Eruption Pattern of Permanent Molars among School Children in Chennai

Daniel Rajendran T

[1]*Department of Forensic Medicine and Toxicology, Sree Balaji Medical College and Hospital*

Abstract

Background: Estimation of the age of an individual is essential investigation in medicolegal cases, especially involving children and adolescents. Among the various factors used for age estimation, eruption of permanent teeth is one of them. Several factors influence the eruption of teeth, including genetic, nutritional and hormonal. This study was carried out to analyze the pattern of eruption of permanent teeth among school going children in urban Chennai.

Method: This cross sectional study was carried out among 983 school children between the age group of 4-14 years. Two schools, one belonging to the lower socioeconomic status and the other belonging to the higher socioeconomic status were taken up for this study. Eruption of permanent teeth were examined clinically.

Results: Majority of the first molars erupted by7-7.5 years of age (95%) while majority of the central incisors erupted between 8-9 years. Lateral incisors were completely erupted between 9.5-10 years and first premolar were completely erupted between 12.5-12.9 years. Both second premolar and canine erupted by 13.5-13.9 years.

Conclusion: The visual observation of eruption of permanent teeth is a non invasive procedure and does not require any special machines like that of radiography. This method of assessing the age of the individual is considerably easier, economical and safe. Hazards of exposing the individual to radiation can be prevented.

Keywords: *Chronological age, eruption of permananent teeth, medicolegal issues, anthropometry, nutritional status.*

Introduction

Estimation of the age of an individual is of utmost importance in medicolegal cases, especially in populations where records are not well maintained. Medically, age of an individual can be estimated based on the eruption of teeth, ossification of bones, presence of secondary sexual characteristics and various other physical features.[1] Among these methods, assessment of dentition is one of the most widely used techniques, given the fact that they are simple and feasible methods. Moreover, eruption of teeth is fairly constant in all races and ethnic groups, and are specific to narrow age range. The three types of human dentition (deciduous, mixed and permanent) follow a periodic sequence which is useful for determining accurate estimation of the age. There are two methods currently available for assessment of dentition, namely the clinical examination and radiological assessment. With the help of radiographic methods, it is possible to follow the formation of crowns and roots of the teeth and their calcification. However, clinical method is more suitable as it is simple, feasible and economical.[2]

Several factors influence the eruption of teeth, including genetic, nutritional and hormonal. Moreover, these factors are influenced further by various socioeconomic factors. Most importantly, presence of malnutrition can directly delay dental eruption,

Corresponding author:
Dr. T. Daniel Rajendran,
Assistant Professor, Department of Forensic Medicine and Toxicology, Sree Balaji Medical College and Hospital Email address: tdanielrajendran@gmail.com

especially in the low socioeconomic status population. Studies have shown linkages between delay in the eruption of the permanent teeth and protein energy malnutrition in children and stunting among adolescents. [3] There are however, no registries maintained in India to document the eruption of permanent teeth with respect to age and socioeconomic status. A study focusing on dental eruption, clinical assessed at school level will go a long way in documenting the pattern of maturation, in addition will serve as a proxy measure for evaluating the nutritional status of these school children.

Objectives

This study was carried out to analyze the eruption pattern of permanent dentition among school going children.

Methodology

Study setting and participants

This study was carried out as a cross sectional study among the school children of the urban field practice area of our medical college in Chennai. This study was carried out for a period of three months between July to September 2019.

Sample size and sampling technique

All the schools in the urban field practice area of our medical college were approached for permission to carry out the study. Two schools – one government and one private school consented for the study. Since there was no literature available regarding the eruption patterns, all the children aged between four and fourteen years studying the above two consented schools were taken up for the study. The participants were selected by purposive sampling. A total of 963 children participated, of which 490 were from government school and 473 were from a private school within the field practice area.

Ethical approval and informed consent

Approval was obtained from the institutional ethics committee prior to the commencement of the study. Written consent was obtained from the principals of both the schools. Each participant was explained in detail about the study. Informed consent was obtained from both the parents and the participants prior to the commencement of data collection.

Data collection

A structured clinical proforma was used to obtain information regarding demographic characteristics like age, sex, etc. Oral examination was carried out by the principal investigator to evaluate the dentition pattern among the study participants.

