the body and thus give a better indication of age. Age estimation from dental developmental stages is considered highly accurate, reliable and precise than any other methods² and use of Dental radiography is an effective tool in estimation of dental age and 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 estimation⁵.

Tooth development has variations among populations and these differences exist between several ethnic groups worldwide⁷. So, this study was performed to estimate the DA in Kerala population by using Willems et al method.

In the present study which is conducted in 56 patients, with 30 females and 20 males, the overall mean difference between the estimated DA and CA for males was 0.346 ± 1.314 while for females, it was 0.221 ± 1.123 . When the entire sample was considered, slight underestimation of age was noted, in both males and females, however under estimation was more in males, it shows that females matures earlier than males in Kerala population in agreement with previous studies done in other south Indian populations. In the present study Willems method was better applied for females when compared with males, which is in agreement with Begum R et al, and Akbar A et al.

This delay in dental maturation may be partly explained by the environmental factors, genetic variations, population differences, socio-economic status, nutrition, dietary habits, and lifestyle. And it is important to know that no methods for estimation of age will accurately determine the exact age of the individual, since development naturally varies between individuals¹.

Conclusion

In this study, significant relation was found between estimated DA and CA and thus the Willems method seems to be applicable in estimating age in Kerala children. As no published data is available regarding the application of Willems method in selected population, this paper provides an insight in using Willems method in Kerala population for estimating mean age of a child with unknown CA. This paper provides an insight in

using Willems method in Kerala for estimating mean age of a child with unknown CA.

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