

ESTIMATION OF AGE BASED ON THE STAGES OF ERUPTION OF PERMANENT 2nd AND 3rd MOLAR TEETH.

Upender Kishore* S K Verma G K Sharma*****

*Sr. Resident *** Prof. & Head – Lady Harding Medical College & Smt. S.K.

Hospital, New Delhi – 110001.

**Prof., Department of Forensic Medicine & Toxicology, University College of

Medical Sciences, Dilshad Garden, Delhi – 110095.

ABSTRACT

A community based study on the time of eruption of permanent 2nd and 3rd molar teeth to establish the age of an Individual was undertaken on 1100 subjects (550 males and 550 females) residing in Delhi, in the age group of 10-21 yrs. Correlation between the age and eruption time of individual tooth was calculated stage wise in both jaws.

Eruption time of each tooth was to vary not only from population to population but also with in the same population. This is why the present study was undertaken in view of this because there is a significant time lag between the cutting of the tooth in to the oral cavity and completion of eruption (i.e. completion of bite), and hence it was felt that in age determination cases, their actual age of eruption should be taken in to account.

Key Words: Age estimation, stages of eruption, permanent molars.

INTRODUCTION

Age estimation is an important activity that is frequently required to be carried out in medico legal work. An individual is often referred to a medical man by the court or investigating authority in criminal as well as civil cases to give the opinion regarding his/her age. Assessment of age of the individual by dental examination is one of the commonly employed methods.

It is known that chronology of dental development is less variable than bone development and the method applied for this particular period of life is a reliable indicator of age. Though eruption of teeth may be effected by dietary, climatic, racial and geographical variation, the eruption time for deciduous and permanent teeth are fairly constant. Eruption of teeth is one of the changes observed easily among the various dynamic changes that occur from formation of teeth to the final shedding of the teeth. There is a significant time lag between cutting of a tooth into the mouth and completion of eruption (i.e. completion of bite) in both deciduous and permanent teeth⁴.

Skeleton maturity and dental maturity to some extent are related to morphological advancement during the whole growth period. It is observed, that unlike deciduous teeth there existed marked variation not only in the eruption time but also in the sequence of eruption of permanent teeth among different populations of the world⁶

With the increase of criminals and crime in a country improved and rapid method of age estimation is required. An individual is often referred to a medical man by courts or investigating authorities in criminal as well as in civil cases to give opinion regarding his/her age. The case in which the opinion regarding the age is required includes criminal responsibility, consent, marriage contract, kidnapping, rape, attainment of majority, eligibility for employment and judicial punishment¹.

Despite of rapid environmental and growth pattern changes in the population very few studies have been carried out in the vast and thickly populated area of Delhi to evaluate their effect on the teeth. Hence, this study was planned to estimate the age of an individual based on the stage of eruption of permanent 2nd and 3rd molar teeth.

MATERIAL & METHODS

The material for the present study consist of 550 boys and 550 girls, students from schools/colleges of eastern part of Delhi including University College of Medical Sciences and Guru Teg Bahadur Hospital, Dilshad Garden, Delhi from the period April 1998 to March 1999, The subjects were examined after obtaining informed consent

Ascertained date of birth:

Only those cases whose date of birth was known and supported by one or more documentary proof such as municipal birth certificate, hospital birth certificate or school Certificate of age were taken for the study.

Most of the individuals who are included in the study were bonfire residents of Delhi since birth and were brought up in this region. Persons recently coming to reside by transfer from other states or districts or migrated from other countries were excluded from the study.

Only those individual who at the time of study were having apparently sound health was included in the study.

The males and females belong in to age group 10-21 years irrespective of their caste, religion and socio-economic status were included in the study. All the selected cases are broadly classified in the following groups:

Group I Age between 10 years to 10 years + 364 days

Group II Age between 11 years to 11 years + 364 days

Group III Age between 12 years to 12 years + 364 days

Group IV Age between 13 years to 13 years + 364 days

Group V Age between 14 years to 14 years + 364 days

Group VI Age between 15 years to 15 years + 364 days

Group VII Age between 16 years to 16 years + 364 days

Group VIII Age between 17 years to 17 years + 364 days

Group IX Age between 18 years to 18 years + 364 days

Group X Age between 19 years to 19 years + 364 days

Group XI Age between 20 years to 20 years + 364 days

In each group 100 cases were studied, consisting of 50 males and 50 females.

The following instruments and documents were used in the study:

- I. Weighing machine;
- II. Standard steel made anthrop meter;
- III. Measuring tape;
- IV. Torch;
- V. Dental mirror;
- VI. Photographic equipment;
- VII. Age record;
- VIII. computer and related software.