Data Analysis

Data was entered and analyzed using SPSS ver. 20 software. The pattern of eruption of the permanent teeth was expressed in percentages. Independent sample t test was used to evaluate the association between eruption and background characteristics. A p value <0.05 was considered statistically significant.

Results

This study was carried out among 963 school students in the field practice area of our tertiary teaching institution. Majority of the participants were aged between 4-7.5 years (41.4%) and were males (64.4%). (Table 1)

It was observed that central incisor had erupted in 31.1% of the participants followed by first molar (29.6%). Lateral incisor and second molar had erupted in 22.2% of the participants. (Figure 1)

The age wise comparison of the eruption of permanent teeth is given in table 2. It was observed that first molar and central incisors were the earliest to develop as early as 4-4.5 years. Majority of the first molars erupted by7-7.5 years of age (95%) while majority of the central incisors erupted between 8-9 years. Lateral incisors were completely erupted between 9.5-10 years and first premolar were completely erupted between 12.5-12.9 years. Both second premolar and canine erupted by 13.5-13.9 years. (Table 2)

On comparing with the gender, central incisors erupted in 23.7% of the males followed by first molar (22.4%) and lateral incisor (17.8%). Among females, central incisor erupted in 44.6% followed by first premolar in 43.7%. (Table 3)

On comparison with the socioeconomic status, among the low income group, central incisor erupted in 42% followed by first molar (40.4%) and first premolar (30.6%). Among the high income group, central incisor

erupted in 19.9% followed by first molar (18.4%) and first premolar (17.3%). (Table 4)

Table-1: Background characteristics of the study participants:

S. No	Characteristics	Frequency N=963	Percentage (%)
1	Age of the participants (in years)		
	4-7.5	399	41.4
	7.51-11.5	341	35.4
	11.6-14.5	223	23.2
2	Sex		
	Males	620	64.4
	Females	343	35.6
3	Socioeconomic status		
	Low	490	50.9
	High	473	49.1

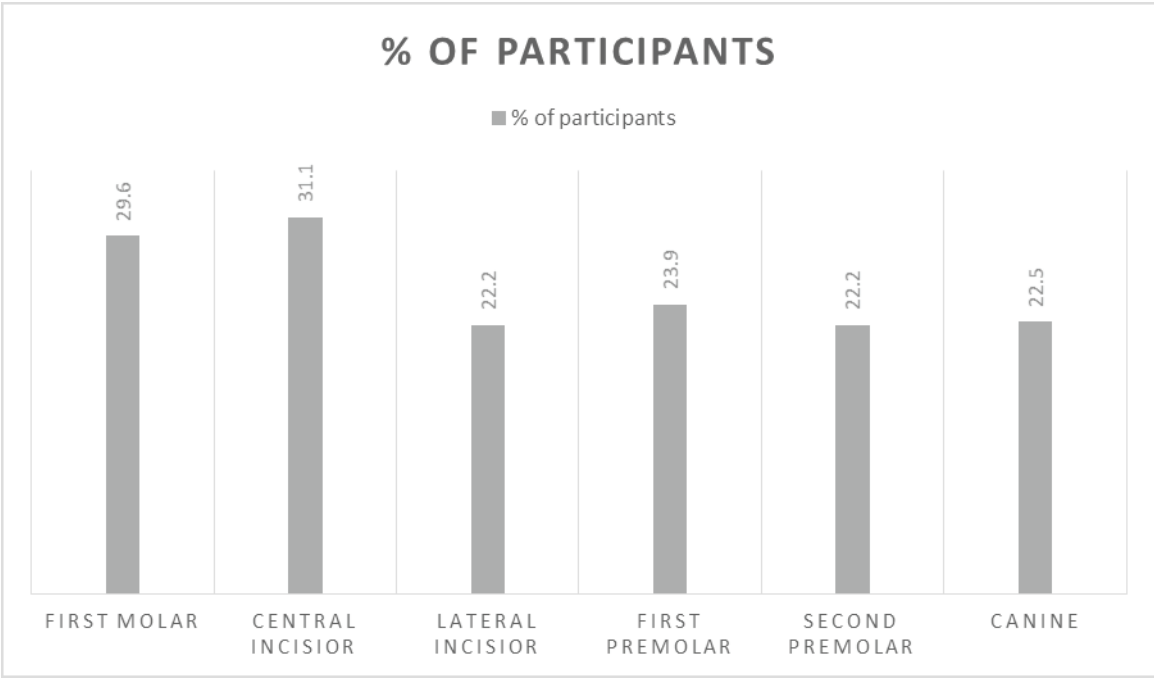

Figure-1: Eruption of permanent teeth:

