AGE ESTIMATION OF PERMANENT TEETH AND ITS CORRELATION AMONG LOCAL POPULATION

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ABSTRACT

Objectives: The aim of this study was to establish the relationship between the ages of the eruption of permanent teeth in correlation with the local population and related factors.

Methods: The present prospective observation study was conducted on one thousand students in schools and colleges aged 6–25 years by the Department of Forensic Medicine and Toxicology, Government Medical College, Amritsar. The data collected from this study were organized by presenting it in appropriate tables and graphs, which are statistically analyzed for percent ages and inferences.

Results: The first permanent tooth to erupt is the first permanent Molar, which erupts at 75.9–77.9 months; permanent central incisor is the second permanent tooth to erupt following the first Molar. The age of eruption is 80.8–84.0 months. Permanent Lateral Incisor erupts at the age of 105.2–107.4 months, and permanent Premolar one teeth erupt at the age of 109.5–112.6 months, permanent premolar two teeth erupt at the age of 131.0–133.8 months, permanent Canine teeth erupt at the age of 142.6–144.8 months.

Conclusion: It is thus concluded, based on the present study that the growth and eruption of teeth depend on various factors, including genetic as well as ecological aspects. The most accurate method, which depends on the conditions as well circumstances of each case, namely, the elements can be age, people participating in the study, supporting networks, availability of tools of age estimation, culture, religion, and ethnicity of the individual.

Keywords: Permanent tooth, Age estimation, Medicolegal work.

INTRODUCTION

In natural and mass disaster victims, an essential and major role is played by age estimation [1]. The majority of the victims have lost their identity and are unclaimed due to this reason, thus playing a vital role in identification [2]. Teeth are the hardest substance known in the human body, which undergoes minor biological changes but is resistant to external influences. The teeth can provide information about the identity depending upon their unique features and age estimation of an individual [3]. Over the span of hundreds of years, the human race, in its evolution, has seen many changes in food, oral hygiene, and living habits. These habits can influence the eruption of temporary as well as permanent teeth [4].

The development of teeth is controlled by factors other than nutrition and race; it depends on genetic factors. Thus, it is not wrong to say that dental age shows variations as compared to other body parts as well as bones [5].

It has been reported by various authors in their studies regarding the difference in the eruption of permanent teeth between different ethnic groups, socioeconomic, gender, and nutritional factors [6]. Eruption of teeth is affected by climate, race, diet, and geographical factors. India is a vast country with different climates [7]. Various deficiencies include caries, congenital anomalies such as supernumerary teeth, cleidocranial dysplasia, down's syndrome, and environmental and even secular trends [8,9]. In the present scenario, since dental science has widened its horizons in another specific and expert field, rationalizing eruption timings is much more desirable in the current era. The norms regarding the development of eruption of permanent teeth need to be established for orthodontic treatment planning, diagnosis, archeological, anthropological, preventive dentistry procedure, and, more importantly, in the application in legal as well as forensic field [10].

Hence, it is incorrect to rely on the same data in the given literature to the whole country. Moreover, no recent study on the eruption of teeth has been performed in this region. Thus, this research aims to look into the features and factors affecting the eruption of teeth in this region of the country.

Aims and objectives

The aim of the study was to establish the relationship between the ages of an eruption of permanent teeth in correlation with the local population and related factors.

METHODS

The present prospective observation study was conducted on one thousand students in schools and colleges aged 6–25 years by the Department of Forensic Medicine and Toxicology, Government Medical College, Amritsar. Written informed consent was taken from the students above the age of 12, while consent from the parents/Guardians was taken in children below the age of 12. The teeth were assessed visually by the medical officer in a well-illuminated place for an eruption of various permanent teeth. The data collected from this study was organized by presenting it in appropriate tables and graphs, which are statistically analyzed for percent ages and inferences. The data were compiled, scrutinized, and analyzed using the SPSS software 2018.

RESULTS

The observations are demonstrated in Tables 1-12.

DISCUSSION

Various factors must be considered while estimating the age using multiple methods. It must be remembered that the results depend on

the most accurate method, which depends on the conditions as well circumstances of each case, namely, the factors can be age, people participating in the study, supporting networks, availability of tools of age estimation, culture, religion, and ethnicity of the individual.

The dental age estimation and the developmental changes among the teeth are reliable age indicators in children, as studied by various

studies [11,12]. However, some authors suggest that skeletal methods are more accurate [13].