A General Physical Examination of each subject was done to collaborate the dental findings.

The various landmarks considered were:

- a) height; b) weight; c) general body built; d) dental examination.

The oral cavity was examined with the help of torch light with mouth widely open and a dental mirror. Detailed dental examination was done and details noted in the form of number of teeth erupted, type of teeth erupted, whether deciduous or permanent, stage of eruption and fall out temporary teeth. Dental charting was done according to F D I (Federation Dentaire Internationale) system, as follows:

The staging of tooth eruption was done in the following manner:

Stage 0 - Non-eruption of temporary tooth/fall out of temporary tooth and non-eruption of corresponding permanent tooth.

Stage 1 - When tip of crown of tooth penetrated the gum margin.

Stage 2 - When this crown has grown into oral cavity beyond gum margins but not yet reached the occlusal plane.

Stage 3 - When the occlusal surface came in contact with its counterpart and the bite was complete.³

OBSERVATIONS & RESULTS

1. ERUPTION OF SECOND MOLAR TEETH

The mean age of starting of eruption (stage1) of second molar maxillary teeth of right side in males was 12.4651 years with standard deviation of 1.3682. The earliest age of eruption was 10.0137 years and the latest age was found to be 14.5507 years. In case of females the mean age of eruption was 11.6802 years with standard deviation of 1.1033. The earliest age was 10.2219 years and the latest age was 14.2164 years.

The mean age of eruption (stage1) of second molar maxillary teeth of left side in males was 12.1852 years with standard deviation of 1.5239. The earliest age was 10.0740 years and the latest age was 14.5507 years. In females the mean age of eruption was 11.7854 years with standard deviation of 1.2802. The earliest age of eruption was 10.1068 years and the latest age was found to be 14.5781 years.

The mean age of eruption and standard deviation for each stage of maxillary second molar teeth in both the sexes are shown in table below:

Table I: Mean age of eruption of 2nd Maxillary molar teeth with stages

Stages	17				27			
	MALE		FEMALE		MALE		FEMALE	
	M A	S D	M A	S D	M A	S D	M A	S D
0	11.2432	.9833	11.3483	1.0912	11.2530	0.9610	11.3588	1.0118
1	12.4651	1.3682	11.6802	1.1033	12.1852	1.5239	11.7854	1.2802
2	13.0922	1.0403	11.4147	1.8397	13.0916	0.9275	14.4314	1.9400
3	17.0848	2.4100	17.1823	2.5169	17.1615	2.3498	17.2385	2.5114

The mean age of eruption of mandibular second molar teeth of right side in males was 11.3727 years with standard deviation 1.1944. The earliest age of eruption was 10.0521 years and the latest age was 13.8630 years.

In females the mean age of eruption of right second molar teeth was 11.4858 years with standard deviation 1.1596. The earliest age of eruption was 10.0630 years and the latest was 15.4301 years.

The mean age of eruption mandibular second molar teeth of left side in males was 11.8375 years with standard deviation 1.2772. The earliest age of eruption was 10.1068 years and the latest age was 15.4301 years. In females the mean age was 11.4725 years and standard deviation was 1.0686. The earliest age was 10.1068 years and latest was 14.068 years.

The mean age of eruption and standard deviation of each stage of mandibular second molar teeth in both the sexes shown in Table 2

Table 2: Mean Age of Eruption of 2nd Mandibular molar teeth with Stages

	37				47			
	MALE		FEMALE		MALE		FEMALE	
	M A	S D	M A	S D	M A	S D	M A	S D
0	11.1045	0.9026	11.2403	1.0541	11.0582	0.8745	11.6015	2.2259
1	11.3727	1.1944	11.4858	1.1596	11.4725	1.0686	11.8375	1.2772
2	12.4538	1.1062	12.3292	1.7384	12.4693	1.1113	12.3772	2.0131
3	16.6864	2.5720	16.6214	2.6395	16.6363	2.6135	16.3491	2.8023

2. ERUPTION OF THIRD MOLAR

The mean age of eruption of maxillary third molar in the right side in case of males was 19.4150 years with standard deviation 1.3159. while the earliest age of eruption was 15.1068 years and the latest age was 20.9836 years. In females the mean age in the maxillary third molar was 19.1324 years with standard deviation of 1.2252. The earliest age of eruption was found to be 15.4904 years and the latest age was 20.9151 years.

The mean age of eruption of maxillary third molar in the left side in case of males was 18.8502 years with standard deviation 1.3022. The earliest age was 15.1068 years and the latest age was 20.9836 years. In case of females the mean age was 19.2623 years with standard deviation of 1.1954. The earliest eruption was seen at the age of 15.4904 years and latest at 20.9808 years.

