

Estimate Chronological age in Adult and Children Using Third Molar Development Stages

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ABSTRACT

Background: In human body teeth are the most long lasting structure. In age determination of unidentified bodies the pattern of teeth development used as a credible technique. The last erupted teeth are third molars / wisdom teeth and regarded as most variable in dentition. For estimation of chronological age, development stages of third molar tooth growth used.

Aim: To assess judgment of chronologic age based on the development stages of third molar growth.

Methods: The cross-sectional study was carried out at Nishtar Institute of Dentistry, Multan from 16.1.2016 to 20.1.2018. Final sample consist of 600 orthopantomograms from young population of known chronologic age ranging 9 years to 26 years; mean age 15.94 ± 72 years and sex in which males were 260 with mean age of 15.53 ± 3.75 year and 340 were females with mean age of 16.36 ± 3.89 year.

Results: Between male and female third molar development showed the stages of calcification D&G $p < 0.05$ significant difference statistically. Males were earlier attained genesis of third molar as compared to females. Strong association showed among age & growth of third molar for males $r^2 = 0.64$ and $r^2 = 0.60$ for females. For estimation of chronologic age, equation was derived age = 9.42 ± 1.60 development stage.

Conclusion: Third molar is suitable development marker particularly when comparing obtained standard deviation with other methods for calculation of skeletal age.

Key words: Third molar, Development stage, Chronological age, Judgment of age

INTRODUCTION

Teeth are the most long lasting structure in human body. Teeth are the most opposing part and reliably used for age estimation and have least natural structure turnover. For a long period of time teeth are comparatively un-changed and also survive death¹. In the dentition of teeth third molar is the main variable in different studies. For age estimation during twenties the third molars are the most reliable biologic tool². When no any official document available, the third molar tooth to ascertain the age in young or adults is considerably vital and reliable tool. Furthermore, this type of age determination applied in patients who suffer with amnesia and samples of anthropologically significance³. Age determination between range of 15.5 years to 23.5 years remains difficult in people. Skeletal marker with fusion of diaphysis & epiphysis, hand wrist evaluation, amino acid racemization, public symphysis changes, cranial sutures fusion or secondary sex characteristics changes. During these years previously mentioned variables are less or more uncertain for age determination & have benefit and disadvantage^{4,5}.

Teeth represent helpful material to evaluate the age. Through observing stages of dentition in infants highly perfect/ accurate age is evaluated. However, this perfection decreases as a dental growth of person is completed.⁶ The radiologic morphologic estimation and third molars skeletal features in young are two techniques for estimation of age.⁷

As compared with other teeth, the third molar grows continuously for a long period of time which is a unique characteristic of third molar. However, third molar teeth are most variable of all teeth.⁸ However, for evaluation the age of un-reported young individuals or asylum seeker, it

In various areas, a number of researches have been conducting to assess third molar effectiveness as a proper seems a reliable technique / skeletal maturity in combination age marker. Dental growth among various populations show a small variation as revealed by those studies, proposing population particular studies are important. Presently, for different cultural groups, there are many research on growth evaluation of third molar^{6,10,11}.

At start of the present study, we assumed the growth of third molar in Pakistani children may have different cadence than that of obtained standards from other countries children. So that growth of wisdom tooth regarded as helpful tool to ascertain development stages in Pakistan, on the basis of development stages estimation of chronologic age, to evaluate the development of wisdom tooth by age & sex and these results compare with previous studies.

MATERIALS AND METHODS

In Nishtar Institute of Dentistry, Multan this cross-sectional study was conducted during 16.01.2016 to 20.01.2018. Six hundred orthopantomogram (OPG) from young population of known chronologic age ranging from 9 years to 26 years of age and sex were selected in this study. All the selected subjects were fully nourished and healthy with excellent dental hygiene as well as normal growth (i.e. no impactions or teeth transposition, congenital absence). Those patients were excluded from this study with image deformity and clear dental pathology shown by Orthopantomogram. Due to low quality of radiology, twenty two films were not included and 122 agensis films of third molar were excluded. Illuminator used to enhance contrast of tooth images in a dark room for evaluations. Third left mandibular molar consider, if not present than neighboring tooth used to evaluate the phase of development by classification and

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examination. For tooth calcification, Demirjian et al⁹ method was used, in which A to H one of the eight stages was allocated to third molar for calcification. The first four stages from A to D showed the crown formation from the start of cusp calcification to crown complete calcification. The last four stages from E to H indicated the formation of root from initial radicular bifurcation to closing of apical.

For the 8 development stages from A to H, the chronologic ages range with means & standard deviations were obtained. For statistical analysis among sex and age U test of Mann Whitney and Wilcoxon were used in this study. To obtain the regression formulas, analysis of regression was executed for dental age. As an independent variable, chronologic age was used and as dependent variables, development stages of third molar were used. Randomly re-assessed radiographs from 10% of same males and females patients through two investigators after 8 weeks of first assessment for evaluating the reproducibility of dental growth stages.

