Age estimation from eruption of permanent teeth in school children

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Abstract
Aim: To study the age estimation from eruption of permanent teeth in school children.

Objective: 1) To study eruption of permanent teeth in a child of age group from 6 years to 14 years. 2) To study and compare eruption timings of maxillary and mandibular teeth between boys and girls.

Material and Methods: This was a prospective study. A random sample of 180 school children in the age group of 6 to 14 years was selected. The mean age of eruption of individual permanent teeth was recorded and result was analysis.

Result: The study population included 99 boys constituting 54.995% and 81 girls constituting 44.997% of the total sample. In the age group of 6 years, the first permanent molar teeth was found to be erupted. In the age group of 14 years, all the permanent teeth except third molar had erupted. Girls showed early tooth eruption compared to boys. Mandibular teeth erupted earlier than maxillary teeth in both the sexes. Right and left side teeth erupted at same time in both the arches.

Conclusion: The mean ages of eruption obtained from the present study are strikingly comparable with those of other investigators in different population across the world

Keywords: Federation Dentaire International (FDI).

Introduction
Teeth are very important indicators in medico-legal cases as they help in identification and age estimation in the living as well as in dead. The knowledge of tooth eruption is essential for diagnosis and treatment planning. Eruption of teeth is affected by climate, race, diet and geographical factors.

The age at which tooth penetrates the gum and appear in oral cavity is eruption time and is a biological marker of the maturity of an individual. Tooth eruption is an important milestone is an individual life.¹

Evolution of the human race has seen many changes in the living habits, food habits, and oral hygiene habits over a span of thousands of year, which may have influenced the eruption of teeth as well.²

Studies have also reported difference in eruption of permanent teeth between ethnic group, gender, socioeconomic and nutritional factors carious condition, fluorides, congenital abnormalities such as supernumerary teeth, Down’s syndrome, cleidocranial dysplasia, and environmental and secular trends.³ ⁴ ⁵

Rationalization of eruption timings is more desirable in the present era, since dentistry has widened its horizons towards many specific fields. Developmental norms of emergence of permanent teeth need to be established for diagnosis, orthodontic treatment planning, preventive dentistry procedure, archaeological, anthropological, paleontological and may have legal as well as forensic application.⁶

Material and Methods
The present study was the prospective study entitled “Age estimation from eruption of permanent teeth in school children”. The sample collected was based on simple random technique. Children aged between 6 to 14 years in 2 school of who fulfilled the inclusion criteria were involved in the study. Consent was taken by the school principal or relative for the examination of the children of the school. The subject who was apparently healthy both physically and mentally was included in the study. Children with a history of chronic infectious disease, nutritional disorders, endocrine disorders, syndromes and development disturbance including cleft lip and palate were excluded from the study. Their teeth were examined for eruption and charting of teeth with Federation Dentaire International (FDI). The visual examination was done in good light. The eruption of permanent teeth was estimated, age of child from 6 years to 14 years. A maximum of 10 children per day were examined over a period of 6 months.

Examination was done using a mouth mirror and probe with adequate natural illumination. The examination commenced from the maxillary right quadrant for the presence of permanent teeth followed by the maxillary left, mandibular left and mandibular right quadrant. The date of birth of a child was obtained from the school record and the examination date will be recorded. Number of permanent teeth erupted in the oral cavity of each child was recorded in his/her proforma. A tooth with any of its parts emerged through the gingiva was considered as erupted. Similar procedure was carried out for all the 180 children included in the study group. Statistical table were prepared for the explosion of each individual tooth with age and gender

Observations and Results
The study population consisted of 180 subjects in the age group 6-14 years. They were 99 boys constituting 54.995% and 81 girls constituting 44.997% of the total sample of 180 children.
Table 1: Showing distribution of the study according to population

| Age in years | Males | Males (%) | Females | Females (%) | Total |
|--------------|-------|-----------|---------|-------------|-------|
| 6            | 15    | 8.333     | 8       | 4.444       | 23    |
| 7            | 9     | 5         | 10      | 5.555       | 19    |
| 8            | 16    | 8.888     | 9       | 5           | 25    |
| 9            | 14    | 7.777     | 11      | 6.111       | 25    |
| 10           | 8     | 4.444     | 9       | 5           | 17    |
| 11           | 10    | 5.555     | 10      | 5.555       | 20    |
| 12           | 5     | 2.777     | 11      | 6.111       | 16    |
| 13           | 19    | 10.555    | 10      | 5.555       | 29    |
| 14           | 3     | 1.666     | 3       | 1.666       | 6     |
| Total        | 99    | 54.995    | 81      | 44.997      | 180   |

In present study, Table 2 and table 3 shows the number of maxillary and mandibular permanent teeth, erupted at different ages, in case of males and females. (Table 2 and 3).

