

Skeletal Maturity Assessment Using Maxillary Canine Calcification Stages

Nayha Enver¹, Asmi Shaheen¹, Fasila Rashid¹, Muhammad Azeem¹, Asad Ur Rehman² and Samina Qadir¹

ABSTRACT

Objective: To determine the correlation between maxillary canine stages and age and gender

Study Design: Cross Sectional Study

Place and Duration of Study: This study was conducted at the Department of Orthodontics, de'Mont, Lahore, from March 2022 to October 2022.

Materials and Methods: The study was conducted after obtaining informed consent and institutional ethics approval. We obtained panoramic radiographs to find out the phases of mineralization of upper canine so that correlation can be found out with age and gender.

Results: Descriptive statistics of age and mineralization of maxillary canine were calculated. Frequency of gender was also calculated. Results of Spearman Coefficient of Correlation showed a weak linear relationship between age and mineralization of maxillary canine.

Conclusion: Correlating age and gender with upper cuspid calcification stages is not an accurate method to find out skeletal maturity in orthodontic patients.

Key Words: Orthodontics; Peak puberty; Canine calcification stage

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INTRODUCTION

The need to determine dental stages and stage of maturity of skeletal structures is one of the very important diagnostic step in orthodontics and dentofacial orthopaedics as treatment planning is totally linked with this in those orthodontic patients that are skeletally disturbed.¹⁻³ The biological age in term of chronological age is not an accurate method for the assessment of peak puberty because of extreme variations in maturity among children according to chronological age, and all of this has led to the skeletal age concept.¹

The determination of skeletal development for the assessment of skeletal maturity can be done through various radiographic and chemical methods. The most commonly used methods are hand-wrist x-rays and lateral cephalograms.²

¹. Department of Orthodontics, de'Montmorency College of dentistry Lahore.

¹. Department of Orthodontics,

Correspondence: Dr. Nayha Enver, Demonstrator Orthodontics, de'Montmorency College of dentistry Lahore.
Contact No: 03234143349
Email: nayha_100@hotmail.com

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The determination of skeletal development for the assessment of skeletal maturity using lateral cephalograms by Hassel and Farman method relies on examination of shape and lower border of cervical vertebrae (C2, C3, and C4) in lateral cephalograms and this method is called CVM method. The assessment of skeletal development using panoramic radiographs is a relatively new method.³

The assessment of skeletal development for skeletal maturity using panoramic radiographs is a successful method.⁷ The determination of skeletal development using panoramic radiographs can be done by either using stages of dental eruption or using stages of tooth calcification.^{4,5} There are various factors that play a pivot role in the relationship of dental and biological maturation such as race, ethnicity, medical status, nutritional status, hormonal status, socioeconomic levels, and urbanization.¹¹⁻¹⁴

The chronological age is not a good method for finding out the peak puberty because of many reasons, so therefore it is very important to find out skeletal age. The determination of skeletal development using radiographs can be done by either using many methods such as stages of dental eruption or using stages of tooth calcification.^{15,16}

Practical implication of this study is that there is no need to take extra radiographs to find out skeletal age, thus avoids unnecessary radiation exposure. The rationale of the study was to determine skeletal development using stages of maxillary canine calcification stages.

The gap in literature showed that there is limited data available in local and international literature on determining the correlation between age gender and upper canine mineralization stages. Therefore, the objective of this study was to determine the correlation between age gender and upper canine mineralization stages.

MATERIALS AND METHODS

This cross sectional study was conducted at de'Montmorency College of dentistry, Lahore, from March 2022 to October 2022 at the department of Orthodontics. Patients presenting in the orthodontic department having malocclusion and requiring treatment were included under the following criteria: Age range from 8 to 15 years, normal growth and development, normally erupting and growing permanent upper canines as seen on OPG, no dental pathos, and no history of any surgical or orthodontic treatment.

Population: Orthodontic patients visiting department of Orthodontics, de'Mont, Lahore.

Sampling: Non-probability convenience sampling

Sample size: A sample size of 100 was calculated at $\alpha = 0.05$, $\beta = 0.100$ and $\gamma = 0.854.13$

Study Design: A Cross Sectional Study.

Place & Duration: Department of Orthodontics, de'Mont, Lahore, from March 2022 to October 2022.

Instrument: Maxillary canine calcification was assessed from the panoramic radiograph according to Demirjian.

Data Collection Procedure: The panoramic radiographs of subjects who had be attending orthodontic department, fulfilling the inclusion/exclusion criteria. After obtaining informed consent assessment of panoramic radiographs was performed by a single examiner in a recommended radiographic room setting.