In the present study, the first permanent molar to erupt is the first permanent molar, which erupts at 75.9–77.9 months, and the permanent central incisor is the second permanent tooth to erupt following the first molar. The age of eruption is 80.8 to 84.0 months. Permanent lateral incisor erupts at the age of 105.2–107.4 months and permanent premolar one teeth erupt at the age of 109.5–112.6 months, permanent premolar two teeth erupt at the age of 131.0–133.8 months, and permanent Canine teeth erupt at the age of 142.6–144.8 months. The observations are consistence to the available standard literature of Subrahmanyam [14], Togra and Rudra [15], Nandy [16], Reddy [17], Vij [18], Guharaj and Chandran [19]. The observations are also similar to the observations in the studies conducted by Kerr [20] and Pathak *et al.* (1999) [21].

The present study's findings are similar to the studies conducted by Sharma and Mittal (2001) [22]. Grewal [23] concluded in their study that the first permanent teeth to erupt was the first molar at the age of 6–7 years, central permanent incisors erupt between 7 and 8 years, lateral incisors between 8 and 9 years, first premolars between 9 and 10 years, second premolars between 10 and 12 years, canine to erupt at the age between 11 and 12 years, age of eruption of M2 as 12–14 years, and that third molar erupted mostly between 17 and 25 years.

The correlation of eruption of teeth with the sex of the person and it was observed that no significant difference was observed between males and females, which was similar to the observations by the studies conducted by Ilieva *et al.* (2002) [24] and Singh *et al.* (2004) [7].

Table 1: Total number of subjects examined

S. No	Age in months	Male	Female	Both male and females
1	Completed 72 months	25	22	47
2	Completed 84 months	23	15	38
3	Completed 96 months	45	42	87
4	Completed 108 months	42	29	71
5	Completed 120 months	27	32	59
6	Completed 132 months	50	30	80
7	Completed 144 months	54	42	96
8	Completed 156 months	31	26	57
9	Completed 168 months	126	95	221
10	Completed 204 months	27	23	50
11	Completed 216 months	11	13	24
12	Completed 228 months	15	12	27
13	Completed 240 months	13	12	25
14	Completed 252 months	16	23	39
15	Completed 264 months	15	08	23
16	Completed 276 months	12	07	19
17	Completed 288 months	11	09	20
18	Completed 300 months	11	06	17
	Total	554	446	1000

Table 2: Description of study subjects according to the eruption status and sites of teeth

S. No	Teeth	Side of Teeth	Status of eruption						Total
			Completely erupted		Not completely erupted		Not erupted		
			No's	Percentage	No's	Percentage	No's	Percentage	
1	Molar–1 (72 months)	Right Upper	42	89.4	5	10.6	0	-	47
		Left Upper	42	89.4	4	8.5	1	2.1	47
		Right Lower	42	89.4	5	10.6	0	-	47
		Left Lower	42	89.4	5	10.6	0	-	47
2	Central Incisor (96 months)	Right Upper	74	89.2	8	9.6	1	1.2	83
		Left Upper	77	92.8	5	6	1	1.2	83
		Right Lower	73	88	10	12	0	-	83
		Left Lower	77	92.8	6	7.2	0	-	83
3	Lateral Incisor (108 months)	Right Upper	154	97.5	3	1.9	1	0.6	158
		Left Upper	155	98.1	3	1.9	0	-	158
		Right Lower	158	100	0	-	0	-	158
		Left Lower	158	100	0	-	0	-	158
4	Pre-Molar–1 (132 months)	Right Upper	175	80.7	32	14.7	10	4.6	217
		Left Upper	183	84.3	24	11.1	10	4.6	217
		Right Lower	197	90.9	14	6.4	6	2.7	217
		Left Lower	210	96.8	7	3.2	0	-	217
5	Pre-Molar–2 (144 months)	Right Upper	122	87.8	12	8.6	5	3.6	139
		Left Upper	122	87.8	12	8.6	5	3.6	139
		Right Lower	131	94.2	5	3.6	3	2.2	139
		Left Lower	133	95.7	5	3.6	1	0.7	139
6	Canine (144 months)	Right Upper	158	89.8	12	6.8	6	3.4	176
		Left Upper	159	90.3	13	7.4	4	2.3	176
		Right Lower	171	97.2	5	2.8	0	-	176
		Left Lower	172	97.7	4	2.3	0	-	176
7	Molar-2 (168 months)	Right Upper	250	66.8	36	9.6	88	23.5	374
		Left Upper	239	63.9	56	15	79	21.1	374
		Right Lower	276	73.8	51	13.6	47	12.6	374
		Left Lower	293	78.4	33	8.8	48	12.8	374
8	Molar-3 (306 months)	Right Upper	85	34.7	74	30.2	86	35.1	245
		Left Upper	111	45.3	54	22	80	32.7	245
		Right Lower	107	43.7	56	22.9	82	33.4	245
		Left lower	113	46.1	58	23.7	74	30.2	245

