

## Eruption Age And Sequence Of Permanent Teeth Among School Children In The Dravidian Population

Research Article

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### Abstract

**Introduction:** Significant knowledge on timing and pattern of permanent teeth eruption in a given population is essential for the diagnosis and treatment planning. Already established but changes to every population. The purpose of this study was to determine the eruption age and sequence of permanent teeth among school children in the Dravidian population.

**Material and Methods:** This cross-sectional study was conducted among 1,650 Dravidian children (886 girls and 764 boys) ranging in age from 5 to 15 years. Descriptive statistics and paired t-test were used to compare the mean time of eruption of permanent teeth between gender and upper and lower jaws.

**Results:** The permanent tooth started to erupt in 7.06 years of age and ended at 13.60 years of age in girls and in boys between the ages of 6.45 years and 13.40 years. In both the gender, the first tooth to erupt was the lower 1st molar, while the last was the upper 2nd molar. Statistically significant difference was noted between the eruption of permanent teeth in girls and boys except upper and lower canines and 2nd premolars.

**Conclusion:** Boys showed earlier eruption of permanent teeth than girls. All the mandibular teeth erupted earlier than their maxillary counterpart, with the exception of right premolars in girls and left incisors in boys. A delay in eruption of lower canines was noticed in girls.

**Keywords:** Eruption; Permanent Teeth; Sequence.

### Introduction

Tooth eruption is a continuous physiological process, in which tooth move from its developmental position within the jaws to break the mucosa towards the oral cavity [1].

The maturation status of an individual can be assessed based on skeletal development, dental development and chronological age. Eruption of teeth are considered as markers of maturity and an important milestone in an individual's life. Timing and pattern of tooth eruption has been associated with parameters, such as skeletal and dental maturity, to indicate the level of somatic development of individuals [2].

Significant knowledge on the timing and pattern of tooth erup-

tion are vital for diagnosis, prevention and treatment planning in pediatric dentistry, orthodontics and also essential in forensic dentistry to determine the age [3]. Estimation of age by the number of teeth erupted has been recognized as having paramount importance in demographic surveys, forensic sciences and anthropology [3, 4].

Tooth eruption time varies widely for every individual. A trend toward earlier eruption of permanent teeth has been reported in industrialized countries which are thought to be primarily caused by early puberty that in turn, is a result of modified diet and nutrition. Other factors such as gender, ethnic origin, racial group, gestational age, geographical conditions also influence the timing of eruption [5, 6]. Therefore, the developmental patterns cannot be universally applied owing to ethnic diversity. The standards for

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tooth eruption patterns derived for a western population cannot be speculated to every other population as there is wide difference racially, culturally, and environmentally. Therefore, this study aimed at evaluating the eruption time and sequence of permanent teeth among school going Dravidian children.

## Material And Method

Ethical clearance for the present study was obtained from the Institutional Ethical Review Board (SRB/MDS/PEDO/18-19/015) and in accordance with the 1964 Helsinki declaration and its later amendments. This cross-sectional study was conducted among a group of 1,650 school Dravidian children ranging in age from 5 to 15 years. Permission was obtained from the school authorities to conduct the study. Informed verbal consent was obtained from the participants' parents and that was approved by institutional review board.

The exclusion criteria were children with systemic diseases, developmental syndromes or craniofacial skeletal deformities like cleft lip and palate and children undergoing orthodontic treatment, or with any history of extraction of permanent teeth.

At the start, basic information, that is, age and gender of the child was recorded. The age was calculated from date of birth to the date of examination and rounded off to the full month. Oral examination was then carried out using mouth mirror with participant seated on an ordinary chair.

A tooth was considered to be erupted even if a small part of the crown had perforated the gum, becoming visible in the oral cavity [7-9]. The teeth were recorded according to the two-digit system of Federation Dentaire Internatioanale (FDI).

The collected data were recorded in spreadsheet (Excel 2017: Microsoft office) and analyzed using SPSS software (Version 21.0). The calculations were performed according to previous studies on tooth emergence. Student t-test were used to determine the differences between gender and between contralateral sides. P-

value of less than 0.05 was considered statistically significant.

## Results

A total of 886 girls (54%) and 764 boys (46%) between the age group of 5-15 years of age participated in the study.

The mean age, standard deviation and median for eruption of permanent teeth of both genders are shown in [Table 1] and [Table 2].

