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.[3-5]

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					20	
F	4					12	
7 year							
M	13	1				18	
F	12	3				20	
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	
F	20	20	11	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	

F	16	10				20	
8 year							
M	32	21		1		32	
F	18	17		2		18	
9 year							
M	26	26		10	1	28	
F	22	22	1	15	3	22	
10 year							
M	16	16		15	5	16	
F	18	18		18	11	18	
11 year							
M	20	20	14	20	20	20	
F	20	20	16	20	20	20	
12 year							
M	10	10	10	10	10	10	5
F	20	20	22	22	22	22	10
13 year							
M	38	38	38	38	38	38	29
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

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(I M),and 12.3±0.9 (II M) year in maxilla and 6.1±0.8(CI), 7.2 ± 0.91(LI), 11.1±1.3(C), 10.6±1.8(I PM), 11.1±2.5(II PM), 5.1±1.6(IM), 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(I M),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(I M), 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 cacine, 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(Cl)	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	O.94
First Premolar(lPM)	10.2± 2.1	10.5± 3.1	0.002
Maxillary Mandibular	10.6± 1.8	10.3± 1.3	0.033
Second Premolar (llPM)			
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			21			
Male	7.2	1.0	Male	7.3	1.1	0.023
Female	7.5	1.0	Female	7.2	1.3	0.013
12			22			
Male	8.9	1.1	Male	8.5	1.2	0.063
Female	8.2	1.11	Female	8.5	1.1	0.073
13			23			
Male	11.7	1.6	Male	11.7	1.1	0.62
Female	10.8	1.5	Female	11.6	1.9	0.39
14			24			
Male	10.8	1.8	Male	10.8	1.1	0.91
Female	10.8	1.9	Female	10.8	1.2	0.83
15			25			
Male	10.6	2.1	Male	11.1	1.3	0.03
Female	11.2	1.1	Female	11.2	1.2	0.55
16			26			
Male	5.2	1.0	Male	5.4	1.0	0.77
Female	5.3	0.9	Female	5.7	1.0	0.07
17			27			
Male	12.6	1.1	Male	12.7	0.9	0.46
Female	12.3	1.1	Female	12.4	1.0	0.48
41			31			
Male	6.4	1.1	Male	6.8	0.6	0.88
Female	6.9	1.2	Female	6.9	0.6	0.93
42			32			
Male	7.6	1.1	Male	7.8	0.9	0.55
Female	7.8	1.0	Female	7.8	0.7	0.66
43			33			
Male	11.4	1.1	Male	11.0	1.1	0.05
Female	10.5	1.2	Female	10.9	1.1	0.02
44			34			
Male	10.9	1.4	Male	10.9	1.3	0.63
Female	10.2	1.4	Female	10.8	1.4	0.03
45			35			
Male	10.9	1.3	Male	11.3	1.3	0.02
Female	10.1	1.3	Female	11.2	1.3	0.001
46			36			
Male	5.0	1.5	Male	5.1	1.39	0.11
Female	5.1	1.5	Female	5.4	1.26	0.12
47			37			
Male	12.3	1.6	Male	11.82	1.2	0.16
Female	11.8	1.4	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 insicor,second Premolar and first molar erupted earlier 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 of 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 insicors erupted between the age of 6 to 8 years for both halves upper as well as lower jaws. Permanent latral 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 maxillary. 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.

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Conflict of interest

None.

Reference

1. Ash MM, Nelson SJ. Development and eruption of the teeth anatomy,physiology and occlusion, 8th edition.ST Louis: Elsevier;2013,p.49-51
2. Mugonzibwa EA, kuijpers – jagtaman AM, Laine- Alava MT, van't Hof MA. Emergence of permanent teeth in Tanzanian children. Comm *Dent Oral Epidemiol* 2002;30:455-62.
3. Leroy R, Bogaerts K, Lesaffre E, Declerck D. The of fluorides and caries in Primary teeth on permanent teeth emerge community dental oral. *Epidermoid* 2003;31:465-70.
4. Baccetti T. Tooth anomalies associated with failure of eruption of first and Second permanent molars. *Am J orthod Dentofacial Orthop* 2000;118:608-10.
5. Rousset MM. Boualam N. Delfosse C, Roberts WE. Emergence of permanent Teeth: Secular trends and variance in a modern sample. *J Dent Child (chic)* 2003:70:208-14.
6. Arya VK,Oral health survey basics Method 4th Ed.World Health Organization Geneva A.I.T.B.S Publishers and Distributors;1999.
7. Peter S,editor Essential of preventive and community dentistry. New Delhi: Arya Publishing house;2009:292.
8. Moslemi M. An epidemiological survey of the time and sequence of eruption of permanent teeth in 4-15 year olds in Tehran. Iran. *Int J paediaiatr Dent* 2004;14;4328.
9. Mahima VG. Balaji Rao B. Emergence time of Permanent teeth-An epidemiological study. Dissertation submitted to the Kuvempu University, Davangere, Karnataka,1997
10. Kim Vincent,probit Analysis. Available from:http// userwww.sfsu. edu/- efc/classes /biol7 10/probit Analysis. PDF.
11. Krumholt a roed- Petersen B, Bindhorg JJ. Eruption time of the permanent teeth in 623 Ugandan children. *Arch Oral Boil* 1971:16:128-988
12. Hagg U. Taranga J. Dental development,dental age and tooth counts. *Angle Orthod* 1985;55:93-107.
13. Leroy R. Bogaerts K, lesaffre E, Declared D. Impact of caries experience in the deciduous molar on the emergence of successors. *EUR J Oral Sci* 2003;111:106-10.
14. Hoffding J. Maeda M. Yamaguchi K, Tsuji H, kuwabara S, Nohara Y,. Emergence of permanent teeth and onset stages in Japanese children. *Comm Dent Oral Epidemiol* 1984:12:55-8.
15. Magnusson Re-emergence's of permanent teeth and onset of dental stage in the population of Iceland. *Comm Dent Oral Epidemiol* 1976;4:30-7.
16. Savara BS, Steen JC. Timing and sequence of eruption of permanent teeth in a longitudinal sample of children from Oregon.
17. Lee MM, Low WD, Chang KS, Eruption of the permanent dentition of southern Chinese Children in Hong Kong. *Arch Oral Biol* 1965;10:849-61.
18. Ash MM. Wheeler's text book of dental anatomy, physiology and occlusion. 6th Ed. Philadelphia:WB Saunders Company;1988.p.23-33.
19. Helm S. Seidler B. Timing of permanents teeth emergence in Danish children. *Comm Dent Oral Epidemiol* 1994; 2:122-9.
20. Ommar SM. Occlusal status and permanent teeth eruption in

Libyan children. *J Indian Soc Pedod Prev Dent* 1994;12:1-6.
21. Knott VB, Meredith HV. Statistics on eruption of the permanent dentition from serial data for North American White children. *Angle Orthod* 1966;36:68-79.
22. Lakshmappa, Mahima Veeranana Guledgud, Karthiukeya Patil. Erruption time and pattern of permanent teeth in school children of india. Deparment of oral medicine and radiology, school of dental sciences. *Krishna Ins Med Sci Deemed Univ Karad* 2011;22(6).

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