

A cross-sectional study to assess the effect of nutritional status on permanent first mandibular molar tooth eruption among 6-7 year old school children

¹Dr Kavita Pahuja, Associate Professor, Department of Anatomy, S.P. Medical College, Bikaner, Rajasthan, India

²Dr Eva Marker, B.D.S, M.Sc.(Med)Anatomy, Department of Anatomy, S.P. Medical College, Bikaner, Rajasthan, India

³Vijay Kumar Dayma, M.Sc.(Med)Anatomy, Department of Anatomy, S.P. Medical College, Bikaner, Rajasthan, India

⁴Maitree Sharma, M.Sc.(Med)Anatomy, Department of Anatomy, S.P. Medical College, Bikaner, Rajasthan, India

Corresponding Author: Dr Eva Marker, B.D.S, M.Sc.(Med)Anatomy, Department of Anatomy, S.P. Medical College, Bikaner, Rajasthan, India

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Abstract

Tooth eruption is influenced by various factors, one of them is nutritional factors. This study was aimed to determine the relationship between the timing of permanent tooth eruption and nutritional status in 6-7-years-old children.

Method: This research was school based cross-sectional and co-relational data analysis. The study was conducted at Department of Anatomy, S.P. Medical College, Bikaner which included 456 children who were 6-7 years old studying in Government and Private schools of Bikaner city. The stratified random sampling method was used for sample selection. Nutritional status was calculated based on the Body Mass Index (BMI) according to age from anthropometric measurements of body weight and height. Assessment of nutritional status was performed using the WHO Anthroplus@v1.0.4 application. Statistical analysis was performed using the Chi square test.

Conclusion : In our study we observed that there is an overall delay in tooth eruption among children of 6-7 years of age in government schools in comparison to private schools which could be due to nutritional deficiency due to differences in socioeconomic status and dietary intake, or other factors

Keywords: 6-7-years-old children, nutritional status, permanent teeth eruption.

Introduction

Tooth eruption is the tooth movement in the jaw bone towards its functional position in the oral cavity. This eruption process continues until the tooth has contact with the antagonistic teeth. ^[1] Clinically, tooth eruptions are characterized by the appearance of the crown or when the cusp penetrates the gingival part. ^[2] Dental eruption begins with the eruption of the first primary teeth around 6 months and finishes at 2 years and a half for primary teeth, and around 18-25 years for permanent teeth, when the third molar erupts. ^[3] The permanent tooth begins to erupt at the age of 6-7 years

old, which is an eruption of mandibular first premolar, mandibular first incisors, and maxillary first molar.^[4]

The eruption age at which the deciduous teeth start appearing in the oral cavity has been of great significance and interest to investigators and parents mainly due to its relation to the growth and development of the child.^[5]

The changes in the living habits, food habits, and oral hygiene habits may have its influence on the eruption of teeth in human race.^[6]

The age and order of eruption of permanent teeth show as much marked variation between one individual and other as among the different racial groups within the same region and outside.^[7]

Permanent tooth eruption is a complex process influenced by various factors, such as genetics, gender, premature birth, hormones, systemic diseases, nutrition, socio-economic and local factors.^[8]

Nutrition is one important factor for the growth of the teeth and affects the eruption of permanent teeth. Malnutrition and poor nutrition in early childhood affects tooth eruption and results in the delayed emergence of the teeth.^[9]

Although data on nutritional influence on permanent teeth emergence is scarce, there is evidence that chronic malnutrition extending beyond the early childhood is correlated with delayed teeth eruption.^[10] In a number of studies it has been found that children from higher socioeconomic backgrounds show earlier tooth emergence than children from lower socioeconomic classes.^[11]

The relationship between nutritional status and oral health has become a subject of increased research over the past two decades.^[12] Nutritional deficiencies can lead to delays in the process of teeth eruption. So, in the present study an attempt has been made to study the

effect of nutritional status on tooth eruption among school going children of Bikaner city.

Materials and Method

This was a School based cross-sectional study conducted in the Department of Anatomy, S. P. Medical College, Bikaner. In present study a total of 456 subjects with age ranging from 6 to 7 years were incorporated. All the subjects were school going children residing in Bikaner, Rajasthan. Four schools were selected by using stratified random sampling technique and their status of eruption of permanent mandibular first molar tooth and BMI were recorded.

Inclusion criteria were the subjects who were apparently healthy children with no facial and dental deformity evident, aged 6-7 years old, willing to take part in the study, got parental / guardian approval through the signing of an informed consent form.

Exclusion criteria were those having evident dental deformity.

