AGE ESTIMATION IN NORTH TELANGANA POPULATION BASED ON RADIOGRAPHIC THIRD MOLAR DEVOLEPMENT ON ORTHOPANTAMOGRAM

Angalakurthi Sam Jaysheel[1], Jaya Krishna[2], Talla harshavardhan[3], shailender reddy[4], Deepika meesala[5], Madhulatha gopaladas[6]

1.Post graduate, Department of Oral medicine and radiology, Meghna Institute of Dental Sciences. Nizamabad.
2.Reader, Department of Oral medicine and radiology, Meghna Institute of Dental Sciences. Nizamabad.
3.Reader, Department of Oral medicine and radiology, Meghna Institute of Dental Sciences. Nizamabad.
4.Professor, Department of Oral medicine and radiology, Meghna Institute of Dental Sciences. Nizamabad.
5.Post graduate, Department of Oral medicine and radiology, Meghna Institute of Dental Sciences. Nizamabad.
6.Senior lecturer, Department of Oral medicine and radiology, Meghna Institute of Dental Sciences. Nizamabad.

ABSTRACT:

Aim: Age estimation using forensic methodologies cover both living and dead people. In this regard, teeth are far more beneficial for being among the most indestructible tissues of the body, both in life and after death. Considering that maturity is function of age the objective of our study was to explore the utility of stages of tooth development in estimating the chronological age, which may be considered as a tool in forensic investigations.

Materials and methods: Orthopantomograms of 300 individuals with known age and gender were selected for the study. The age ranged between 15-25 years. The investigated radiographs were taken from the records of MIDS, Department of Oral medicine and Radiology from a period starting from 2014 to 2015. Radiographs with optimum density and contrast were included in the study and radiographs with any pathology, magnification and distortion were excluded.

Results: The radiographic analysis of tooth calcification according to the method described by Demirjian et al, assigned to the third-molar tooth were rated in panoramic radiographs and assessed statistically. The inference drawn from the observations of the study results support the fact that the developmental stages of third molar yields acceptable estimates of chronological age of a suitable individual.

Conclusion: Tooth formation has been more widely used than tooth eruption for assessing dental maturation, because it is a continuous and progressive process that can be followed radiographically, and most teeth can be evaluated at each examination. It has been shown that dental development relates more closely to chronological age than skeletal, somatic or sexual maturity indicators.

Keywords: Chronological Age, Demirjian method, Mandibular Third molars, Panoramic radiograph.

INTRODUCTION:

Ageing is a natural, unavoidable and irreversible phenomenon to any thing in Universe. Among animate things aging is characterized by initial stages of development followed by growth. [1] This active phase is later taken over by tissue remodeling. As ageing is associated by constant change in physical state of an organism, any stage of this characteristic process could be correlated with corresponding age as such.[2] Such a process may gain status of investigation,

and could help in identification of certain details of a person.

Radiology plays an indispensable role in the human age determination. Radiological images are utilized in the process of age estimation, which is one of the essential tools in identification in forensic science.[3] Radiographic assessment of age is a simple, non-invasive and reproducible method that can be employed both on living and unknown dead. [4]

Various radiographic images that can be used in age identification are intraoral periapical radiographs, lateral oblique radiographs, cephalometric radiographs, panoramic radiographs, digital imaging and advanced imaging technologies. [5]

The radiological age determination is based on assessment of various features as follows: [6]

1. Jaw bones prenatally

2. Appearance of tooth germs

3. Earliest detectable trace of mineralization or beginning of mineralization

4. Early mineralization in various deciduous teeth during intrauterine life

5. Degree of crown completion

6. Eruption of the crown into the oral cavity

7. Degree of root completion of erupted or unerupted teeth.

8. Degree of resorption of deciduous teeth

9. Measurement of open apices in teeth

10. Volume of pulp chamber and root canals/formation of physiological secondary dentine

11. Tooth-to-pulp ratio

12. Third molar development and topography

To establish the identity of an individual, age estimation is necessary not only in cases of living but also in the dead too. For example in Civil cases like identification in aeroplane crashes, railway disasters, bomb blasts, earthquakes, floods, fire disasters, ship wrecks, employment and retirement, Marriage, Management of property, Voting right, Competency as witness, insurance claims, passport, visa and others. [7]

Our study was designed to further evaluate the contribution of developmental stages of mandibular third molars in assessing the chronological age based on Demirjian method of tooth identification.

MATERIALS AND METHODS:

A total of 300 radiographs were taking of patients visiting the department of oral medicine and radiology, Meghna institute of dental sciences, Nizamabad.

Age range 15-25 years were included in the study. Informed consent was taken from every individual, prior to examination.