Table 2: Showing Number of maxillary permanent teeth erupted in ages

| Age in year | Central Incisors (CI) | Lateral Incisor (LI) | Canines (C) | First Premolar (I PM) | Second Premolar (II PM) | First Molar (I M) | Second Molar (II M) |
|-------------|-----------------------|----------------------|-------------|-----------------------|------------------------|------------------|---------------------|
| 6 year      |                       |                      |             |                       |                        |                  |                     |
| M           | 8                     |                      |             |                       |                        |                  |                     |
| F           | 4                     |                      |             |                       |                        |                  |                     |
| 7 year      |                       |                      |             |                       |                        |                  |                     |
| M           | 13                    | 1                    |             |                       |                        |                  |                     |
| F           | 12                    | 3                    |             |                       |                        |                  |                     |
| 8 year      |                       |                      |             |                       |                        |                  |                     |
| M           | 29                    | 13                   | 1           |                       |                        |                  | 32                  |
| F           | 16                    | 13                   |             |                       |                        |                  | 18                  |
| 9 year      |                       |                      |             |                       |                        |                  |                     |
| M           | 26                    | 18                   | 3           |                       |                        |                  | 28                  |
| F           | 22                    | 20                   | 5           |                       |                        |                  | 22                  |
| 10 year     |                       |                      |             |                       |                        |                  |                     |
| M           | 16                    | 16                   | 12          | 2                     | 16                     |                  |                     |
| F           | 18                    | 18                   | 17          | 5                     | 18                     |                  |                     |
| 11 year     |                       |                      |             |                       |                        |                  |                     |
| M           | 20                    | 20                   | 6           | 20                    | 20                     | 20               | 20                  |
| F           | 20                    | 20                   | 11          | 20                    | 20                     | 20               | 20                  |
| 12 year     |                       |                      |             |                       |                        |                  |                     |
| M           | 10                    | 10                   | 10          | 10                    | 10                     | 10               | 3                  |
| F           | 22                    | 22                   | 22          | 22                    | 22                     | 22               | 5                  |
| 13 year     |                       |                      |             |                       |                        |                  |                     |
| M           | 38                    | 38                   | 36          | 38                    | 38                     | 38               | 28                 |
| F           | 20                    | 20                   | 20          | 20                    | 20                     | 20               | 18                 |
| 14 year     |                       |                      |             |                       |                        |                  |                     |
| M           | 6                     | 6                    | 6           | 6                     | 6                      | 6                | 6                  |
| F           | 6                     | 6                    | 6           | 6                     | 6                      | 6                | 6                  |

Table 3: Showing Number of mandibular permanent teeth erupted in ages.

| Age in year | Central Incisors | Lateral Incisor | Canines | First premolar | Second premolar | First molar | Second molar |
|-------------|------------------|-----------------|---------|----------------|----------------|-------------|--------------|
| 6 year      |                   |                 |         |                |                |             |              |
| M           | 16                | 1               |         |                |                |             | 27           |
| F           | 6                 | 2               |         |                |                |             | 16           |
| 7 year      |                   |                 |         |                |                |             |              |
| M           | 14                | 12              |         |                |                |             | 18           |
The mean age of eruption obtained from the present study in boy were, 7.2±0.9 (CI), 8.2±1.2 (LI), 11.1±1.0 (C), 10.2±2.1 (I PM), 11.2±1.9 (II PM), 5.4±1.2 (IM), and 12.3±0.9 (II M) year in maxilla and 6.1±0.8 (CI), 7.2±1.1 (LI), 11.1±1.3 (C), 10.6±1.8 (I PM), 11.1±2.5 (II PM), 5.1±1.6 (IM), and 12.7±1.0 (II M) years in mandible. 

The mean age of eruption obtained in maxilla of girl were 7.2±0.1 (CI), 8.1±1.1 (LI), 10.9±1.5 (C), 10.5±3.1 (I PM), 11.1±0.5 (II PM), 4.9±1.0 (IM), 12.3±1.6 (II M). Years and 6.6±1.6 (CI), 7.1±1.0 (LI), 10.8±1.9 (C), 10.3±1.3 (I PM), 11.5±1.3 (II PM), 5.2±1.2 (IM), 11.9±1.2 (II M) years respectively in mandible. (Table 4).

