RADIOGRAPHIC EVALUATION OF MAXILLARY 1st PREMOLAR DEVELOPMENT BASED ON NOLLAS STAGE OF TOOTH DEVELOPMENT IN 7-9 YEAR OLD MALE CHILDREN - A RETROSPECTIVE ANALYSIS

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Abstract

The aim of the study is to radiographically evaluate the maxillary first premolar development based on nollas stage of tooth development in 7 to 9 year old male children. A total of about 400 orthopantomography (OPG) images were collected from the database record of the dental institution between June 2019-March 2020. Of these 200 OPGs were selected based on the age group between 7-9 years old male children. Dental age of developing permanent first maxillary premolar was calculated based on the nollas method after data collection statistical analysis was done in SPSS software. Among the study population 68% were 7 years old, 13% were 8 years old and 19% were 9 years old. Considering the distribution of teeth assessed 52.5% were 14 and 47.5% were 24. Majority of the teeth attained maximum development at stage 4(45%), and the least assessed at stage 1(1%). The association between the age and nollas stage of tooth development showed p-value of 0.082(p>0.05) the difference is statistically not significant. And the association between the tooth number and nollas stage of tooth development showed p value-0.054,p(>0.05), which is statistically not significant. Within the limitations of the study it was concluded that, majority of the maxillary first premolar teeth assessed among 7 to 9 years old male children had premolar 'crown almost completed' (Stage 4) according to Nollas stage of tooth development. Majority of the children in the age group of 7 and 9 years had 2/3rd crown completed in premolar(Stage 4) and majority of 8 years old children had 'crown almost completed' in premolar (Stage 5).

Introduction

Age determination has great importance in treating orthodontic patients.[1] Therefore it is necessary that the clinician has certain growth Status of the individual so that the appropriate treatment can be timely initiated. Dental age identification plays an important role in paediatric dentistry, Orthodontic treatment planning and forensic medicine. [2] Dental age is based upon the rate of development and calcification of their teeth buds and the progressive sequence of their eruption in the oral cavity[3].Early childhood caries is one arising prevalent disease which can be a cause of premature loss of primary teeth[4,5] Maintenance of oral health has an important role in general well being of an individual [6–9] Pulpectomy procedure is performed in primary teeth to avoid extraction and to maintain its form and function[10–16] Fluoride when present in optimal quantities is known to prevent caries by various mechanisms but more predominantly by deposition of calcium fluoride crystals which is more resistant to demineralisation [17,18]

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Various skeletal and dental methods are available for age assessment of the child. They are described by Nolla, Demirjian and William where tooth formation at the different age is a more accurate way to determine the dental age.Dental age is of particular interest to the paediatric dentist and orthodontist in planning the treatment of different types of malocclusion in relation to the maxillofacial growth[19]In the absence of chronological age a reliable method is needed for the assessment of the growth status of the child to plan different treatment modalities. Growth status can be assessed by height, weight, gender, chronological age, dental age and skeletal age of child[20]. Difference between chronological and biological age have led to the development of different indications of their maturity such as skeletal age[21]

Dental age can be assessed by observing the degree of calcification of the teeth on radiographs.Tooth calcification is more reliable indicator of dental maturity than the tooth eruption because it is not affected by local factors such as loss of primary teeth, lack of space, dental decay, malnutrition, ankylosis,orthodontic modalities in addition to the under genetic control[20,22,23]

The aim of the study is to radiographically evaluate the development of maxillary first premolar based on the Nollas stage of tooth development in 7 to 9 year old male children.

MATERIALS AND METHODS:

Study Setting:

The study was conducted with the approval of the Institutional Ethics Committee [SDC/SIHEC/2020/DIASDATA/0619-0320]. The study consisted of one reviewer, one assessor and one guide.

Study Design:

The study was designed to include all children aged between 7-9 years male children and maxillary first premolar only included . The children who did not fall under this inclusion criteria were excluded.

Sampling technique:

The study was based on the Random sampling method. To minimise the sampling bias, all the cases were reviewed priorly and included.

