

Emergence and Agenesis of Third Molar and Its Relationship with Cephalo-Facial Measurements in Punjabi Girls

P. Singal, D.P. Bhatnagar and Amandeep Kaur

Department of Human Biology, Punjabi University, Patiala 147 002, Punjab, India

KEY WORDS Dentition. Eruption. Anthropometry.

ABSTRACT The present study is based on a cross-sectional sample of 495 Punjabi girls ranging in age from 20 to 25 years. The subjects were drawn from various educational institutions of Faridkot and Patiala districts of Punjab. The subjects were examined for the eruption of third molars. Four head and face measurements *i.e.* head length, head breadth, bizygomatic and bigonial diameters were also taken on each subjects. The median age of eruption of third molars have been calculated through probit analysis. The mandibular third molars have shown early emergence *i.e.* 21.89 years (right), 22.03 years (left) as compared to maxillary third molars *i.e.* 24.16 years (right) and 23.17 years (left). The subjects in whom the third molar has erupted have larger head length, head breadth, bizygomatic and bigonial diameters. The absence of third molar in other subjects may be a step toward an evolutionary trend leading to reduction in cephalofacial diameters. It has been observed that even at the age of 25 years, third molar has not erupted in all the subjects. The absence of third molar in about 37% subjects at this age may be as a consequence of the phylogenetic tendency towards delay of the onset of third molar formation as suggested earlier also.

INTRODUCTION

In the process of evolution, Schultz (1960) pointed out that there is a shifting of cranio-vertebral joint anteriorly in man and in Simians the greater increase in head size occurred in front parts of condyles. Among the primates a trend in the evolution has been toward reduction in the number of teeth. Reduction in shape and size also occurred on account of their masticatory habits. Premolars get reduced in number, as well as have undergone molarization. The molars have also undergone certain changes in their cusp pattern from tritubercular stage to multitubercular stage. Finally a man is provided with two sets of teeth which make their appearance at different periods of life.

The data on eruption of third molar is scanty. Suk (1919) compared the third molar eruption in Zulus and Europeans and found that in general third molar begin to erupt much earlier in Zulus (13 years) than in Europeans (17 years). Chagula (1960) studied both eruption and congenital absence of third molar in male East Africans. Brothwell et al. (1963) pointed out that the absence of third molar is by far more frequent form of hypodontia in human permanent dentition. Studies regarding third molar agenesis have analysed its association with agenesis of other teeth (Garn and Lewis, 1962 and Labot and Salmon, 1967), with other dental polymorphisms (Keene, 1965, 1968) as well as with the timing of emergence of other permanent teeth (Goldstein, 1932; Chagula, 1960; Garn et al., 1961; Fanning, 1962 and Brothwell et al., 1963). Leuesque et al. (1981) have studied sexual dimorphism in development, emergence and agenesis of mandibular third molar. Hassanali (1982) reported that Africans were significantly ahead of Asians in third molar eruption.

In the present study, an attempt has been made to study the emergence and agenesis of third molar and its association if any with the cephalo-facial measurements in girls of Punjab.

MATERIAL AND METHODS

The data for the present study is based on a sample of 495 adult Punjabi girls ranging in age from 20 to 25 years. Most of the subjects were from various educational institutions of Faridkot and Patiala. The date of birth recorded for each subject has been converted into decimal age by using decimal calender given by Weiner and Lourie (1969).

To study the eruption of third molar (M-3) a tooth was considered to be erupted, when a portion of the crown of the tooth, however, small have penetrated the gingiva. Wooden spatulae were used to open the mouth of the subjects to examine the eruption of third molar.

The percentage of subjects showing eruption of all the four teeth *i.e.* maxillary and mandibular of right and left sides were calculated. From these values the median age of eruption of each tooth has been calculated by applying probit analysis (Finney, 1952).

The cephalo-facial measurements *viz.* head length, head breadth, bizygomatic breadth, bigonial breadth and profile angle have been taken on each subject by following standard technique given by Weiner and Lourie (1969). The data thus collected have been subjected to various statistical tests *i.e.* mean, standard deviation, standard error of mean etc. The 't' test has been applied for comparison of the two groups *i.e.* a group of girls in whom the third molar has emerged and the other group of girls in whom the third molar was not emerged.