Table-2: Age-wise distribution of eruption of permanent teeth:

S. No	Age group	First molar N(%)	Central incisor N(%)	Lateral incisor N(%)	First premolar N(%)	Second premolar N(%)	Canine N(%)
1	4.0-4.5	3(33)	3(33)	1(9)	-	-	-
2	4.51-4.9	4(11)	3(8)	1(3)	-	-	-
3	5.0-5.5	6(9)	5(8)	0(0)	-	-	-
4	5.51-5.9	27(57)	11(23)	1(2)	-	-	-
5	6.0-6.5	49(60)	39(48)	9(11)	-	-	-
6	6.51-6.9	66(84)	49(64)	13(17)	-	-	-
7	7.0-7.5	72(89)	60(74)	31(38)	1(1)	-	-
8	7.51-7.9	58(95)	55(90)	28(46)	1(2)	-	-
9	8.0-8.5	-	25(100)	20(80)	2(8)	-	-
10	8.51-8.9	-	50(100)	48(96)	3(6)	3(6)	-
11	9.0-9.5	-	-	31(94)	3(9)	3(9)	1(3)
12	9.51-9.9	-	-	31(100)	2(6)	1(3)	1(3)
13	10.0-10.5	-	-	-	14(40)	10(29)	9(26)
14	10.51-10.9	-	-	-	20(50)	14(25)	14(35)
15	11.0-11.5	-	-	-	39(59)	33(21)	30(45)
16	11.51-11.9	-	-	-	40(67)	31(55)	33(55)
17	12.0-12.5	-	-	-	55(92)	47(52)	45(75)
18	12.51-12.9	-	-	-	52(100)	46(90)	47(90)
19	13.0-13.5	-	-	-	-	26(100)	26(100)
20	13.51-13.9	-	-	-	-	-	11(85)
21	14.0-14.5	-	-	-	-	-	-

Table-3: Gender wise distribution of eruption of permanent teeth:

S. No	Type of permanent teeth	Males N=620		Females N=343	
		N	%*	n	%*
1	First molar	139	22.4	146	42.6
2	Central incisor	147	23.7	153	44.6
3	Lateral incisor	110	17.8	104	30.3
4	First premolar	82	13.2	150	43.7
5	Second premolar	69	11.1	145	42.3
6	Canine	73	11.8	144	41.9

*percentage will not total to 100.

Table-4: Distribution of eruption pattern based on socioeconomic status:

S. No	Type of permanent teeth	Low N=490		High N=473	
		N	%*	n	%*
1	First molar	198	40.4	87	18.4
2	Central incisor	206	42.0	94	19.9
3	Lateral incisor	147	30.0	67	14.2
4	First premolar	150	30.6	82	17.3
5	Second premolar	141	28.6	73	15.4
6	Canine	147	30.0	70	14.8

*percentage will not total to 100.

Discussion

On analyzing the eruption of individual teeth from the above tables, it is clearly understood that some individuals have early eruption from six months to two years. However, there was no correlation between early eruption ad socio economic status. The early shedding of primary teeth advances the emergence of the permanent teeth.[4] This could be the reason for early eruption of the permanent teeth. In addition, it was found that some individuals have late eruption from 6 months to 2 years. Root resorption of the primary tooth sometimes does not follow their routine procedure, with the result that the permanent tooth cannot emerge which may bring about the prolonged retention of deciduous tooth. This could be the reason for late eruption.[5]

The emergence of permanent teeth, whether it is primarily in the mandibular or maxillary regions was not a part of this study as the emergence of teeth in any of the quadrants were taken as the corresponding age group of the individual but in the majority of the cases it was noted that the mandibular teeth erupts earlier than the maxillary teeth.