Data Collection And Tabulation:

Data collection was done using the patient database with the timeframe work of 1st June 2019 to 30th April 2020. About 400 OPGs were reviewed and those fitting under the inclusion criteria were included. Cross verification of data was done by a reviewer. The collected data was tabulated based on the following parameters:

- Patients demographic details

- Tooth number(teeth were included which showed maximum maturation)

- Nollas stage of tooth development

Statistical Analysis:

The variables were coded and the data was imported to SPSS. Using SPSS Version 20.0 categorical variables were expressed in terms of frequency and percentage and bar graphs were plotted.The statistical significance of the associations were tested using the Chi-square test.

RESULTS:

Among the study population 68% were 7 years old, 13% were 8 years old and 19% were 9 years old. Considering the distribution of teeth assessed 52.5% were 14 and 47.5% were 24. Majority of the teeth attained maximum maturation at stage 4 (45%), least maturation assessed at stage 1(1%). The association between the age and nollas stage of tooth development showed p-value of 0.082(p>0.05) the difference is statistically not significant. And the association between the tooth number and nollas stage of tooth development showed p value-0.054,p(>0.05), which is statistically not significant.

AGE OF THE CHILD IN YEARS		FREQUENCY	PERCENT	VALID PERCENT	CUMULATIVE PERCENT
VALID	7	136	68	68	68
	8	26	13	13	81
	9	38	19	19	100
	TOTAL	200	100	100	

Table 1:Shows the distribution of age of the male children participants wot were included in the study. Among the study population 68% were 7 years old, 13% were 8 years old and 19% were 9 years old.

		FREQUENCY	PERCENT	VALID PERCENT	CUMULATIVE PERCENT
VALID	14	105	52.5	52.5	52.5
	24	95	47.5	47.5	100
	TOTAL	200	100	100	

Table 2: Shows the tooth distribution based on Nolla's stage assessed in this study. Among the study population 52.5% were 14 and 47.5% were 24.
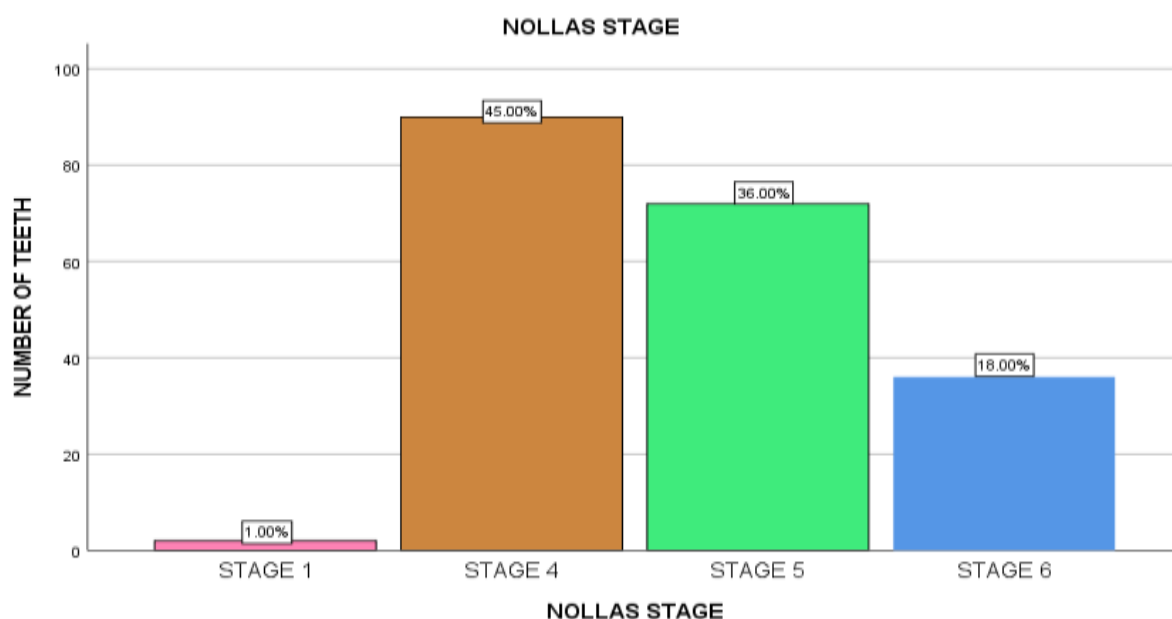