RESULTS

The mean age was 15.94±3.72 with 9 years to 26 years range of age in this study. Two hundred and sixty were males (mean-age of 15.53±3.75 year) and 340 were females (mean-age of 16.36±3.89 year). No important difference of intra-observer or inter-observer (p >0.05) showed by the thirty radiographs, (a subsample repeated scoring).

Table 1: Descriptive Value & Statistical Comparison of Demirjian Stages in Male & Female:

Stage	Males		Females		p. value
	No.	Mean ± SD	No.	Mean ± SD	
a	48	12.43 ± 3.48	66	13.64 ± 4.45	-
b	46	12.30 ± 2.42	44	12.32 ± 2.52	-
c	40	13.12 ± 1.75	38	13.57 ± 1.73	-
d	26	13.40 ± 1.50	48	13.90 ± 2.52	<0.05
e	20	14.32 ± 1.80	24	16.32 ± 2.30	-
f	16	17.60 ± 1.40	22	17.54 ± 1.90	-
g	20	18.06 ± 2.42	30	19.69 ± 2.42	<0.05
h	44	23.02 ± 2.90	68	23.86 ± 2.16	-

There was 94% and 97% consistency in inter-observer and intra-observer respectively. In both males and females the third molar development process was observed and shown in Table-2, the age with standard deviation and mean. Among males and females growth of third molar about calcification stage D & G were revealed important statistical differences p <0.05. Those outcomes show that the stages of Demirjian start earlier in males as compared to females. Furthermore, a minor delay shown in males in B and F stages about not significant statistically. In development of tooth, useful landmark such as completion of crown stage-D, root length completion stage-G and apical closure stage-H were described for community. Around 74% females of stage-D and 89% males were ≤ 14.5 year old in this present study. About 68% males and 58% female between the age of 17 years and 20 years in stage-G. Around 69% males & 78% females were >22 years in stage-H. In two females and one male (three subjects) third molar formation completed earlier in the age of 17 years.

Correlation growth of third molar and chronologic age is assessed by linear regression coefficients. Statistical definite association was found among growth of third molar and females age r²=0.60 and for males r²=0.64. On the basis of number of wisdom teeth complete sample and regression formula for male and female were estimated.

DISCUSSION

Since long period of time tooth development has been used to estimate the chronologic age. The accurate chronologic age is calculated by evaluation of wisdom tooth, external factors such as malnourished state or any disease not influenced^{6,12}. Age can be correctly assessed by calcification stage of third molar when growth is near to complete⁵. There are shortfall for estimation of age based on dental methods. Particularly, during teenage when only third molar tooth is lasting variable. Definitely, is morphology, there is a large variation and development time and position exists. In this study, to control over some these deficiencies, all 600 Orthopantomogram were examined by well reputed two examiners using 8 stages in the light of Demirjian standard⁹.

In this study, minimum limit of age is 8 year which is alike with foreign studies conducted by Uzamis & Orhan^{13,14}. The crypt was noticeable in early age of 8 years in mandibular arch.

Different results extract from sex differences in past studies, individually we examined male and female for each stage by mean ages. Statistically important differences among females and male individuals observed in stage-D & G for calcification stages in third molar. According to Demirjian criteria for tooth calcification stages, the formation of third molar happens later in females as compared to males as per these significant differences. These outcomes were also in accordance with other, which reported that the development stages occurs later in females as compared to males in different communities e.g., Spanish, Hispanics, Belgian & Swedes origin people.^{6,11,15,16} However, researchers discover out allocation for both sex and alike values of mean age.^{17,18} Reaches stage-H at mean age of 20.1 males in 23.02 and for females 23.86 years at reaches stage-H observed in our study. It is not according to the outcomes of other research work. This assortment may be due to select age range differences at the study population as compared to different studies. The outcomes demonstrate probability of an individual being younger than seventeen years at stage-D & E or older than nineteen years at stage-H which according to past studies.^{11,15,17} As compared to German, South African, Japanese, the development of third molar occur earlier in Pakistan for all stages.^{17,19} Third molar development take place earlier in Spanish only in F, G & H stages.¹¹ Mean definite dissimilarity among chronologic and dental age have been noticed with elevated correctness. With the age of individual, growing stage of third molar has linear relation, regardless male or female; the latter grow a slight earlier as reported.^{16,21} r²=0.60 a strong association for females and r²=0.64 for males showing by statistical analysis. These outcomes have similar view with other community's studies.

CONCLUSION

Among Pakistani, third molar growth occurs at an earlier age for all stages as compared to other populations. In Spanish the growth of third molar earlier take place only in stage-F-G & H than in Pakistani. Third molar used as an appropriate growing sign, especially when compared derived standard deviation with other method for estimation of skeletal age based on wrist hand or long bones, e.g. determination of age with upsurge accuracy, indications of sexual maturity and in addition to mineralization of third molar, ossification should be derived.

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