The results show that the permanent tooth starts to erupt in 7.06 years of age and ends at 13.60 years of age in girls. Whereas this occurs between the ages of 6.45 years and 13.40 years in boys. In both the gender, the first tooth to erupt is the lower 1st molar, while the last is the upper 2nd molar.

[Table 3] and [Table 4] compares the mean age of permanent teeth eruption between genders.

Statistically significant difference was noted between the eruption of permanent teeth in girls and boys except upper and lower canines and 2nd premolars. Majority of permanent teeth emerged earlier in boys than in girls. In the age group of 15 years, all the permanent teeth erupted except 3rd molars.

Mandibular teeth erupted earlier than their maxillary counterparts except right 1<sup>st</sup> and 2<sup>nd</sup> premolars, left central and lateral incisors. [Table 5] and [Table 6] shows the comparison of mean age of permanent teeth eruption between contra-lateral sides of maxillary and mandibular arches among both genders.

In girls, statistically significant difference was noted in case of eruption of right and left upper premolars and lower 1st premolar. In boys, statistically significant difference was noted in the eruption of right and left upper incisors, premolars, and 2nd molar; lower lateral incisor, and 1st premolar.

Based on the mean time of eruption, the sequence of eruption of

**Table 1. Mean age (in years), standard deviation and median (in years) of permanent maxillary teeth eruption among girls and boys.**

Tooth	Girls			Boys		
	Mean	Standard Deviation	Median	Mean	Standard Deviation	Median
11	7.36	0.39	7.4	7.57	0.68	7.5
12	8.71	0.85	8.7	8.91	1.01	9
13	11.85	0.96	12.1	11.82	0.74	11.6
14	11.13	0.85	11.1	10.74	0.81	10.9
15	11.7	0.79	11.8	11.52	0.92	11.5
16	7.16	0.56	7.3	6.76	0.43	6.8
17	13.6	0.99	13.6	13.29	1.06	13.4
21	7.38	0.36	7.4	7.14	0.42	7.2
22	8.7	0.86	8.7	8.06	0.68	8.3
23	11.76	0.97	11.9	11.81	0.78	11.8
24	10.93	0.66	10.9	11.34	1.09	11.5
25	11.9	0.81	12.1	11.82	0.89	11.6
26	7.14	0.56	7.3	6.87	0.47	6.9
27	13.52	1.15	13.6	13	1.01	13.1

Table 2. Mean age (in years), standard deviation and median (in years) of permanent mandibular teeth eruption among girls and boys.

Tooth Number	Girls			Boys		
	Mean	Standard Deviation	Median	Mean	Standard Deviation	Median
31	7.28	0.49	7.4	7.44	0.71	7.4
32	8.54	0.89	8.6	8.32	0.83	8.4
33	11.58	1.02	11.7	10.95	0.69	11.2
34	10.82	0.75	10.8	10.8	0.82	11.1
35	11.88	0.86	12.1	11.81	0.87	11.8
36	7.05	0.6	7.1	6.47	0.35	6.5
37	13.41	0.99	13.4	13.14	1.03	13.2
41	7.25	0.51	7.3	7.46	0.72	7.4
42	8.54	0.9	8.6	7.96	0.68	8.1
43	11.64	1.04	11.7	10.94	0.73	11.2
44	11.48	1.08	11.6	11.09	1.05	11.3
45	11.87	0.9	12.1	11.63	0.88	11.6
46	7.06	0.6	7.1	6.45	0.37	6.4
47	13.45	0.97	13.5	13.19	1.01	13.3

Table 3. Comparison of mean age (in years) of permanent maxillary teeth eruption between genders.

Tooth Number	Girls		Boys		t Value	P Value
	Mean	Standard Deviation	Mean	Standard Deviation		
11	7.36	0.39	7.57	0.68	-2.74	0.006*
12	8.71	0.85	8.91	1.01	-2.01	0.045*
13	11.85	0.96	11.82	0.74	0.33	0.74
14	11.13	0.85	10.74	0.81	4.01	0.000*
15	11.7	0.79	11.52	0.92	1.58	0.11
16	7.16	0.56	6.76	0.43	5.39	0.000*
17	13.6	0.99	13.29	1.06	2.74	0.006*
21	7.38	0.36	7.14	0.42	4.09	0.000*
22	8.7	0.86	8.06	0.68	5.94	0.000*
23	11.76	0.97	11.81	0.78	-0.46	0.65
24	10.93	0.66	11.34	1.09	-4.4	0.000*
25	11.9	0.81	11.82	0.89	0.81	0.42
26	7.14	0.56	6.87	0.47	3.83	0.000*
27	13.52	1.15	13	1.01	5.02	0.000*

\*P<0.05, Statistically significant

permanent teeth in both genders are as follows: Maxilla\_ 6-1-2-4-3-5-7; Mandible\_ 6-1-2-3-4-5-7.