Data Analysis: The descriptive statistics were calculated by determining the means and SD of the chronological ages. Frequency and percentage were calculated for gender and stages of calcification on DI. Spearman coefficient of correlation was applied to find out the correlation between age gender and upper cuspid calcification stages (DI).

RESULTS

Descriptive statistics of age, and Maxillary Canine calcification (DI) stage were shown in table 1 & 2 respectively. Results of Spearman Coefficient of Correlation were shown in table 3 & 4.

Spearman Coefficient of Correlation between Maxillary Canine calcification (DI) stage and Gender was 0.35 that showed a weak positive linear relationship between them. Spearman Coefficient of Correlation between Maxillary Canine calcification (DI) stage and Age was

0.078 that showed a very weak positive linear relationship between them.

Table No.1: Descriptive statistics. (n = 100)

	Min.	Max.	Mean	SD
Age	8	15	11.45	2.41

Table No.2: Distribution of Maxillary Canine calcification (DI) stage

Maxillary Canine calcification (DI) stage	Frequency	Percent
D	5	5
E	19	19
F	30	30
G	24	24
H	22	22
Total	100	100.0

Table No.3: Spearman Coefficient of Correlation (CC) between Maxillary Canine calcification (DI) stage and Gender

Correlations				
			DI	Gender
Spearman's rho	DI	CC	1.000	0.355**
		Sig. (2-tailed)	.	0.000
		N	100	100
	Gender	CC	0.355**	1.000
		Sig. (2-tailed)	0.000	.
		N	100	100

**., Significant at 0.01.

Table No.4: Spearman Coefficient of Correlation (CC) between Maxillary Canine calcification (DI) stage and Age

Correlations				
			DI	age
Spearman's rho	DI	CC	1.000	0.078
		Sig. (2-tailed)	.	0.439
		N	100	100
	age	CC	0.078	1.000
		Sig. (2-tailed)	0.439	.
		N	100	100

DISCUSSION

The objective was to find out the correlation between age gender and maxillary canine calcification stages. Therefore, one hundred patients were included by using non-probability consecutive sampling and obtained panoramic radiographs of all patients who were attending orthodontic department after fulfilling the inclusion/exclusion criteria.

The gap in literature showed that there is limited data available in local and international literature on determining the correlation between age gender and

upper canine mineralization stages. Therefore, the objective of this study was to determine the correlation between age gender and upper canine mineralization stages.

In this present study, from one hundred orthodontic patients, it was found out that the minimum age was eight years and maximum was fifteen years with mean and SD of 11.45 ± 2.41 years. In this study, the males were 48/100 (48%) while females were 52/100 (52%) (Fig. 1). Frequency of Maxillary Canine calcification (DI) stage as D was 5%, E was 19%, F was 30%, Gender was 24% and H was 22%.

In previous studies, various other accurate methods have been suggested to calculate the time of growth spurt.¹⁶ Dental maturity can be used to find out the time of growth spurt and it got certain advantages, such as it is an accurate method and it avoids unnecessary radiographs too. Spearman Coefficient of Correlation between upper cuspid calcification (DI) stage with age and gender was found out in the present study that showed a very weak relationship between them. This is in contrast with the findings of the previous studies that showed that there is a high correlation between them however the results differences may be linked with the factors such as race, ethnicity, medical status, nutritional status, hormonal status, socioeconomic levels, and urbanization.¹⁴⁻¹⁶

The chronological age is not a good method for finding out the peak puberty because of many reasons, so therefore it is very important to find out skeletal age. The determination of skeletal development using radiographs can be done by either using many methods such as stages of dental eruption or using stages of tooth calcification.^{15,16}

The findings of the present study are in agreement with Lewis, Garn et al., and Tanner that showed a strong relationship between skeletal and dental maturity. Findings from studies done by Chertkow concluded that root formation of lower cuspid can be used as a maturity indicator to find out the peak puberty stage with same accuracy as for hand-wrist radiographs. Similarly, other studies indicated that root formation of lower 2nd molars can be used as a maturity indicator to find out the peak puberty stage.¹⁷

Practical implication of this study is that there is no need to take extra radiographs to find out skeletal age, thus avoids unnecessary radiation exposure. The rationale of the study was to determine skeletal development using stages of maxillary canine calcification stages

CONCLUSION

Correlating age and gender with upper cuspid calcification stages is not an accurate method to find out skeletal maturity in orthodontic patients

Author's Contribution:

Concept & Design of Study:	Nayha Enver
Drafting:	Asmi Shaheen, Fasila Rashid
Data Analysis:	Muhammad Azeem, Asad Ur Rehman, Samina Qadir
Revisiting Critically:	Nayha Enver, Asmi Shaheen
Final Approval of version:	Nayha Enver

Conflict of Interest: The study has no conflict of interest to declare by any author.

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