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ORIGINAL ARTICLE

Determination of Eruption Timings of Mandibular and Maxillary First Permanent Molar and its Association with BMI of Children

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ABSTRACT

Objective: To determine the association of eruption timing of the mandibular and maxillary first permanent molars with BMI of children in school children of Hyderabad.

Subject and Methods: A total of 704 (364 boys 340 girls) school children from various government schools of Hyderabad city were enrolled in the study. All the children were in age range on 5 to 8 years. A dental examination was conducted to determine the presence of permanent mandibular and maxillary first molars. Children's height and weight were recorded in meters and kilograms, and their BMI was calculated. The SPSS version 22.0 was used to analyze the data

Results: Out of 704, there were 364 (51.70%) boys and 340 (48.29%) girls. Mandibular 1st molar was the 1st tooth to erupt with mean age of 5.83±1.2 in boys and in girls it was 5.52±1.2. Most of the children were reported with normal weight as per BMI.

Conclusion: An earlier median eruption timing was recorded for the mandibular permanent first molar compared to the maxillary permanent first molar. All the teeth examined in girls erupted earlier than in boys.

Keywords: Eruption Timing, Body Mass Index, Mandibular First Molar, Maxillary First Molar, Children

INTRODUCTION

Teeth eruption is the process in which developing teeth emerge from the jaws under the overlying mucosa in order to enter the oral cavity and attach to teeth in the opposing arch.[1,2] A child's eruption of permanent teeth is an important milestone in his or her development because they are biological markers of maturity. When a child's permanent teeth erupt at a specific age, the clinical maturity stage of the permanent dentition is determined.[3]

An exfoliation of primary teeth and the eruption of new teeth occurs as a continuous age-related process in which the teeth emerge from the upper and lower jaws and the mucosa overlying them into the oral cavity to occlude with the teeth of the opposing arch.[4,5] It is not necessary to dissect teeth since they are the most indestructible part of the body. Therefore, teeth are excellent sources of information in anthropology, paleontology, genetics, odontology, and forensics in living and non-living populations.[6]

Upon shedding the deciduous teeth, the permanent teeth erupt, and each tooth follows a specific eruption sequence. At 6 years of age, the first permanent tooth erupts, the central incisor, followed by the first molar. It has been found that the eruption of teeth is positively correlated with the somatic growth of individuals (height and weight). It has long been believed that nutrition plays a positive role in speeding up the eruption of teeth out of all the factors that affect tooth eruption. Additionally, many authors worldwide report that poor nutrition during the growing period adversely affects dental development, including delay in the eruption of deciduous teeth, congenital dental anomalies, and poor oral health.[7,8,9] Using the Body Mass Index (BMI), it is possible to make reliable measurements of individuals who are obese or overweight, especially teenagers and small children, and this can be a very useful tool. The Body Mass Index (BMI) is calculated by dividing an individual's weight in kilograms by his or her height in meters squared.[10]

Between the ages of 6 and 7 years, the lower first molar erupts into the oral cavity followed by the upper first molar. Next to erupt are the central and lateral incisors in the lower arch, followed by the upper arch incisors.[11] Permanent teeth usually erupt in the following order: first molar, then central incisor, then lateral incisor.

The association between BMI and the eruption of permanent mandibular and maxillary first molars has not received the recognition it deserves in the literature, so this study was conducted on school children of Hyderabad city to determine whether such an association exists. It is expected that the results of this study will find application in a wide range of fields of dentistry, including pediatric dentistry, orthodontics, and forensic dentistry.

MATERIAL AND METHODS

The cross sectional study was conducted on schoolchildren between the ages of 5 and 10 years from various government schools in the Hyderabad city, Sindh, Pakistan. With margin of 5% error of prevalence, the total sample size estimated was 704 children. To conduct the study, the institution's ethics review board provided ethical clearance and the school authorities provided written consent. The study recruited healthy cooperative children without developmental disorders or systemic diseases. A student with supernumerary teeth or a history of congenital or systemic disorders was not included in the study. Prior to the oral examination, the children were instructed to rinse thoroughly. For better visibility, sterile cotton swabs were used to remove food debris from the teeth. The oral examination was performed under adequate illumination by a single trained, calibrated examiner using a sterile mouth mirror and Community Periodontal Index for Treatment Needs (CPITN) probe. If any part of a permanent tooth's crown penetrated the gingiva and appeared in the oral cavity, it was considered to have "erupted." In cases where a gingival flap covered the erupted tooth, a CPITN probe was used to determine whether the tooth had erupted. For each child, the erupted permanent first molars in all four quadrants were recorded.