Sampling procedure

Dental examination: On the basis of the date of birth of the subjects and taking the date of examination as the reference date, the age of the subjects were calculated. The examination was performed with the subject seated in an ordinary chair, ensuring good illumination. The oral cavity was examined using a sterile mouth mirror and William's probe and careful observation and palpation of alveolar ridges were done to evaluate and ensure tooth eruption. A permanent first mandibular molar tooth was recorded as erupted if any part of its crown, however small, had pierced the gingiva and appeared in the oral cavity. Gingival emergence was used as the criterion of the eruption.⁸ Only those cases were considered whose records were available for date of birth from school records. Children with growth or congenital anomalies

or severe medical conditions and children who were absent on the day of examination were excluded.

Nutritional status: Nutritional status was calculated based on the Body Mass Index (BMI) according to age from anthropometric measurements of body weight and height. Weight measurement was done using digital scales with accuracy of 0.1 kg. Height measurement was done by:

1. Asking the subject to remove footwear (sandals/shoes), hat (head covering).
2. Respondents were asked to stand upright, just close to height scale.
3. The position of the head and shoulders back, arms, buttocks and heels, stick to the wall, while looking straight ahead and hands-free in a dependent position the figure height was read on the height scale.

BMI was calculated using measured height and weight of the individual subject.

Body Mass Index (BMI) is defined as person's weight in kilograms divided by the square of the height in meters.⁸

$$BMI = \frac{\text{Weight (kg)}}{\text{Height (m)}^2}$$

Assessment of nutritional status was done using the WHO Anthroplus v1.0.4 application. Data in the form of name, gender, weight, height, date of birth and date of examination were entered into the application to get a threshold value (Z-score). Furthermore, the child's threshold value was compared to the threshold value set by the Ministry of Health and was categorized as follows⁸:

1	Very thin	<-3 SD
2	Skinny	-3 SD to <-2 SD
3	Normal	-2 SD to 1 SD
4	Fat	> 1 SD to 2 SD
5	Obesity	> 2 SD

Data Collection & Analysis

Data thus measured and collected from both groups of school children were compared by entering into excel sheet and was analysed with help of appropriate descriptive and analytical statistics and tests of significance. Chi square test was used to compare the proportions of subjects with erupted tooth and to find the association of eruption of tooth to gender, BMI and nutritional status. $p < 0.05$ was considered critical level of any statistical test to be significant.

Observation

In present study total 456 school children (231 from government & 225 from private school of Bikaner, Raj) of age group 6-7 years were incorporated. They were evaluated and examined for:

- Dental eruption of first permanent mandibular molar.
- Nutritional status in the form of BMI

Following observations were recorded:-

Table 1: Distribution of study population according to gender - (Government schools & Private schools)

Gender	Government schools	Private schools
Girls	112	84
Boys	119	141
Total	231	225

Table 2: Association of nutritional status according to gender – (Government schools & Private schools)

Nutritional status	Government		Private	
	Boys	Boys	Girls	Girls
Skinny	1	2	2	0
Normal	107	126	69	96
Fat	8	8	11	13
Obese	3	5	2	3
Total	119	141	84	112
P-Value	0.629		0.315	

Table 3: Association of gender to status of eruption of permanent first mandibular molar tooth in study population of Government schools & Private schools

Eruption	Government		Private	
	Boy	Girl	Boy	Girl
Erupted	67	61	103	64
Non Erupted	52	51	38	20
Total	119	112	141	84
P- Value	0.882		0.716	

Table 4: Association of nutritional status to status of eruption of permanent first mandibular molar tooth - (Government schools & Private schools)

School	Eruption	Skinny	Normal	Fat	Obese	P value
		(n)	(n)	(n)	(n)	
Government School	Erupted	0	109	13	6	0.109
	Non Erupted	1	94	8	0	
	Total	1	203	21	6	
Private School	Erupted	2	143	17	4	0.271
	Non Erupted	2	52	2	3	
	Total	4	195	19	7	

Discussion

The present cross sectional study was conducted after obtaining permission from institutional ethical committee and prior consent of individual under study

in the form of informed consent form. In the present study an attempt was made to study the effect of nutritional status on first permanent mandibular tooth eruption among 6-7 year old children.