The mean age of eruption and standard deviation of each stage of maxillary third molar teeth in both the sexes shown in Table No 3

TABLE 3: Mean Age of Eruption of 3rd Maxillary Molar Teeth with stages

	18				28			
	MALE		FEMALE		MALE		FEMALE	
	M A	S D	M A	S D	M A	S D	M A	S D
0	14.9682	3.0183	15.1065	3.0798	14.9360	3.0407	15.0296	3.0344
1	19.1953	1.3159	19.1324	1.2252	18.8502	1.3022	19.2623	1.1954
2	19.4150	1.1543	19.0472	0.7807	19.2544	1.1822	19.1895	0.9512
3	18.7411	1.2166	19.6320	0.3366	18.9680	1.7287	19.6432	0.6219

The mean age of eruption of right third mandibular teeth in males was 18.4820 years with standard deviation 1.3715. The earliest age was 15.4904 years and the latest was 20.9562 years. In females the mean age was 18.4200 years and standard deviation was 1.4128. The earliest age of eruption was 15.4521 years and latest was 20.9562 years.

The mean age of eruption of left third mandibular teeth in males was 18.6128 years with standard deviation of 1.5602. The earliest age of eruption was 15.4521 years and the latest was 20.5178. In females the age of eruption was 18.1892 years with standard deviation 1.2772. The earliest age of eruption was 14.3616 years and latest was 20.7479 years. The mean age of eruption and standard deviation of each stage of mandibular third molar teeth in both the sexes shown in Table 4.

TABLE 4: Mean Age of Eruption of 3rd Mandibular Molar Teeth with stages

	38				48			
	MALE		FEMALE		MALE		FEMALE	
	M A	S D	M A	S D	M A	S D	M A	S D
0	14.8232	3.0138	14.6362	2.8844	14.7899	2.9875	14.5924	2.8684
1	18.4200	1.4128	18.4820	1.3715	18.6128	1.5602	18.1892	1.5211
2	19.6340	1.2188	19.1056	1.1891	19.3452	1.1767	19.2318	1.0320
3	18.9314	1.3330	19.5108	0.9475	18.9923	1.3202	19.4699	1.0643

A comparative statement on various Indian studies related to eruption of 2nd & 3rd Molar Teeth is given in Table 5.

DISCUSSION

Methods for determination of a child's growth and development are of great value for both the medical and deontological point of view. Although various methods for the age determination do exist, a universal system has not been achieved due to the varying differences in different ethnic population groups.

Workers from different parts of the world have studied the eruption of deciduous and permanent teeth. However, in India studies relating to the eruption time and the sequence of eruption of deciduous and permanent teeth are yet to achieve their full momentum.

In our study the mean age of eruption i.e. stage 1 was 12.4651 years for the right second maxillary molar and 12.1852 years for the left maxillary in males. However this difference is not statistically significant (anova p value >0.05). In females the mean age of eruption of right maxillary second molar was 11.6802 years and in left maxillary second molar was 11.7854 years. This difference is also not found statistically significant (anova p value >0.05) for eruption of permanent teeth.

A similar study by Kaul et al² from Chandigarh shows that the mean age of eruption in males for the right maxillary molar was 12.02 year. The study by Mishra et al³ the mean age for males right maxillary molar was 12.00 years while in females the mean age of maxillary molar was 11.50 years which is lightly lower in comparison to our study. Another study conducted on females only, the mean age of eruption was found to be 11.87 years for 2nd maxillary molar².

The mean age of eruption in both sexes in most of the studies has been found almost similar with the females having slightly early eruption.

The early age of eruption of 2nd maxillary molars in females in our study is consistent with other authors. The reason for this may be the hormonal affect mainly that cause difference in steroid, adrenocorticoid and gonadotrophin levels between the two sexes.

In our study the mean age of eruption of right molar in males was found to be 11.3727 years and of left side 11.4725 years. However this difference is not statistically significant (p value >0.05). In females the mean age was 11.4858 years for the right side and 11.8375 years for the left. This difference was also not found statistically significant (p value >0.05).

In the study by Shourie⁵ on Madras boys the mean age of eruption of mandibular second molar was 12.26 years and 11.41 years in Lahore boys. In madras females the mean age of eruption was 11.59 years. In Kaul's study² the mean age of eruption of 2nd mandibular molar for males was 11.41 years and in females it was 11.72 years. The Study by Singh on females the mean age was 11.84 years. While in Mishra's study³ the mean age in males was 11.9 years and in females it was 11.50 years. All these results are in consonance with the results of the present study.