RESULTS AND DISCUSSION

The median age of eruption of third molar calculated by applying probit is 21.89 years and 22.03 years for right and left sides, respectively in the mandible and 24.16 years and 23.17 years for right and left sides, respectively in the maxilla. The right third molar in the lower jaw is the first to erupt

(21.89 years) followed by left M-3 in the lower jaw (22.03 years). The maxillary M-3 erupts first on the left side (23.17 years) followed by right M-3 (24.16 years) (Table 1).

Table 1 : Median age of eruption of third permanent molar (M-3) in Punjabi girls

Teeth	Median age	S.E.
Upper Jaw		
Right M-3	24.16	1.02
Left M-3	23.17	3.38
Lower Jaw		
Right M-3	21.89	4.26
Left M-3	22.03	1.38

While comparing the median age of eruption of third molar with other populations (Table 2), it has been observed that the third molar eruption is the earliest in African females followed by Asians, Tamilians, Punjabis and in the present study it is still delayed. In Africans, Asians and TAMILIAN females the third molars have shown their eruption earlier in the maxilla as compared to mandibular molars, whereas in Punjabis studied in 1973 and in the present study also the mandibular third molars have shown early emergence as compared to maxillary third molars.

The cephalo-facial measurements *i.e.* head length, head breadth, bizygomatic breadth and bigonial breadth have been taken on each individual. To find out if third molar eruption has any bearing on the cephalo-facial measurements, the data have been divided into two groups *i.e.* the group of individuals

Table 2 : Comparison of eruption of third molar in Punjabi girls with other populations

	Punjabi females (Present study)		Punjabi females ¹ (1972)		Asians females ²		African females ²		Sri Lankan Tamil females ³	
	Mean	S.D.	Mean	S.D.	Mean	S.D.	Mean	S.D.	Mean	S.D.
Right Upper M-3	24.16	1.02	22.75	5.15	20.19	2.61	17.63	2.83	19.55	1.05
Left Upper M-3	23.17	3.38	21.54	3.29	20.28	2.66	17.84	2.73	19.33	1.04
Right Lower M-3	21.89	4.26	20.04	2.75	20.82	2.62	18.47	2.38	19.55	1.05
Left Lower M-3	22.03	1.38	19.42	7.35	21.02	2.64	18.50	2.37	20.17	1.09

1. Sidhu and Gupta (1972); 2. Hassanali (1985); 3. Pathmanathan et al. (1985)

in whom the third molar has not erupted as yet and the other group in which the third molar has already erupted. The subjects in whom the third molars have erupted have larger head length, head breadth,

ments which are direct indicators of the maxillo-mandibular dimensions. Levelle and Moore (1973) also suggested that the high incidence of agenesis in man is correlated with shortening of the maxillo-mandibular skel-

Table 3 : Comparison of cephalo facial measurements (cm) of girls with and without third molar

Measurement	N=294 Showing eruption of M=3		N=201 Not showing eruption of M=3		t' test
	Mean	S.D.	Mean	S.D.	
Head length	18.03	0.47	17.90	0.50	2.60 ¹
Head breadth	13.62	0.61	13.61	0.60	0.18
Bizygomatic breadth	11.07	0.77	10.85	0.78	3.44 ¹
Bigonial breadth	9.72	0.62	9.67	0.55	0.89

1. indicates statistically significant at 5% levels

bizygomatic and bigonial diameters.

The differences between the two groups are statistically significant only in head length and bizygomatic breadth (Table 3).

It has been observed from the present data that third molar has not erupted in all the subjects even upto the age of 25 years (Table

4). The impacted third molars and malocclusion of other teeth may also be due to insufficient space found in recent human populations. Bermudez de Castro (1989) also explained that the loss of third molar in *Homo sapiens* could be produced by a heterochronic phenomenon of post displacement, as a con-

Table 4 : Percentage of girls showing eruption and non-eruption of M-3

S.No.	Age group (in years)	Third molar present	Third molar absent	Total no. of individuals
1.	19.500 - 20.499	57(55.34)	46(44.66)	103
2.	20.500 - 21.499	65(54.17)	55(45.83)	120
3.	21.500 - 22.499	54(56.25)	42(43.75)	96
4.	22.500 - 23.499	54(68.35)	25(31.65)	79
5.	23.500 - 24.499	30(69.77)	13(30.24)	43
6.	24.500 - 25.499	34(62.96)	20(37.04)	54
Total		294(59.39)	201(40.61)	495

4). It may be a step towards an evolutionary trend for the agenesis of third molar as has been reported by Bermudez de castro (1989). Bolk (1916) and Hellman (1936) also reported that both reduction in size, third molar agenesis and the shortening of arches have been interpreted as correlated phenomenon of the same phylogenetic tendency of human evolution. As observed in the subjects, in whom third molar has not emerged as yet, have smaller cephalo-facial measure-

sequence of the phylogenetic tendency toward the delay of the onset of the third molar formation and the genetic factors responsible for the absence of these teeth could be related to the general process of delay in tooth formation.

