

Permanent Teeth Eruption Pattern in the Age Group of 5 to 15 Years: A Cross-Sectional Study in Southern India

Vinoth Kumar. V¹, Rajkumar.G², Balavenkataperumal R³, Jeyasingh.T⁴

¹Assistant Professor, ²Assistant Professor, ³Assistant Professor, ⁴Professor and HOD, Department of Forensic Medicine, Coimbatore Medical College and hospital, Coimbatore, TamilNadu.

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Abstract

Introduction: Age estimation plays a vital role in various medico legal cases including both civil and criminal litigations. Assessment of age of an individual by examination of teeth is one of the universally accepted methods of age estimation. In the present study we observed the patterns of dental eruption in Coimbatore. In this study we considered the eruption pattern of all permanent teeth (Molar 1 teeth, Central Incisor teeth, Lateral Incisor teeth, Pre Molar 1, Pre Molar 2, Canine and Molar 2).

Material and Methods: The present study was a community based cross sectional study conducted in C.R.R. Matric Higher Secondary School, Ondipudur. C.R.R. Mat.Hr.Sec. School (CMHSS) located at Coimbatore S.S. Kulam, Ondipudur, The study was conducted among 1000 study participants

Results: The mean age for complete eruption of the first molar teeth and central incisor was observed to be between 75.9 to 77.9 months and 80.8 to 84 months respectively. Lateral Incisor teeth was completely erupted among all the study participants aged between 105.2 and 107.4 months of age. The mean age for complete eruption of the first premolar was observed to be between 109.58 to 112.6 months. The mean age for complete eruption of the second pre molar was observed to be between 131.0 to 133.8 months. Complete eruption of Canine and second molar was observed to be between 142.6 to 144.8 months and 174.5 - 178.6 months of age respectively.

Conclusion: First Pre Molar, Second Pre Molar, Canine and the second molar appears to be earlier on left side as compared to the right side. The eruption of the second molar tooth was significantly earlier in the female study participants as compared to the male study participants. The dental eruption patterns should be studied in detail to assess the role of various associated factors like nutrition, oral hygiene.

Keywords: Age estimation, Dental eruption, Forensic odontology, Forensic dentistry

Corresponding Author: Vinoth Kumar. V, Assistant Professor, Department of Forensic Medicine, Government Medical College and ESI hospital, Coimbatore, Tamil Nadu.

E-mail: dr.vinothcmb@gmail.com

Mobile: 9965802748

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Introduction

Forensic odontology or Forensic dentistry, a relatively young branch of forensic medicine deals with the science of dentistry to aid in the administration of justice. Eruption of teeth is not always bilaterally symmetrical in both halves of the jaw. Assessment of age of an individual by examination of teeth is one of the universally accepted methods of age estimation. The teeth eruption time may differ in upper and lower jaw. There are variations among eruption of teeth among both genders like the eruption of teeth is earlier in females as compared to males. Males have larger tooth than females. The first primary teeth to erupt are usually the lower central incisors, premolar and molar erupt one year earlier than upper jaw.¹⁻⁶

Dental eruptions are especially useful in determining the age of the children. The appearance of permanent teeth is especially useful in narrowing the age of the individual. Other obvious anthropometric indicators like height and weight can also narrow down the age group the individual may belong to but it cannot be decisive.⁷

The assessment of age of an individual can be done by examining the oral cavity for the appearance of various dental markers. This can be done by examination of the oral cavity clinically and by using radiological images of the teeth. Examination of the oral cavity is used to identify the age of the individual based on the eruption stage of teeth. While the radiological examination requires a level of skill, manpower and financial resources, the examination of the oral cavity is a cost effective alternative especially in a developing countries like India. However, clinical examination of the oral cavity should be used along with other indicators like physical development, pubertal and age related changes hence, while estimating the age, sum total of all these factors should be taken into consideration.⁹⁻¹⁰

The present study was undertaken to provide a baseline data source on the patterns of dental eruption in Coimbatore. The eruption pattern of all permanent teeth (Molar 1 teeth, Central Incisor teeth, Lateral Incisor teeth, Pre Molar 1, Pre Molar 2, Canine and Molar 2) was observed.