At the age of 6 years, first permanent teeth were emerged in both genders. In the age group of 14 years all the permanent teeth except third molars had erupted. First teeth to emerge in oral cavity was mandibular first molar whereas maxillary second molar was the last teeth to emerge. Teeth in maxillary arch erupted earlier in girl than boy. Mandibular central incisor, second Premolar and first molar erupted earlier in boys than girl. Mandibular canine, 1st premolar, 2nd molar erupted earlier in girls than boys. (Table 4).

**Table 4:** Teeth Comparison of mean age of eruption of teeth in males and females

| Tooth                  | Boys         | Girls        | P Value |
|------------------------|--------------|--------------|---------|
| Central incisor(CI)    | 7.2±0.9      | 7.2±0.1      | 0.32    |
| Maxillary Mandibular   | 6.1±0.8      | 6.6±1.6      | 0.032   |
| Latelar incisor(LI) Maxillary | 8.2±1.2 | 8.1±1.1     | 0.051   |
| Mandibular             | 7.2±0.91     | 7.1±1.0      | 0.046   |
| Canine (C) Maxillary   | 11.1±1.0     | 10.9±1.5     | 0.82    |
| Mandibular             | 11.1±1.3     | 10.8±1.9     | 0.94    |
| First Premolar(IPM)    | 10.2±2.1     | 10.5±3.1     | 0.002   |
| Maxillary Mandibular   | 10.6±1.8     | 10.3±1.3     | 0.033   |
| Second Premolar (IIPM) |              |              |         |
| Maxillary              | 11.2±1.9     | 11.1±0.5     | 0.051   |
| Mandibular             | 11.1±2.5     | 11.5±1.3     | 0.003   |
| First Molar(M1) Maxillary | 5.4±1.2 | 4.9±1.0     | 0.019   |
| Mandibular             | 5.1±1.6      | 5.2±1.2      | 0.05    |
| Second Molar(M2) Maxillary | 12.3±0.9 | 12.3±1.6    | 0.54    |
| Mandibular             | 12.7±1.0     | 11.9±1.2     | 0.0074  |
Table 5: Comparison of mean age of eruption between right and left maxillary and right and left mandibular teeth.

| Tooth | Mean Age | SD | Tooth | Mean Age | SD | P Value |
|-------|----------|----|-------|----------|----|---------|
| 11    | 7.2      | 1.0| Male   | 7.3      | 1.1| 0.023   |
|       | Female   | 7.5| Male   | 8.9      | 1.1| 0.063   |
| 12    | 8.2      | 1.1| Female | 8.2      | 1.1| 0.073   |
|       | 21       |    | Male   | 11.7     | 1.6| 0.62    |
|       | Female   | 10.8| Female | 11.7     | 1.9| 0.39    |
| 13    | 10.8     | 1.8| Male   | 10.8     | 1.1| 0.91    |
|       | Female   | 10.8| Female | 10.8     | 1.2| 0.83    |
| 14    | 10.6     | 2.1| Male   | 11.1     | 1.3| 0.03    |
|       | Female   | 11.2| Female | 11.2     | 1.2| 0.55    |
| 15    | 12.6     | 1.1| Male   | 12.7     | 0.9| 0.46    |
|       | Female   | 12.3| Female | 12.4     | 1.0| 0.48    |
| 16    | 5.2      | 1.0| Male   | 5.4      | 1.0| 0.77    |
|       | Female   | 5.3| Female | 5.7      | 1.0| 0.07    |
| 17    | 12.6     | 1.1| Male   | 12.7     | 0.9| 0.46    |
|       | Female   | 12.3| Female | 12.4     | 1.0| 0.48    |
| 18    | 6.4      | 1.1| Male   | 6.8      | 0.6| 0.88    |
|       | Female   | 6.9| Female | 6.9      | 0.6| 0.93    |
| 19    | 7.6      | 1.1| Male   | 7.8      | 0.9| 0.55    |
|       | Female   | 7.8| Female | 7.8      | 0.7| 0.66    |
| 20    | 11.4     | 1.1| Male   | 11.0     | 1.1| 0.05    |
|       | Female   | 10.5| Female | 10.9     | 1.1| 0.02    |
| 21    | 10.9     | 1.4| Male   | 10.9     | 1.3| 0.63    |
|       | Female   | 10.2| Female | 10.8     | 1.4| 0.03    |
| 22    | 10.9     | 1.3| Male   | 11.3     | 1.3| 0.02    |
|       | Female   | 10.1| Female | 11.2     | 1.3| 0.001   |
| 23    | 5.0      | 1.5| Male   | 5.1      | 1.39| 0.11   |
|       | Female   | 5.1| Female | 5.4      | 1.26| 0.12   |
| 24    | 12.3     | 1.6| Male   | 11.82    | 1.2| 0.16    |
|       | Female   | 11.8| Female | 11.9     | 1.2| 0.12    |