It was stated that from the day of eruption of the permanent first molar till the day of eruption of last permanent canines there would be both temporary and permanent teeth in the jaws, referred to as the period of mixed dentition.In addition, it was stated that there would not be any deciduous teeth above 12 years.[6] The available data was analysed for this and it was found that in about 11% subjects between 12 to 14 years even after the eruption of permanent second molar, deciduous canine is still present. There was mixed dentition even after the eruption of permanent second molars.

This study observed a wide deviation from the early eruption to late eruption for each permanent tooth for both males and females. It was found necessary to arrive an average or mean period of eruption by clubbing males and females together for each permanent dentitionThe mean period for each permanent dentition in the present study is almost corroborative with the earlier studies. A very few in the literature have shown mean age group for each permanent dentition but there was no mention of standard deviation. This study has clearly arrived at a standard deviation of eruption of each permanent tooth irrespective of the sex.

*Schour and Massler*have described the formation of the permanent teeth in 1940 as occurring in three clusters. The first cluster consists of the first molars, the central incisors, the lateral incisors and the cupids, which begins formation during first year. The second cluster being the second molar forms during 2 to 4 years and the third cluster being the third molar forms during 5 to 6 years.[7] This clearly shows that there was simultaneous eruption of differing permanent teeth and this was observed in the present study. Overlapping or simultaneous eruption of two differing permanent teeth whose eruption schedule is close to each other is observed. This overlapping tooth eruption corroborates with the first group of cluster formation and the second cluster with canine.

Dental age can reflect an assessment of physiological age comparable to age based on skeletal development, weight or height. In addition, it was stated, when forming, the crowns and roots of the teeth appear to be the tissues least affected by environmental influences (nutrition, endocrinopathies etc) and dentition may be considered to be single best physiological indicator of chronological age in juveniles.[8]

This study has clearly shown that eruption of permanent teeth has no correlation with the socioeconomic status of the individual during the mixed dentition period and is mainly inheritable based on genetic factors unless the tooth is affected by caries or severe malnutrition.Since the eruption of permanent teeth is least affected by the socio economic status of the individual as well as by nutrition, it can be taken as the best indicator for assessment of physiological age in the juveniles. However, while giving the age of the individual, it should be given as a range by adding or subtracting the standard deviation for that tooth.

Conclusion

The visual observation of eruption of permanent teeth is a non invasive procedure and does not require any special machines like that of radiography. This method of assessing the age of the individual is considerably easier, economical and safe. Hazards of exposing the individual to radiation can be prevented.

Conflict of Interest – Nil

Funding –Nil

Ethical approval – Obtained

References

[1] Manjunatha BS, Soni NK. Estimation of age from development and eruption of teeth. J Forensic Dent Sci 2014;6(2):73-76

[2] Krishan K, Kanchan T, Garg AK. Dental evidence in forensic identification- An overview, methodology and present status. Open Dent Surg 2015;9:250-256

[3] Reyes-Perez E, Borrell LN, Katz RV, Gebrian BJ, Prophete S, Psoter WJ. Effect of early childhood protein energy malnutrition on permanent dentition dental caries. J Public Health Dent 2014;74(3):181-187

[4] Burgueño Torres L, Mourelle Martinez MR, de Nova Garcia JM. A study on the chronology and sequence of eruption of primary teeth in Spanish children. Eur J Paediatr Dent 2015;16(4):301-4

[5] Bhuvaneswarri J, Chandrasekaran SC. Failure of eruption of permanent tooth. Int J Appl Basic Med Res 2018;8(3):196-198

[6] Kjær I. Mechanism of human tooth eruption: Review article including a new theory for future studies on the eruption process. Scientifica (Cairo)2014;2014:341095

[7] Karadayi B, Afşin H, Ozaslan A, Karadayi S. Development of dental charts according to tooth development and eruption for Turkish children and young adults. Imaging Sci Dent 2014;44(2):103-113

[8] Panchbhai AS. Dental radiographic indicators, a key to age estimation. DentomaxillofacRadiol 2011;40(4):199-212