Figure 1: Shows the distribution of Nollas stage of tooth development assessed in this study. X axis - distribution of nollas stage of tooth development, Y axis - number of teeth. Majority of the teeth attained maximum development at stage 4 (45%), and attained least at stage 1(1%)
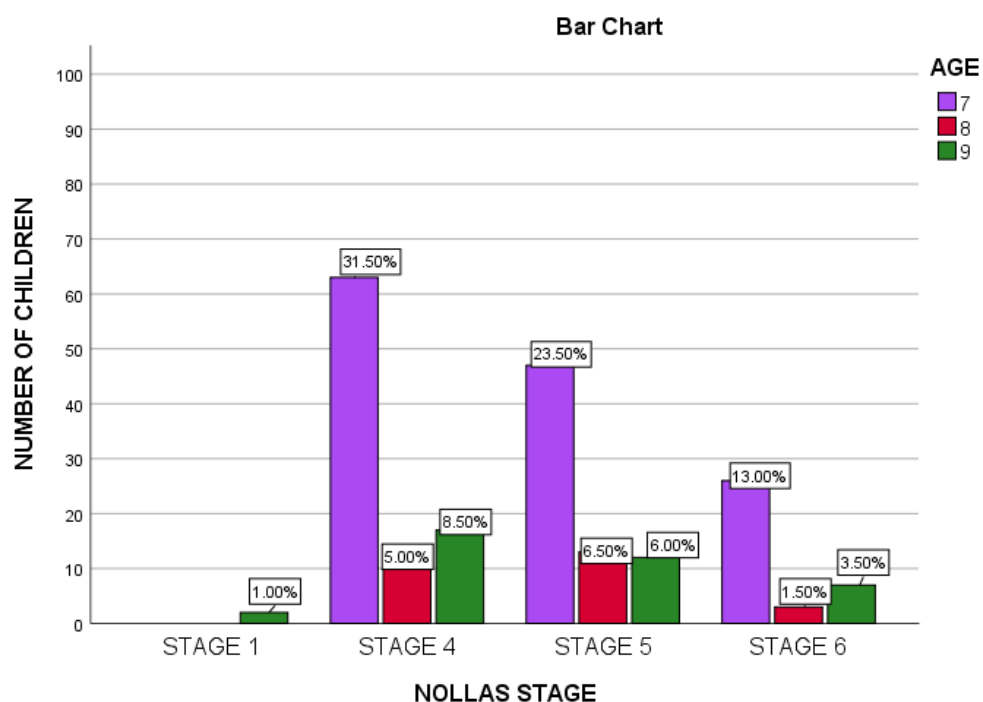
Figure 2: Shows the association between the age and nollas stage of tooth development. X axis-distribution of nollas stage in maxillary first premolar,Y axis- number of children. All the children in 9 years of age group attained stage 4 maturity of maxillary first premolar development. Majority of the children in the age group of 7 attained stage 4 who had two thirds of the crown completed and the age group of 8 attained almost equal maturation in stage 4 and stage 5. However, the difference is statistically insignificant as the chi square test, p-value is 0.082(p>0.05).
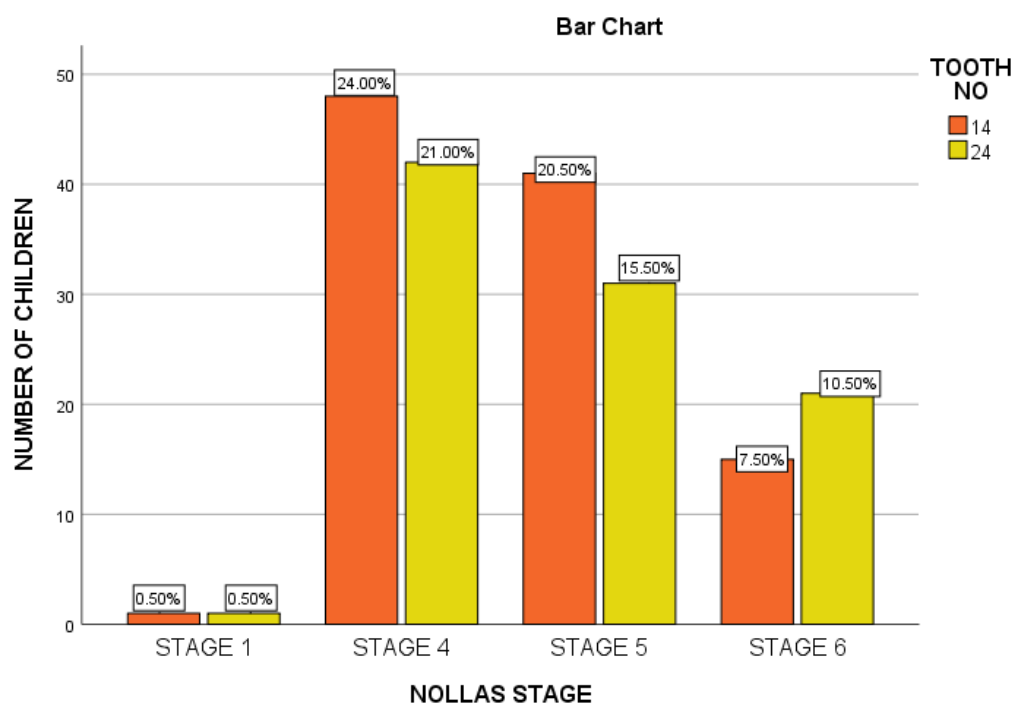