The mandibular teeth eruption has been found to be ahead of maxillary teeth in previous studies and the same results have been obtained in our study also. The finding of a slightly early age of eruption in females than in males is again consistent with the other similar studies.

In the present study the mean age of eruption in right maxillary molar in males was 19.1953 years and in females 19.1324 years. For the left maxillary molar males the mean age was 18.8502 years and in females it was 19.2623 years. However these differences were not statistically significant (p value >0.05).

The study by Mishra shows that the mean age of eruption of third maxillary molar was 17.60 years in males and 17.40 years in females. Which is much lower as compared to our study. While the study by Pathmanathan⁷ on Srilankan Tamils describe the mean age of eruption as 19.61 years in males for left maxillary third molar and 19.33 years in females. Our findings are in line with their findings.

In our study as well as in other similar studies the finding of a slightly early age of eruption in females than males is found consistent. In the present study among males the mean age of eruption of right mandibular third molar was 18.4200 years and in females it was 18.4820 years. In males on the left side the third molar erupted at the mean age of 18.6128 years and in females little earlier at 18.1892 years. However these differences are not statistically significant (p value >0.05).

In Mishra's study the mean age of eruption of mandibular third molar was 17.60 years and in females at 17.40 years. The mean age of eruption in the same study was again lower as compared to the present study. The finding is similar for second molars as well as for the third molars. This may be due to variations in the geographical and nutritional factors, because the study population in Mishra's study belongs to hilly region of the country. This shows that geographical factors must be taken into account while determining the age on the basis of eruption of stages of teeth. The effect of geographical location may be due to difference in the environmental factors viz. temperature, pollution levels; nutritional and dietary factors viz. dietary habits, type water consumed (calcium content, fluorides etc.) and genetic difference, differing biological factors and socioeconomic factors. All these factors should be explored in detail to find out the effect of each one of them on the eruption of teeth individually and in combination with other factors and area-wise and race-wise knowledge has generated for practical use.

CONCLUSION

- There exist a co-relation between the stages of eruption of a tooth with chronological age.

- It is better to assess the age of an individual based on the stages of eruption rather than by mere presence/ absence.
- 2nd Maxillary molar erupts earlier than 2nd Mandibular molar.
- The teeth (2nd & 3rd Molar) erupts earlier in females than males.

REFERENCES

1. Franklin C A (ed). Modi's Text Book of Medical Jurisprudence and Toxicology. 21st edition, NM Tripathy Pvt Ltd, Bombay 1988:p 37- 39.
2. Kaul S, Saini S, Saxena B. Emergence of permanent teeth in school children in Chandigarh, India. Arch Oral Bio 1975; 20: 587-593.
3. Mishra VK, Rao CM. Age and stage of dental eruption. J Forens Med Toxicol 1994; 9: 8-14
4. Reddy V, (ed). Dental Anthropology: Application and Methods, Inter India Publication. New Delhi 1985: p 368-369
5. Shourie K L Eruption of age of teeth in India. Indian J Med Res 1946; 34:105-118.
6. Singhal P, Basal I J S. Relation between age at menarche, height, weight and eruption of third molar in adult Punjabi females. Indian J Phys Anthropol & Genetics 1984; 10 (3 & 4): 169-171.
7. Pathmanathan G, Prakash S, Kaul V. Permanent tooth emergence in Tamils of Sri Lanka. In: Reddy V (ed.) Dental Anthropology: Application and Methods, Inter India Publication, New Delhi 1985: p 37-47.

TABLE 5: Comparison between present study and other similar Indian studies.

SN	STUDY WITH YEAR	REGION	2 nd molar								3 rd molar							
			Maxillary				Mandibular				Maxillary				Mandibular			
			M		F		M		F		M		F		M		F	
			RT	LT	RT	LT	RT	LT	RT	LT	RT	LT	RT	LT	RT	LT	RT	LT
01	Shourie (1946)	Madras	12.37	12.37	11.86	11.93	12.26	11.90	11.95	11.48								
02	Kaul (1989)	Haryana	11.48		11.35		11.00		10.89									
03	Laxmi kumar (1990)	A.P.	11.60		11.50		11.76		11.15									
04	Mishra (1994)	Himachal Pradesh	12.66		12.10		12.50		12.30		18.30		18.90		18.26		18.13	
05	Present (1999)	Delhi	12.46	12.18	11.68	11.78	11.83	11.37	11.47	11.48	19.41	18.85	19.13	19.26	18.61	18.48	18.18	18.42