Table 3: Comparison of the complete eruption of teeth between the right and left sides of the upper and lower quadrants

Teeth	Upper quadrant				Lower quadrant			
	Percentage of		"Z"	Significance	Percentage of		"Z"	Significance
	Right	Left			Right	Left		
Molar–1	89.4	89.4	0.00	p=1.00	89.4	89.4	0.00	p=1.00
Central incisor	89.2	92.8	0.773	p>0.05	88.0	92.8	0.998	p>0.05
Lateral incisor	97.5	98.1	0.359	p>0.05	100.0	100.0	0.00	p=1.00
Pre-Molar–1	80.7	84.3	0.896	p>0.05	90.9	96.8	2.477	p<0.05
Pre-Molar–2	87.8	87.8	0.00	p=1.00	94.2	95.7	0.557	p>0.05
Canine	89.8	90.3	0.148	p>0.05	97.2	97.7	0.303	p>0.05
Molar–2	66.8	63.9	0.674	p>0.05	73.8	78.4	1.286	p>0.05
Molar–3	34.7	45.3	1.515	p>0.05	43.7	46.1	0.358	p>0.05

Table 4: Comparison of the complete eruption of teeth between right and left sides of upper and lower quadrants

Teeth	Right side				Left side			
	Percentage of		"Z"	Significance	Percentage of		"Z"	Significance
	Upper quadrant	Lower quadrant			Upper quadrant	Lower quadrant		
Molar–1	89.4	89.4	0.00	p=1.00	89.4	89.4	0.00	p=1.00
Central Incisor	89.2	88.0	0.229	p>0.05	92.8	92.8	0.00	p=1.00
Lateral Incisor	97.5	100.0	1.987	p<0.05	98.1	100.0	1.733	p>0.05
Pre-Molar–1	80.7	90.9	2.818	p<0.01	84.3	96.8	4.236	p<0.01
Pre-Molar–2	87.8	94.2	1.773	p>0.05	87.8	95.7	2.286	p<0.05
Canine	89.8	97.2	2.722	p<0.01	90.3	97.7	2.834	p<0.01
Molar–2	66.8	73.8	1.757	p>0.05	63.9	78.4	3.691	p<0.001
Molar–3	34.7	43.7	1.277	p>0.05	45.3	46.1	0.169	p>0.05

Table 5: Complete eruption of Molar-1 at different sites (Age in months)

Molar-1	"n"	Age (Months)		Population Mean age estimated at 95% confidence interval (Age in months)
		Mean	SD	
Right Upper	42	76.8	2.7	75.9–77.7
Left Upper	42	76.9	2.7	76.0–77.7
Right Lower	42	76.8	2.7	76.0–77.7
Left Lower	42	76.7	2.7	75.9–77.6

Table 6: Complete eruption of Central incisortee that different sites (Agein months)

Central Incisor	"n"	Age (Months)		Population Mean age estimated at 95% confidence interval (Age in months)
		Mean	S.D	
Right Upper	74	82.3	6.6	80.8to83.8
Left Upper	77	82.4	6.5	80.9to83.9
Right Lower	73	82.5	6.6	80.9to84.0
Left Lower	77	82.5	6.6	81.0to84.0

Table 7: Complete eruption of Late ralincisortee that different sites

Lateral incisor	"n"	Age (Months)		Population Mean age estimated at 95% Confidence Interval (Age in months)
		Mean	SD	
Right Upper	154	106.3	6.4	105.3–107.4
Left Upper	155	106.3	6.4	105.3–107.4
Right Lower	158	106.2	6.5	105.2–107.2
Left Lower	158	106.2	6.5	105.2–107.2