Materials and Methods

The present study was a Community Based Cross Sectional study C.R.R. Matric Higher Secondary School, Ondipudur. C.R.R. Mat.Hr.Sec. School (CMHSS) located at Coimbatore S.S.Kulam. The present study included all the 1000 students. Simple Random Sampling was used to select the study participants. Approval for the study was obtained from the Institutional Ethics Committee of Coimbatore Medical College and Hospital ((Regd. No.ECR/892/Inst/TN/2016) dated 29.01.2019). Written informed consent was obtained from the parents and local guardians of the students. Individual assent was obtained from all the children who participated in the study. The data was entered and analyzed by using Statistical Package for Social Sciences (SPSS) (version 21.0) software package. A p value of less than 0.05 was considered to be statistically significant. Microsoft Excel was used to generate graphs, charts.

Study Procedure

After obtaining informed consent from the parents and assent from the children, socio-demographic details was collected. The students were divided according to their completed months of age as completed 72months, 84months, 96months, 108months, 120months, 132months, 144months, 156 months, 168 months, 180 months. A detailed dental assessment was done for all the students with the help of an experienced dental surgeon. The oral cavity is examined with the help of a torch light and a dental mirror while the study participant's mouth was held wide open using a tongue depressor. The dental chart was used to record information regarding the number of teeth erupted and stage of eruption that was observed and recorded. Dental charting is done according to Modified F.D.I (Federation Dentaire Internationale) system.

The stages of tooth eruption are done in the following manner. Stage 0: Fall out of primary tooth and non-eruption of permanent tooth. Stage 1: Crown Tip of tooth penetrated the gum margin (positive clinical eruption). Stage 2: Crown in oral cavity beyond gum margins but not reached occlusal plane. Stage 3: Occlusal surface is in contact with its counterpart and the bite complete. In the present study Stage 0 was considered as not erupted, Stage 1

& 2 were considered as not completely erupted and Stage 3 as erupted

Results

Distribution of Eruption status and sites of teeth:

Molar 1 teeth:

We observed that the molar 1 teeth was completely erupted in more than 90% of subjects in all jaws at the expected age. The percentage of participants with incomplete eruption was (10.6%) except left upper jaw (7.5%) and tooth was not erupted 2.1% of the study participants in the left upper jaw.

Central Incisor teeth:

All the study participants had complete eruption in all jaws, right upper (90%) left upper (92.8%) right lower (88.4%) left lower (93%) at expected age group and not completely erupted in right upper (9.1%) left upper (6.6%) right lower (11.8%) left lower (6.8%) and those with not erupted subjects were observed in 1.2 % of the right and left upper jaws respectively of the study participants.

Lateral Incisor teeth:

We found that almost all the study participants had complete eruption in all jaws, right upper (98%) left upper (98.5%) right lower (100%) left lower (100%) at expected age group and not completely erupted in right upper (1.4 %) left upper (1.5%) and those with not erupted subjects were observed in 0.6 % of the right upper jaw of the study participants.

Pre Molar 1

The eruption patterns of the Pre Molar 1 of right upper (81.3 %) and left upper jaws (85.5%) was completely erupted in more than 80% of subjects. The same of right lower and left lower jaws were 91.3% and 96.4% respectively at expected age group. In the right upper and left upper jaws incomplete erupted Pre Molar 1 was seen in less than 15% of the study participants. Those with no eruption was seen in less than 5% of the study participants.

Pre Molar 2:

The eruption patterns of the Pre Molar 2 of right upper and left upper jaws was completely erupted in more than 87.8% of subjects. The tooth

was completely erupted in right lower and left lower jaws was 94.6% & 95.4% respectively at the expected age group. In the right upper and left upper jaws incomplete erupted pre molar 2 was seen in less than 8.6% of the study participants in the right upper and left upper jaws. In the right lower and left lower jaws incomplete eruption was seen in 3.6% of the study participants. Those with no eruption was seen in less than 3.6% of the study participants in the right upper and left upper jaws and 2.3% and 0.8 % respectively.

Canine:

The eruption patterns of the canine teeth of right upper and left upper jaws was completely erupted in 90% of subjects. The completely erupted tooth in right lower and left lower jaws was 96.9% & 97.2% respectively at the expected age group. In the right upper and left upper jaws incomplete erupted canine was seen in 6.2% and 7.6% respectively. In the right lower and left lower jaws incomplete eruption was seen in 3.1% and 2.8% of the study participants. Those with no eruption was 3.1% and 1.6% in the right upper and left upper jaws.