Figure 3: Shows the association between the tooth number and nollas stage of tooth development. X axis - distribution of nollas stage. Y axis- number of children. It is assessed that both 14 and 24 showed maximum maturation at stage 4. Chi square test, p value-0.054,p(>0.05), statistically insignificant. However, based on this analysis there was no association between tooth number and nollas stage.

DISCUSSION:

In this study about 400 OPGs were evaluated out of which 200 were segregated based on the age group 7 to 9 years old male children. The dental system is considered as an integral part of the human body, its growth and development can be studied in comparison with other physiological maturity indicators. Nollas method is based on 10 stages of tooth development. Stage 0-absence of crypt, stage 1-presence of crypt, stage 2- initial calcification, stage 3- one third crown completed, stage 4-two third crown completed, stage 5-crown almost completed, stage 6-crown completed, stage 7- one third of the root completed,stage 8-two third of the root completed, stage 9-root completed apex open, stage 10-apical foramen closed.It is accepted as the gold standard method over years.(20) Among the study population 68% were 7 years old, 13% were 8 years old and 19% were 9 years old. [Table 1]

[Table 2] Shows the distribution of the tooth that is taken in the study. Among the study population 52.5% were 14 and 47.5% were 24.[Figure 1] shows the distribution of the Nollas stage. It included 10 stages, out of which stage 1, 4, 5 and 6 were noted in the development of maxillary 1st premolar. Majority of the teeth attained maximum development at stage 4(45%) , and least assessed at stage 1(1%).

[Figure 2]Shows the association between the age and nollas stage of tooth development.All the children in 9 years of age group attained stage 1 maturity of maxillary first premolar development. Majority of the children in the age group of 7 attained stage 4 who had two thirds of the crown completed and the age group of 8 attained almost equal maturation in stage 4 and stage 5. However, the difference is statistically insignificant as the chi square test, p-value is 0.082(p>0.05).

[Figure 3] Shows the association between the tooth number and nollas stage of tooth development.It is assessed that both 14 and 24 showed maximum maturation at stage 4.Chi square test, p value-0.054,p(>0.05), statistically insignificant. Based on this analysis there is no association between tooth number and nollas stage. The limitation of the study is that only male gender was taken in this study and also limited sample size.

CONCLUSION:

Within the limitations of the study it was concluded that, majority of the maxillary first premolar teeth assessed among 7 to 9 years old male children had premolar 'crown almost completed' (Stage 4) according to Nollas stage of tooth development. Majority of the children in the age group of 7 and 9 years had 2/3rd crown completed in premolar(Stage 4) and majority of 8 years old children had 'crown almost completed' in premolar (Stage 5).

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AUTHOR CONTRIBUTION:

G.Nithya Karpagam has contributed to study design, data collection, analysis of the data, tabulation of results, manuscript typing. **Dr.Bhagyalakshmi** has contributed to study design, data collection,analysis of the data,tabulation of results, manuscript typing and formatting and critical reviewing. **Dr Dinesh Prabu** has contributed to formatting and proofreading

CONFLICT OF INTEREST:

This research project is self funded.There is no conflict of interest.

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