Before measuring a child's height and weight, he or she was asked to remove their shoes. The weight was measured using a standardized portable glass digital weighing scale. As soon as the child was stable for five seconds, the reading was recorded on the weighing scale In order to calculate the weight, we recorded it in kilograms and rounded it up to the nearest two decimal places. To calculate a child's BMI, we first have to take their height and weight, and then we follow the underlying steps in order to arrive at the BMI.

$$BMI = \frac{\text{Weight in kilograms}}{(\text{Height in meter})^2}$$

According to their BMI, the children were grouped into four categories[2]:

The data were analyzed using SPSS version 22.0. Pearson's correlation coefficient was used to determine the association between eruption age and BMI.

Weight Status Category	Percentile Range
Underweight	Less than the 5th percentile
Healthy weight	5th percentile to less than 85th percentile
Overweight	85th to less than the 95th percentile
Obese	Equal to or greater than the 95th percentile

RESULTS

A total of 704 school children were examined. There were 364(51.70%) boys and 340(48.29%) girls in total. (See table 1)

At the age of 5, 17 (22.07%) boys and 19 (26.76%) were seen with erupted mandibular 1st molar and 07 (9.09%) boys and 08 (11.26%) girls were having erupted maxillary 1st molar. Overall details of eruption age from 5 to 8 years have been mentioned in table 2 for mandibular first molar and table 3 for maxillary first molar.

As per BMI, 182 boys and 188 girls were seen in normal weight category. Details of distribution of children as per BMI are shown in figure 1.

The median age of mandibular first molar in normal weight category boys was 5.86±1.2 and in girls it was 5.51±1.2, while in maxillary first molar it was 6.80±1.4 for boys and 6.62±1.1 for girls. The distribution of median age as per BMI is shown in table 4.

Table 1: Age Wise Distribution

Age (Years)	Boys (%)	Girls (%)	Total %
5	77 (10.93%)	71 (10.08%)	148 (21.02%)
6	103 (14.63%)	99 (14.06%)	202 (28.69%)
7	102 (14.20%)	96 (13.63%)	198 (28.12%)
8	82 (11.64%)	74 (10.51%)	156 (22.15%)
Total	364 (51.70%)	340 (48.29%)	704 (100%)

Table 2: Distribution Of Mandibular 1st Permamnent Molar

Age (Years)	Boys (%)	Girls (%)	P Value
5	17 (22.07%)	19 (26.76%)	0.10
6	55 (53.39%)	57 (57.57%)	0.71
7	96 (94.11%)	94 (97.91%)	0.027
8	82 (100%)	74 (100%)	-

Table 3: Distribution Of Maxillary 1st Permamnent Molar

Age (Years)	Boys (%)	Girls (%)	P Value
5	07 (9.09%)	08 (11.26%)	0.88
6	46 (44.66%)	41 (41.41%)	0.62
7	94 (92.15%)	91 (94.79%)	0.08
8	82 (100%)	74 (100%)	-

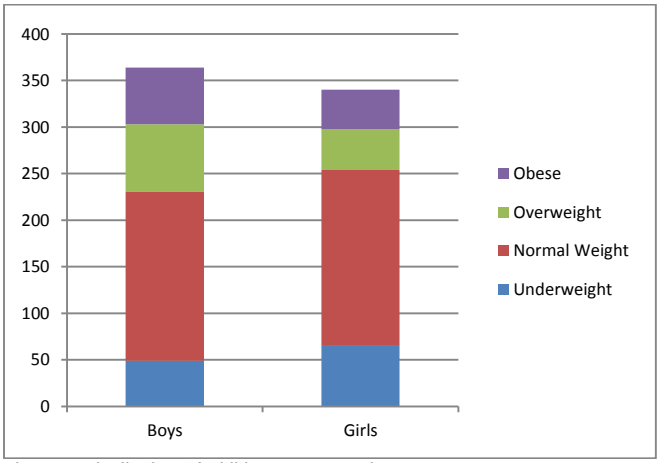

Figure 1: Distribution Of Children As Per Bmi

Table 4: Comparison Of Median Age Of Eruption Between Boys And Girls And Their Pearson Correlation