Molar 2:

The eruption patterns of the second molar teeth of right upper and left upper jaws was completely erupted in 67.1% and 64.4% of the study participants respectively. The completely erupted tooth in right lower and left lower jaws was 73.8% & 78.9% respectively at the expected age group. In the right upper and left upper jaws incomplete erupted second molar was seen in 9.4% and 14.8% respectively. In the right lower and left lower jaws incomplete eruption was seen in 13.6% and 8.5% of the study participants. Those with no eruption was 23.5% and 20.8% respectively in the right upper and left upper jaws. In the right and left lower jaws no eruption was seen in 12.6% of the students.

Comparison of eruption of teeth of right and left sides of upper and lower quadrants

We observed that among the eruption pattern of the lateral incisors, the right lower tooth had developed significantly earlier ($p=0.01$) as compared to its counterparts. The complete eruption of the first pre molar was significantly earlier on the left side of both upper ($p=0.01$) and lower jaws ($p=0.01$)

as compared to the right side. The eruption of the second premolar was significantly ($p=0.02$) earlier on the left lower jaw as compared to its counterparts. Complete eruption of Canine tooth was significantly earlier in the left side of both the upper and lower jaws. Complete eruption of left lower second molar was significantly earlier ($p=0.001$)

Comparison of eruption of teeth between genders

We observed no significant variations in the

mean age for eruption pattern of first molar, central incisor, lateral incisor, first pre molar, second pre molar and canine among both genders. Though age differences were variable there was no noted statistical significance among both genders in the time taken for complete eruption of the aforementioned teeth. We also found that the development of the second molar was significantly earlier among females as compared to males.

Table 1: Age and gender distribution of the study participants

Age in months	Male (n=557)	Female (n=443)	Total (n=1000)
Completed 72 months	32	28	60
Completed 84 months	30	20	50
Completed 96 months	62	58	120
Completed 108 months	59	41	100
Completed 120 months	41	49	90
Completed 132 months	69	41	110
Completed 144 months	73	57	130
Completed 156 months	49	41	90
Completed 168 months	126	94	220
Completed 180 months	16	14	30

Table 2 Distribution of Eruption status and sites of teeth (n = 1000)

Teeth	Side of Teeth	Status Of Eruption		
		Complete (%)	Not complete n (%)	Not erupted n (%)
Molar - 1 (72months) n=60	Right Upper	54 (90.4)	6 (10.6)	0
	Left Upper	54 (90.4)	5 (8.8)	1 (2.1)
	Right Lower	54 (90.4)	6 (10.6)	0
	Left Lower	54 (90.4)	6 (10.6)	0
Central Incisor (96months) n=120	Right Upper	108 (90)	11 (8.8)	1 (1.2)
	Left Upper	111 (92.4)	8 (6.4)	1 (1.2)
	Right Lower	106 (88.4)	14 (11.6)	0
	Left Lower	112 (93)	8 (6.8)	0
Lateral Incisor (108months) n=100	Right Upper	98 (98)	1 (1.4)	1 (0.6)
	Left Upper	98 (98.5)	2 (1.5)	0
	Right Lower	100 (100)	0	0
	Left Lower	100 (100)	0	0
Pre Molar - 1 (132months) n=110	Right Upper	89 (81.3)	16 (14.6)	5 (4.1)
	Left Upper	94 (85.5)	11 (10.4)	5 (4.1)
	Right Lower	100 (91.3)	7 (5.6)	3 (3.1)
	Left Lower	106 (96.4)	4 (3.6)	0

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Pre Molar - 2 (144 months) n=130	Right Upper	114 (87.6)	11 (8.6)	5 (3.8)
	Left Upper	114 (87.6)	11 (8.6)	5 (3.8)
	Right Lower	123 (94.6)	4 (3.1)	3 (2.3)
	Left Lower	124 (95.4)	5 (3.8)	1 (0.8)
Canine (144months) n=130	Right Upper	118 (90.7)	8 (6.2)	4 (3.1)
	Left Upper	118 (90.8)	10 (7.6)	2 (1.6)
	Right Lower	126 (96.9)	4 (3.1)	0
	Left Lower	126 (97.2)	4 (2.8)	0
Molar - 2 (168months) n=221	Right Upper	148 (67.1)	21 (9.4)	52 (23.5)
	Left Upper	142 (64.4)	33 (14.8)	46 (20.8)
	Right Lower	163 (73.8)	30 (13.6)	28 (12.6)
	Left Lower	174 (78.9)	19 (8.5)	28 (12.6)