Table 8: Complete eruption of Premolar 1 teeth at different sites

Pre Molar-1	"n"	Age (Months)		Population Mean age estimated at 95%confidence Interval (Age in months)
		Mean	SD	
Right Upper	175	111.0	10.0	109.5–112.5
Left Upper	183	111.0	10.2	109.5–112.5
Right Lower	197	111.2	9.9	109.8–112.6
Left Lower	210	111.1	9.9	109.7–112.4

Table 9: Complete eruption of Caninetee that different sites

Canine	"n"	Age (Months)		Population Mean age estimated at 95% confidence Interval (Age in months)
		Mean	SD	
Right Upper	158	143.7	6.5	142.7–144.8
Left Upper	159	143.9	6.6	142.9–145.0
Right Lower	171	143.8	6.6	142.8–144.8
Left Lower	172	143.6	6.6	142.6–144.6

Table 10: Complete eruption of Molar–2 at different sites (Age in months)

Molar-2	"n"	Age (Months)		Population Mean age estimated at 95% confidence Interval (Age in months)
		Mean	SD	
Right Upper	250	193.4	9.5	192.2–194.6
Left Upper	239	191.4	11.8	190.4–193.4
Right Lower	276	188.6	15.0	186.8–190.4
Left Lower	293	188.9	14.9	187.2–190.6

Table 11: Complete eruption of Molar–3 at different sites

Molar-3	"n"	Age (Months)		Population Mean age estimated at 95% confidence Interval (Age in months)
		Mean	S.D	
Right Upper	85	305.4	3.0	304.7–306.0
Left Upper	111	305.5	3.0	304.8–306.0
Right Lower	107	305.1	2.9	304.6–305.7
Left Lower	113	304.3	11.0	302.3–306.4

Table 12: Comparison of Meanages of eruption between genders

Teeth	Male			Female			Difference between Means	"t" Unpaired	Difference	Significance
	"n"	Mean	SD	"n"	Mean	SD				
Molar-1	25	76.6	2.4	22	76.9	2.9	0.3	0.345	45	P>0.05
Central incisor	46	82.3	6.6	37	81.8	6.5	0.5	0.377	81	P>0.05
Lateral Incisor	87	106.4	6.4	71	106.0	6.6	0.4	0.418	156	P>0.05
Pre-Molar-1	114	110.8	9.7	103	111.8	10.4	1.0	0.756	215	P>0.05
Pre-Molar-2	77	132.8	6.5	62	130.6	6.9	2.1	1.92	137	P>0.05
Canine	104	143.6	6.7	72	143.7	6.4	0.1	0.149	174	P>0.05
Molar-2	280	185.1	19.0	94	169.1	20.9	16.0	6.889	824	P<0.001
Molar-3	115	305.2	3.0	131	264.2	52	41.0	8.356	244	P<0.001

The present study is different from the study conducted by Kuremoto *et al.* (2022), where it was studied that girls tended to form teeth at a faster rate as compared to boys until puberty. Still, the boys caught up with girls after the age of puberty [25].

In the present study, Molar two erupts at 187.2–193.6 months, and permanent Molar – three erupts completely at 302.3–306.7 months, which is not consistent with the available literature [14-18] In the present study, it was observed that the age of eruption of a permanent tooth is nearly the same for both males and females except for Molar 2 and Molar 3, which erupts earlier in females than males. This finding of the present study is similar to studies conducted by Billewicz and McGregor (1975) [26], and Blankenstein *et al.* (1990) [27].

CONCLUSION AND LIMITATIONS

It is thus concluded, based on the present study, that the growth and eruption of teeth depend on various factors, including genetic and ecological factors. The most accurate method, which depends on the conditions and circumstances of each case, can be age, people participating in the study, supporting networks, availability of tools of age estimation, culture, religion, and ethnicity of the individual. The individuals can be studied for age estimation, including the other age estimation methods for the exact age. This study has been conducted with a limited population. Thus, it is suggested that the sample size with a higher number must be studied in the country's various regions. The age of Molar 2 and 3 should be studied separately in a large population size.

ETHICAL COMMITTEE

Ethical consideration from the Institutional Ethical Committee.

AUTHORS CONTRIBUTION

Dr. Jaspinder Pratap Singh: Data collection applying statistics, rechecking data and validation, and helping prepare the manuscript.

CONFLICTS OF INTERESTS

None.

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