In our study a total of 456 children of the age group 6-7 years were enrolled, out of which 231 (50.6%) were from govt. schools and remaining 225 (49.4%) were from private schools. Whereas Billewicz WZ et al (1975)¹⁴ and Triratana T et al (1990)¹⁶ observed children within the age range of 4.5-14 yr and 6-16 years. In our study among the 231 subjects from govt. schools, majority were boys (51.5%) and 48.4 % were girls (Table 1). Out of the 225 pvt. school subjects, majority were boys (62.6 %) and 37.75 % were girls (Table 1). Similar results were also found by Lailasari D *et al*⁸ in their study sample which consisted of 57 people consisting of 28 boys (49.1%) and 29 children (50.9%)

In our study out of 231 govt. school subjects, majority 87.87% were with normal nutritional status followed by (9.09%) fat , 2.59 % obese and remaining 0.43 % had skinny nutritional status (Table 3). Among the total 225 pvt. school subjects majority (86.66%) were normal according to nutritional status followed by fat (8.44%), (3.11%) were obese and remaining (1.77%) were skinny (Table 2). The study of Lailasari D *et al*⁸ majority had a normal nutritional status (87.7%). Children with thin nutritional status were 2 (3.5%), fat nutritional status were 3 (5.3%), and nutritional status of obesity were 2 (3.5%) (Table 4).

In our study out of total 231 govt. school subjects majority (55.4%) had their permanent first mandibular tooth erupted, while in remaining 44.58% study subjects eruption of permanent first mandibular tooth was not found.

Among the 225 pvt. school subjects majority 74.22% showed eruption of permanent first mandibular molar tooth whereas in 25.77 % the eruption of permanent first mandibular molar tooth was not found.

In our study, 74.22% of the pvt. school subjects showed eruption of permanent first mandibular tooth while, 54.4 % of govt. school subjects showed eruption of permanent first mandibular molar tooth, the reason for higher eruption amongst pvt. School subjects may be better nutritional capacity of families of subjects who are opting pvt. schools for education as compared to the families who are sending their children to govt. school. The results were in contrast to Kaur I et al (2010)⁷ where he found no differences in dental eruptions between Govt. and Public schools.

In our study, out of total 231 govt. school subjects, majority of boys and girls 56.0% and 54.4% respectively showed eruption of permanent first mandibular molar tooth (Table 3) and amongst 225 pvt. School subjects majority of boys and girls 73.04% and 76.19% showed eruption of permanent first mandibular molar tooth (Table 3). Demirjian A et al (1980)¹³ found chronological similarity -between boys and girls in the early stages of development and the advancement of girls over boys for the later stages. Due to this variation eruption is earlier in girls as compared to boys, similar variation showing girl subjects with earlier eruption was seen in our study while similarly the higher percentage and a higher number of girls with erupted permanent molar tooth was found in study conducted by Chaitanya P et al¹⁷ (girls right side 84.9 ± 5.2 , left side 83.4 ± 5.4 , boys right side 83.9 ± 5.1 , left side 82.6 ± 5.1 percentile) which was higher as compared to our study. The reason for this higher eruption may be because of the upper limit of age of subjects higher than that of our study, similar results were observed by

Garcia-Godoy F et al¹⁵ who also observed that girls were relatively advanced in their emergence times but the results were in contrast to Lailasari D et al⁸ who observed that boys have an average number of eruptions of permanent teeth more than girls.

In our study of total 231 subjects from govt. school, all 6 obese subjects showed eruption of permanent first mandibular molar tooth, while 69.9 % fat subjects and 53.6 % normal subjects showed eruption, whereas none among the skinny showed eruption of permanent first mandibular molar tooth (Table 4).

Out of total 225 subjects from private school, majority of (89.4%) fat subjects showed eruption of permanent first mandibular tooth followed by (73.3%) of normal subjects, (57.1 %) obese subjects and (50%) skinny subjects showed eruption of permanent first mandibular molar tooth (Table 4). In the study of Lailasari D et al⁸ the highest number of permanent teeth erupted was in the obesity nutritional status of 10.00 teeth, and the lowest average was in the normal nutritional status of 6.20 teeth.

In our study we found that no significant association was present between nutritional status among study population of both govt. and pvt. schools (Table 3), neither the association between nutritional status and eruptive status of permanent first mandibular molar tooth showed any significant relation (Table 4) nor the association of status of eruption when studied gender wise showed any statistically significant relation (Table 2). But there was a highly significant association found between eruption of permanent first mandibular molar tooth among study population of both govt. and pvt. schools among boys subjects of both schools and girls subjects of both schools.

Conclusion

We found that among school going children of 6-7 year of age of Bikaner (Raj.), there is delayed tooth eruption of permanent mandibular first molar tooth in government schools subjects when compared to subjects of private schools. There was no effect of gender on status of eruption of permanent mandibular first molar tooth in subjects from government and private schools. The subjects with nutritional status of obese were found to have early eruption when compared with those having normal nutritional status. Thus, it can be concluded that there is overall delay in tooth eruption among children of 6-7 years of age in government schools in comparison to private schools which could be due to nutritional deficiency due to differences in socioeconomic status and dietary intake, or other factors but an actual cause needs to be identified for which further studies can be conducted.

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