On comparison with standard eruption time, there was considerable delay in the eruption of lower canines in girls [Table 7], [Table 8].

## Discussion

Interpretation on the timing and sequence of permanent teeth eruption is vital for managing dental problem in children and also

used to supplement other maturity indicators in the diagnosis of growth disturbances and in forensic medicine to estimate the chronological age of children with unknown birth records [10].

The demographic, racial and nutritional factors which vary in each geographical location, might have an effect on tooth eruption [6, 8]. Therefore, the standard eruption chart derived from western population cannot be applied for every other population. The current study aimed at determining the eruption age and sequence of permanent teeth in Dravidian children.

Table 4. Comparison of mean age (in years) of permanent mandibular teeth eruption between genders.

Tooth Number	Girls		Boys		t Value	P Value
	Mean	Standard Deviation	Mean	Standard Deviation		
31	7.28	0.49	7.44	0.71	-2.01	0.046*
32	8.54	0.89	8.32	0.83	2.36	0.019*
33	11.58	1.02	10.95	0.69	5.33	0.000*
34	10.82	0.75	10.8	0.82	-0.04	0.96
35	11.88	0.86	11.81	0.87	0.67	0.5
36	7.05	0.6	6.47	0.35	7.11	0.000*
37	13.41	0.99	13.14	1.03	2.71	0.007*
41	7.25	0.51	7.46	0.72	-2.66	0.008*
42	8.54	0.9	7.96	0.68	5.64	0.000*
43	11.64	1.04	10.94	0.73	5.77	0.000*
44	11.48	1.08	11.09	1.05	3.31	0.000*
45	11.87	0.9	11.63	0.88	2.02	0.045*
46	7.06	0.6	6.45	0.37	7.32	0.000*
47	13.45	0.97	13.19	1.01	2.64	0.008*

\*P&lt;0.05, Statistically significant

Table 5. Comparison of mean age (in years) of permanent teeth eruption between contra-lateral sides of maxillary arches among both genders.

Tooth and Gender	Mean age	Standard Deviation	Tooth and Gender	Mean age	Standard Deviation	t value	P value
11			21				
Girls	7.3	0.39	Girls	7.3	0.36	0.35	0.72
Boys	7.5	0.68	Boys	7.1	0.42	5.04	0.000*
12			22				
Girls	8.7	8.85	Girls	8.7	0.86	0.11	0.911
Boys	8.9	1.01	Boys	8	0.68	6.89	0.000*
13			23				
Girls	11.8	0.96	Girls	11.7	0.97	0.78	0.436
Boys	11.8	0.74	Boys	11.8	0.78	0.09	0.922
14			24				
Girls	11.1	0.85	Girls	10.9	0.66	2.32	0.020*
Boys	10.7	0.81	Boys	11.3	1.09	5.67	0.000*
15			25				
Girls	11.7	0.79	Girls	11.9	0.81	2	0.046*
Boys	11.5	0.92	Boys	11.8	0.89	2.59	0.010*
16			26				
Girls	7.1	0.56	Girls	7.1	0.56	0.29	0.766
Boys	6.7	0.43	Boys	6.8	0.47	1.57	0.116
17			27				
Girls	13.6	0.99	Girls	13.5	1.15	0.84	0.397
Boys	13.2	1.06	Boys	13	1.01	2.55	0.011*

\*P&lt;0.05, Statistically significant

**Table 6. Comparison of mean age (in years) of permanent teeth eruption between contra-lateral sides of mandibular arches among both genders.**

Tooth and Gender	Mean age	Standard Deviation	Tooth and Gender	Mean age	Standard Deviation	t value	P value
31		41					
Girls	7.2	0.49	Girls	7.2	0.51	0.45	0.648
Boys	7.4	0.71	Boys	7.4	0.71	0	0.997
32		42					
Girls	8.5	0.89	Girls	8.5	0.9	0	1
Boys	8.3	0.83	Boys	7.9	0.83	3.52	0.000*
33		43					
Girls	11.5	1.02	Girls	11.6	1.04	0.58	0.56
Boys	10.9	0.69	Boys	10.9	0.69	0.09	0.924
34		44					
Girls	10.8	0.75	Girls	11.4	1.08	6.01	0.000*
Boys	10.8	0.82	Boys	11	0.82	2.2	0.028*
35		45					
Girls	11.8	0.86	Girls	11.8	0.9	0.09	0.924
Boys	11.8	0.87	Boys	11.6	0.87	1.45	0.146
36		46					
Girls	7	0.6	Girls	7	0.6	0.14	0.883
Boys	6.4	0.35	Boys	6.4	0.35	0.3	0.762
37		47					
Girls	13.4	0.99	Girls	13.4	0.97	0.45	0.65
Boys	13.1	1.03	Boys	13.1	1.03	0.47	0.637