In boy, the mean age of eruption between right and left maxillary and right and left mandibular teeth were compared. In the maxilla, teeth erupted at same time on both the side. In the Mandible, right canine, second Premolar, second molar erupted earlier than the left. In girl, maxillary left central incisor, lateral incisor erupted earlier than right. In the mandible, left second Premolar erupted earlier than the right. (Table 5)

Discussion
We took 180 random cases from 2 school out of these 99 were males and 81 were females. We noted eruption of permanent teeth in the various age groups.

In our study found that first permanent teeth to erupt was first molar and erupts at the age between 6 to 7 years. Permanent central incisors erupt between 6 to 8 years, latral incisors erupt between 8 to 9 years, first premolars between 9 to 10 years, second premolars erupt between 10 to 11 years, canines erupt between 11 to 12 years, second molars erupt between 12 to 14 years.
In the present study, analysis was applied for the estimation of mean age of eruption of permanent dentition.

In this study, early eruption of both maxillary and mandibular first molar was observed in both the sexes. When comparison of tooth pattern in the maxillary arch among boys and girls was done, it was observed that maxillary teeth erupted earlier in girl. In the mandible, the central incisor, second premolar and first molar erupted in boys than girl. It is also evident from the study that premolars erupted earlier in boys than girls.13

Mandibular canine, first premolar, and second molar erupted earlier in girls than boys. There was no difference in calcification time between males and females in early stage. However, there was a prior completion of root formation and apical closure in females, which may have led to an accelerated eruption.14

The sequence of eruption observed in boys was 6-1-2-4-5-3-7 in maxilla and 6-1-2-4-5-3-7 in mandible. Sequence of eruption observed in girl was 6-1-2-4-5-3-7 in maxilla and 6-1-3-4-5-3-7 in mandible. The same sequence of eruption of maxillary and mandibular teeth in males and female,16,18,20 eruption sequence of male in mandible is a sequence of eruption of mandible teeth in females.17,21 eruption sequence of males in mandible is 6-1-2-4-5-3-7.22 The result of the present study there was no found the mean emergence time and sequence of delayed for all the teeth.

In present study, done in 180 school children of age 6 years to 14 years from 2 school of sawarda to determine the mean age and sequence of emergence of permanent teeth. The first teeth to emerge in oral cavity was mandibular first molar, and last teeth was maxillary second molar. In general mandibular teeth emerged earlier than its maxillary counterparts.

Conclusion

First permanent teeth to erupt were first molar at the age between 6 years in both jaws. Permanent central incisors erupted between the age of 6 to 8 years for both halves upper as well as lower jaws. Permanent lateral incisors erupt at the age of 7 to 9 years of both halves of both jaws. First permanent premolars erupts between 9 to 10 years of both jaws. Second permanent premolars erupts between 10 to 11 years for the both halves of upper and lower jaws. Next permanent teeth to erupt canines at the age between 11 to 12 years for both halves of upper and lower jaws. Second permanent molar erupts between the age of 12 to 14 years for the both halves of lower jaws. Eruption of permanent teeth were earlier in mandible than that of their maxillaries. In the present study, first teeth to emerge was mandibular first molar whereas maxillary second molar was the last teeth to emerge in oral cavity.

Acknowledgment

We would like to thank all the school children who participated in the study and their parent for their support. We extend our gratitude to the administrative staff of the 2 schools and Dental department, B.K.L Walawalkar hospital of, for their cooperation in screening their school children.

Furthermore, We would like to thank Mr. Charuddatta Joglekar for his support in data analysis.

Source of funding

None.

Conflict of interest

None.

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**How to cite:** Waghmode AH, Bodka P, Pawar P. Age estimation from eruption of permanent teeth in school children. *IP Int J Forensic Med Toxicol Sci* 2020;5(1):5-10.