The orthopantomograms were made during the years 2014-2015. Patient identification number, sex, date of birth, date of exposure, and eruption stages of the third molars were recorded for each individual subject. Each of these orthopantogram was studied for eight different stages of development of the third molars by methods adapted by demirijian as follows:

A ⬭ A – Mineralized cusp tips, not yet coalesced

B ⬭ B - Mineralized cusps united

C ⬭ C - The crown is approximately half formed

D ⬭ D - Crown formation is complete to the dento-enamel ju

E ⬭ E – Root formation has begun

F ⬭ F - Root length at least as great as crown length

G ⬭ G – Parallel root walls with open apices

H ⬭ H – Apices are completely closed

RESULTS:

The study information was recorded by plotting the actual age of the study participant as per the

Chronological stage of third molar development found on the radiograph, as described by Demirijian et.al. The mean of actual age such recorded was calculated and designated as Dental Age for the respective stage of the tooth development.

Statistical analysis: All the analysis was done using SPSS version 14. A p-value of <0.05 was considered statistically significant. Comparison of actual age and calculated age was done using paired t test.

A statistically significant value is obtained for the maxillary third molars when compared between the estimated age and the chronological age. Mandibular teeth showed a value which was statistically non significant.(Table 1)

Table 2 denotes that, in maxilla 32.9% are in stage E and in mandible 31.0% are in stage F. it can be inferred that based on stage of eruption, mandibular teeth erupt earlier than maxillary teeth

DISCUSSION:

Chronologic age estimation by tooth development has been used over a long period. Tooth development is an accurate measure of chronologic age that seems to be an independent of exogenic factors such as malnutrition or disease. [8]

The third molar calcification stage is one of the few tools that can be used to assess age when development is nearing completion. However, age estimates based on dental methods have shortcomings, especially during adolescence when the third molar is the only remaining variable dental indicator. [9] Indeed, a great variation in position, morphology, and time of formation exists. The differences between populations, the different methodology,

and the dissimilarity among observers are other important shortcomings. [10]

In the past different classifications were presented by Kohler et al, Kullman et al [11] and others. However some of these classifications identify a large number of stages that are hard to delimit from each other. Demirjian et al [12] presented a classification distinguishing four stages of crown development (A-D) and four stages of root development.

The present study was designed to evaluate the specificity of developmental stages of maxillary and mandibular third molars in assessing the chronological age of adolescent population of northern telangana. Several studies are focused on evaluating third molar development in particular ethnic group. In our study, stages 'A', 'B'& 'C' were not involved as the age group of this particular study range between 15 to 25 years.

In the present study maxillary third molar tended to develop somewhat earlier than their mandibular counter part which is in accordance with observation in study done by H. Mincer et al. [13]

Comparing the same age groups, in upper and in lower jaw, we conclude that the maxillary third molar exhibit a greater degree of development at the same age with the lower third molar. [14] This means that for the same developmental stage, the chronological age established by using this method is slightly greater when third lower molar is taken into study, compared with the same subject's upper third molar. Our results are similar to those reported by orhan [15], who didn't find any statistically significant differences between the chronologiacal age and calculated age.

The statistical evaluation of the results is found highly significant for all the stages of the tooth development in maxillary third molars which is in accordance with results given by Mincer et.al. [13]

For medico legal purposes, 18 years of age is an important cut point. From table 6 we can say that if a subject presents with a developmental stage A to D there is less likelihood that subject is 18 years old.[16] On the other side if subject presents with developmental stage of H, there are more chances that subject has crossed the 18 years age. Similar observations were made by H. Mincer et al. [13]

Similar results are reported by all the studies related to chronological age assessment based on stages of the tooth development.[17] The results of the present study were also evaluated for specificity of the different stages of tooth development. This was evaluated by calculating the frequency of missing tooth and incidence of particular stage of tooth development in age groups,

Other than the expected age group. The study results are specific for all the stages. [18]

CONCLUSION:

The results of our study show the necessity of generating population-specific data for forensic age diagnostics in living individuals. It has been reported that dental mineralization is less affected by external factors when compared to bone mineralization. Tooth calcification stages of mandibular third molar from panoramic radiographs can be clinically useful, as a developmental

marker and considered as a essential tool in determination of chronological age. Modified Demirjian's method may be recommended for evaluation of the mineralization of thirdmolars for purposes of forensic age determination.

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TABLES:

Table 1: the actual age and calculated age for both maxilla and mandible.

		Actual age		Calculated age		Difference		P-value
		Mean	SD	Mean	SD	Mean	SD	
Arch	Maxilla	18.89	2.08	17.66	1.82	1.23	2.05	<0.001; Sig
	Mandible	18.83	2.08	18.79	1.61	0.05	2.05	0.683; NS
Total		18.86	2.08	18.21	1.81	0.65	2.1	<0.001; Sig

Table 2: shows stage of erupting teeth in maxilla and mandible

		Arch			
		Maxilla		Mandible	
		N	%	N	%
Stage	D	56	18.8%	35	12.1%
	E	98	32.9%	53	18.3%
	F	67	22.5%	90	31.0%
	G	50	16.8%	51	17.6%
	H	27	9.1%	61	21.0%