REFERENCES

- Brothwell, D.R., Carbonell, V. and Goose, D.H. : Congenital absence of teeth in human populations. 179-190, In : *Dental Anthropology*. D.R. Brothwell

- (Ed.). Pergnon Press, Oxford (1963).
- Bolk, L.: Problems of human dentition. *J. Anat.*, **19** : 91-148 (1916).
- Bermudez, de Castro J.M. : Third molar agenesis in Human Prehistoric populations of the canary Islands. *Am. J. Phys. Anthropol.*, **79** : 207-215
- Chagula, W.K.: The age at eruption of third molars in male East Africans. *Am. J. Phys. Anthropol.*, **18** : 77-82 (1960).
- Fanning, E.A. : Third molar emergence in Postanians. *Am. J. Phys. Anthropol.*, **20** : 339-345 (1962).
- Finney, D.J. : *Probit Analysis : A Statistical Treatment of the Sigmoid Response Curve*. Cambridge University Press, London (1952).
- Goldstein, M.S. : Congenital absence and impaction of third molar in Eskimo mandible. *Am. J. Phys. Anthropol.*, **16** : 381-388 (1932).
- Garn, S.M., Lewis A.P and Bone B : The third molar polymorphism and the timing of teeth formation. *Nature*, 192-989 (1961).
- Garn, S.M. and Lewis A.P. : The relationship between third molar agenesis and reduction in tooth number. *Angle Orthod.*, **32** : 14-18 (1962).
- Hassanali, J. : The third permanent molar eruption in Kenyan Africans and Asians. *Ann. Hum. Biol.*, **12** : 517-523 (1985).
- Hellman M. : Our third molar teeth, their eruption presence and absene. *Dent. Cosmos.*, **78** : 750-762 (1936).
- Keene, H.J. : Relationship between third molar agenesis and morphologic variability of the molar teeth. *Angle Orthod.*, **35** : 289-298 (1965)
- Keene, H.J. : The relationship between Carbell's trait and the size number and morphology of the maxillary molars. *Arch. Oral Biol.*, **13** : 1023-1025 (1968).
- Lavelle, C.L.B. and Moore, W.J. : The incidence of agenesis and polygenesis in the primate dentition. *Am. J. Phys. Anthropol.*, **38** : 671-680 (1973).
- Le Bot P. and Salmon D.: Congenital defects of the upper lateral incisors (ULI) : Condition and measurements of the other teeth. measurements of the superior arch, head and face. *Am. J. Phys. Anthropol.*, **46** : 231-244 (1977).
- Levesque, S. Demirjian A. and Tanguay, R. : Sexual dimorphism in the development emergence and agenesis of mandibular third molar. *Am. J. Orthodontics*, **40** : 698-708 (1981).
- Pathmanthion G., Parkash S. and Kaul V.: Permanent tooth emergency in Tamils of Sri Lanka. In : *Dental Anthropology : Applications and Methods*. V. Rami Reddy (Ed.). Inter-India, New Delhi (1983).
- Suk V. : Eruption and decay of permanent teeth in whites and Negroes with comparative remarks on other races. *Am. J. Phys. Anthropol.*, **2** : 351-388 (1919).
- Shultz, A.H. : Age changes in primates and their modification in man. In : *Human Growth*. J.M. Tanner (Ed.) Pergman, Oxford (1960).
- Sidhu, L.S. and Gupta P. : Sequence and age of eruption of permanent teeth in Punjabi population of Patiala. *East Anthropol.*, **26** : 260-270 (1973).
- Tanner, J.M. : *Growth at Adolescence*. Blackwell Scientific Publications, Oxford (1962).
- Weiner, J.S. and Lourie, J.A. : *Human Biology - A Guide to Field Methods*. I.B.P. Handbook No. 9, Blackwell Scientific Publications, Oxford (1969).