Tooth	Gender	Underweight	Normal Weight	Overweight	Obese	Pearson Correlation
Mandibular 1st Molar	Boys	5.96±1.4	5.86±1.2	5.85±1.2	5.87±1.3	−0.0477
	Girls	5.57±1.3	5.51±1.2	5.52±1.2	5.51±1.3	−0.0436
Maxillary 1st Molar	Boys	6.87±1.3	6.80±1.4	6.81±1.3	6.82±1.3	−0.0496
	Girls	6.67±1.3	6.62±1.1	6.62±1.2	6.62±1.3	−0.0474

DISCUSSION

This study was conducted in various government schools of Hyderabad city, with the aim of assessing the eruption of permanent teeth according to age and its relation with body mass index in relation to the eruption of permanent teeth. As part of the present study, teeth of the maxillary and mandibular permanent first molars were examined.

Growth and eruption of dentition are influenced by the physical development of a child. Taking a child's BMI into account provides insight into his or her overall physical development. An individual's genetic makeup greatly influences their BMI. Populations of European, African, and North American descent tend to have higher BMI values than populations of Asian, Mongoloid, and South American descent.[12] A number of studies have examined the influence of BMI on the eruption timing of permanent teeth in various parts of the world, and the results have varied.[13,14]

Our study showed majority of boys and girls in normal weight category, these findings were consistent with another local study conducted in the premises of Hyderabad city.[4] In contrast to these findings, a previously conducted study conducted by Shailee et al[15] in India reported a high percentage of children who were underweight.

The median age of mandibular first molar in boys was 5.83±1.2 and in girls it was 5.52±1.2, while in maxillary first molar it was 6.80±1.4 for boys and 6.62±1.4 for girls. It was seen that eruption timing of mandibular and maxillary first molar was earlier in girls as compared to boys in all categories as per BMI. These findings are well supported by Subramaniam P.[3]

BMI and eruption timing of teeth examined were statistically significantly inversely associated in this study. In a study conducted by Sabharwal R[10], there was a significant negative correlation between BMI and the eruption time of molars. Khan NB[16] conducted a study on Saudi male schoolchildren according to this research.

This study showed both in mandibular and maxillary molar, eruption time was slightly delayed in underweight children. It is possible that children who suffered from malnutrition during infancy will experience a delay in the eruption of permanent teeth. In addition to delaying primary dentition, chronic malnutrition also delays exfoliation. The permanent dentition will be affected if the primary teeth are not exfoliated on time. The completion of secondary dentition takes longer when the first permanent teeth appear late in the oral cavity. The eruption of permanent teeth is delayed in malnourished individuals because they have low BMI values.[10] Bagewadi NB[17] conducted a study stating that children in the underweight category exhibited a delayed eruption pattern in comparison to children in the normal weight category. This finding is similar to that reported by Chohan et al[18], who found that children who are below average in their weight and height report longer eruption times than those who are within the normal range.

Logan and Kronfeld's chronology is consistent with the emergence of the mandibular first molar as the first permanent tooth.[19] The mandibular first molar has been reported to emerge as

the first permanent tooth in various studies during the last decade.[9,20]

Based on the results of the present study, there is an association between BMI and tooth eruption. BMI can play a significant role in the evaluation of eruption time in clinical practice, instead of solely relying on chronological age alone as a way to estimate eruption time. It may be possible to determine eruption timing by recording the child's BMI at the beginning of the eruption period in children reporting delayed eruptions. To provide a more accurate time frame for the eruption of permanent teeth, further longitudinal studies can be carried out on children through adolescence.

CONCLUSION

Based on the results of this study, it was concluded that mandibular permanent first molars erupted sooner than maxillary permanent first molars. Girls had earlier eruptions of all the teeth examined than boys. The eruption timing of permanent teeth was earlier in children with higher BMI values.

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