Table 3 Comparison of eruption of teeth between right & left upper & lower jaws

Teeth	Upper jaw				Lower jaw			
	Right	Left	Test of Significance Z ; p value		Right	Left	Test of Significance Z ; p value*	
Molar - 1	89.4	89.4	0.00	1.00	89.4	89.4	0.00	1.00
Central Incisor	89.2	92.8	0.229	0.07	88.0	92.8	0.00	1.00
Lateral Incisor	97.5	98.1	1.987	0.01	100.0	100.0	1.733	0.07
Pre Molar - 1	80.7	84.3	2.818	0.01	90.9	96.8	4.236	0.01
Pre Molar - 2	87.8	87.8	1.773	0.08	94.2	95.7	2.286	0.02
Canine	89.8	90.3	2.722	0.01	97.2	97.7	2.834	0.01
Molar - 2	66.8	63.9	1.757	0.07	73.8	78.4	3.691	0.001

*p value less than 0.05 was considered to be statistically significant

Table 4 Comparison of eruption of teeth between genders

Teeth	Male		Female		Mean Difference	Test of Significance	
	Mean± S.D (months)		Mean ± S.D (months)			" t "	p value*
Molar - 1	76.6	2.4	76.9	2.9	0.3	0.345	0.07
Central Incisor	82.3	6.6	81.8	6.5	0.5	0.377	0.06
Lateral Incisor	106.4	6.4	106.0	6.6	0.4	0.418	0.06
Pre Molar - 1	110.8	9.7	111.8	10.4	1.0	0.756	0.06
Pre Molar - 2	132.8	6.5	130.6	6.9	2.1	1.92	0.08
Canine	143.6	6.7	143.7	6.4	0.1	0.149	0.008
Molar - 2	174.1	5.0	169.1	20.9	5.0	6.889	0.001

*p value less than 0.05 was considered to be statistically significant

Discussion

The present study was a community based cross-sectional study undertaken to study eruption patterns of permanent teeth among school going children in Coimbatore. The study involved 1000 participants aged between 5 and 15 years.

The first molar teeth was the initial permanent teeth to erupt, this finding is in line with various anatomy, dental and forensic texts which emphasize the same. We observed that the first molar teeth was completely erupted between 75.9 to 77.9 months. These findings are similar to the findings from various studies that have shown that the complete eruption of first molar teeth occurs between 72 to 84 months. We observed that the complete eruption of the Central Incisor teeth was observed between 80.8 to 84 months.

Various studies and texts have shown that the complete eruption occurs between 72 to 96 months.

The lateral incisors completely erupted between 105.2 and 107.4 months of age. Lyon,¹¹ Apurba, Nandy et al¹² have also mentioned that the average age of complete eruption of the lateral incisors occurs between 84 to 108 months. The complete eruption of the lateral incisors was significantly earlier in the left as compared the right lower jaws.

We observed that the complete eruption of the first pre molar teeth was observed between 109.58 to 112.6 months of age. The complete eruption of the lateral incisors was significantly earlier in the left as compared the right in both the upper and lower jaws. The second pre molar was completely erupted between 131.0 to 133.8 months. The complete eruption of the second premolar was significantly earlier in the left lower jaw as compared to the right lower jaw. Studies conducted by Ghai et al¹³, Grewal et al,¹⁴ and Kerr et al¹⁵ have also reported similar findings.

The canine completely erupted between 142.6 to 144.8 months of age. The complete eruption of the canine was significantly earlier in the left as compared the right side. Studies have shown that the left side teeth are earlier to erupt as compared to the right side. The complete eruption of the second molar teeth was observed between 174.5 - 178.6 months of age. The complete eruption of the second molar was significantly earlier in the left side as compared the right side with respect to the lower jaw. We also found that the development of the second molar tooth was significantly earlier among the females. Studies by Ghai et al,¹³ Grewal et al,¹⁴ Kerr et al¹⁵ and Grewal et al¹⁶ have reported similar findings.

Conclusions and Recommendations

This study can be used as a baseline data to carry out large multi-centric studies or larger community based studies can be undertaken in the geographical area. The dental eruption patterns should be studied in detail to assess the role off various associated factors like nutrition, oral hygiene etc. Further studies with radiological assessment could add more evidence to the existing literature.

Conflict of interest: None declared

Source of funding: None

Ethical Committee Approval: Ethics approval (No.0202/2019) for the study obtained

from Institutional Human ethics committee, Coimbatore medical college (Regd. No.ECR/892/Inst/TN/2016) dated 29.01.2019

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