\*P<0.05, Statistically significant

**Table 7. Comparison of mean age (in years) of permanent maxillary teeth eruption among girls and boys compared with standard eruption time (in years).**

Tooth	Standard time of eruption (in years)	Mean age of eruption in girls (in years)	Mean age of eruption in boys (in years)
11	7-8	7.3	7.5
12	8-9	8.7	8.9
13	11-12	11.8	11.8
14	10-11	11.1	10.7
15	10-12	11.7	11.5
16	6-7	7.1	6.7
17	12-13	13.6	13.2
21	7-8	7.3	7.1
22	8-9	8.7	8
23	11-12	11.7	11.8
24	10-11	10.9	11.3
25	10-12	11.9	11.8
26	6-7	7.1	6.8
27	12-13	13.5	13

**Table 8. Comparison of mean age (in years) of permanent mandibular teeth eruption among girls and boys compared with standard eruption time (in years).**

Tooth	Standard time of eruption (in years)	Mean age of eruption in girls (in years)	Mean age of eruption in boys (in years)
31	6-7	7.2	7.4
32	7-8	8.5	8.3
33	9-10	11.5*	10.9
34	10-12	10.8	10.8
35	11-12	11.8	11.8
36	6-7	7	6.4
37	11-13	13.4	13.1
41	6-7	7.2	7.4
42	7-8	8.5	7.9
43	9-10	11.6*	10.9
44	10-12	11.4	11
45	11-12	11.8	11.6
46	6-7	7	6.4
47	11-13	13.4	13.1

\* Delayed eruption compared to standard eruption time.

Eruption of teeth can be determined either clinically or radiographically. However, in community-based studies, radiographic methods may not be appropriate considering ethics and feasibility. Therefore, this study determined the tooth eruption clinically [10].

Most of the earlier studies done in children from Malaysia, Turkey, Australia, Japan, Hawaii, Kingston confirm that the girls were ahead of boys in the permanent tooth eruption [5, 7, 10, 14]. Contradicting to these, in the present study, the mean age of eruption of permanent teeth were earlier in boys than in girls. In the maxillary arch, right and left molars, left incisors and left 2nd premolar showed earlier eruption in boys. In mandibular arch, right canine, premolars, molars, and left lateral incisor, canine and 1st molar were earlier in boys. However, in studies conducted in other regions of India, girls showed earlier eruption than boys [6, 15].

Significant difference in the eruption of contra-lateral permanent teeth in boys can be noted in the present study. Similar to this, in a study conducted among Spanish children, a slight earlier eruption of teeth was noted on the left side with a tendency toward early eruption in boys [16].

In the present study, eruption of all the mandibular teeth, with exception of right premolars in girls and left incisors in boys, were earlier than their maxillary counterparts. This is in accordance with the studies done in Kingston, Malaysia, Turkey and Greece children [5, 7, 10, 14].

The sequence of eruption in this study was similar to other studies reported in Australia, Japan, Kenya, and Indian studies from Hyderabad and Delhi [6, 11, 12, 17, 18]. When the mean age of eruption of permanent teeth was compared with standard eruption time given by Logan and Kornfeld, a delayed eruption was noticed in the eruption of lower canines [19]. Alike, a study con-

ducted among Kerman Province children reported a delay in the eruption of lower canines [20]. This delay has a significant clinical correlation with the development of malocclusion. The risk of a dystrophic eruption of canine is high in an eruption sequence with the canine following premolars when the 1st molar erupts mesially.

However, cross-sectional study gives only the mean age of eruption and precise pattern of eruption could be found only through longitudinal studies.

## Conclusion

The eruption age of permanent teeth among these children were comparable to the standard eruption chart except lower canines. The permanent teeth eruption was found to be earlier in boys. However, the time and sequence of eruption may vary with changes in social status and health care. Further research involving large population could provide more insight into tooth emergence trends and possible factors influencing the same.

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