Norms for the eruption of the permanent dentition in the Sinhalese of Kandy district

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Summary

A total of 5627 Sinhalese children 2860 males and 2767 females in the age range 5 to 16 years from eight schools in the Kandy district were examined to establish norms for tooth eruption in the permanent dentition.

All teeth in the females erupted significantly earlier than those in the males. An average difference of 4.4 months between the mean age of eruption of the males and females was observed. Norms were established separately for males and females. Although a definite influence of the socio-economic status on tooth eruption was evident with the children of the high socio-economic group showing advanced eruption times, the data were pooled when establishing the norms for the tooth eruption of the permanent dentition.

Key words: Tooth eruption, Permanent dentition, Sinhalese

Introduction

The observed regularity of appearance of teeth in the oral cavity at a particular age led even lay people to use the emergence of teeth as an index of maturity in children. Even in Sri Lanka the eruption of teeth is regarded as an important milestone for growth and development. Studies regarding the chronology of tooth eruption of the permanent dentition have been reported from different parts of the world (1, 2, 3, 4). From these studies the influence of gender (1), ethnicity (2) and socio-economic status (3) on the chronology of permanent tooth eruption has been established.

The only available study in Sri Lanka is by Abeyrathne in 1977 (5). This study was restricted to 1500 children attending a dental clinic in the Colombo district. It does not consider the variability of eruption in relation to gender, ethnicity, socio-economic status and sequence. The present study was undertaken to establish norms for tooth eruption of the permanent dentition in the Sinhalese of Kandy district.

Population and Methods

A list of schools within a radius of 5 miles of Faculty of Medicine, Peradeniya was obtained from the Ministry of Education. Eight schools were randomly selected from this list. All children between five to sixteen years were included in the study.

Children known not to be permanent residents of the Kandy district, those receiving orthodontic treatment and or those with cleft lip and palate were excluded from the study.

The sample consisted of 5627 children (2767 females and 2860 males).

Data regarding name, age, gender, date of birth and parents' occupation were obtained from the school records and were re-checked during the interview. The oral cavities of all subjects were examined under natural daylight with the aid of a dental mirror and probe. A tooth was considered as erupted when it had at least partly pierced the gum and identified as such by the examining finger.

Results

The chronological ages were calculated to the nearest month from the date of birth to the date of examination and were grouped at yearly intervals. The grouping of children according to

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age and gender is given in Table 1. The approximate monthly family income was calculated according to the occupation of the parents using the annual report, Central Bank of Ceylon 1984 (6). On the incomes thus calculated three socio-economic groups, low, middle and high were identified. As the number of subjects in the high socio-economic group was small, for the purposes of this study only two socio-economic groups are considered, high consisting of the high and middle groups of the report and low, the low group of the report.

The mean age of eruption and the standard deviation for individual teeth of the permanent dentition was calculated using a modification of Karber's method as described by Hayes and Mantel (7). The resulting mean eruption times in the two socio-economic groups for males and females are given in Table 2. The eruption times for males and females irrespective of their socio-economic classes are given in Table 3.

The sequence of eruption was formulated using the mean values for maxillary and mandibular teeth for both groups. Table 4 presents the sequence of eruption in the present series for maxillary and mandibular teeth of males and females in the total sample.

Discussion

Lee (3) in her study of Chinese children in Hong Kong has reported that both males and females in high socio-economic group show earlier eruption of all teeth than those of the low socio-economic group. However she also reported that the socio-economic status exerts a more marked influence on parameters such as height and weight than on the eruption of teeth. When establishing norms for the eruption of teeth for Chinese children in Hong Kong therefore Lee (3) has not considered the variability due to socio-economic status.

In the present study too all the teeth in the high socio-economic group erupt earlier in both sexes with an average difference of 2 1/2 months for males and 3 1/2 months for females. However when establishing tooth eruption norms for the Sinhalese of Kandy district it was decided to pool the data from both socio-economic groups.

When the two jaws are compared, all mandibular teeth with the exception of the first and second premolars in both genders erupt earlier than their maxillary counterparts. This variability between the two jaws has been established (8). As early as 1919, Bean (1) observed a gender difference in the time of

Table 1. Age and gender distribution of the sample

Age (Years)	Females	Males
5.1 - 6.0	165	171
6.1 - 7.0	265	278
7.1 - 8.0	282	244
8.1 - 9.0	281	284
9.1 - 10.0	268	279
10.1 - 11.0	267	268
11.1 - 12.0	258	320
12.1 - 13.0	252	262
13.1 - 14.0	238	270
14.1 - 15.0	261	242
15.1 - 16.0	230	282
Total	2767	2860

Table 2. Mean age (in years) of eruption of maxillary and mandibular teeth of males & females in the high and low socio-economic groups.

Tooth	Males				Females			
	High SEG		Low SEG		High SEG		Low SEG	
	Mean age	SD	Mean age	SD	Mean age	SD	Mean age	SD
Maxillary								
I_1	7.39	0.67	7.58	0.71	7.17	0.63	7.38	0.71
I_2	8.29	0.77	8.65	0.69	8.08	0.78	8.19	0.73
C	11.30	1.15	11.60	1.12	10.74	1.05	11.03	1.26
Pm_1	9.88	1.47	9.98	1.43	9.58	1.25	9.93	1.36
Pm_2	10.83	1.54	11.07	1.50	10.63	1.23	11.02	1.45
M_1	6.27	0.68	6.39	0.66	6.17	0.60	6.27	0.57
M_2	12.09	1.46	12.38	1.29	11.62	1.02	11.95	1.42
Mandibular								
I_1	6.52	0.63	6.89	0.84	6.45	0.47	6.69	0.68
I_2	7.64	0.82	7.94	0.85	7.30	0.75	7.69	0.72
C	10.78	1.15	11.09	1.21	9.85	1.11	10.21	1.09
Pm_1	10.40	1.26	10.63	1.53	9.87	1.19	10.19	1.27
Pm_2	11.20	1.43	11.21	1.61	10.54	1.29	11.09	1.55
M_1	6.25	0.55	6.31	0.54	6.04	0.51	6.22	0.55
M_2	11.60	1.02	11.84	1.20	10.92	1.02	11.24	1.27

(SEG = Socio-economic group)

Table 3. Mean age (in years) of eruption in males and females of the total sample

	Males		Females	
	Mean	SD	Mean	SD
Maxillary				
I_1	7.55	0.85	7.28	0.69
I_2	8.41	0.81	8.15	0.75
C	11.41	1.17	10.88	1.20
Pm_1	9.95	1.46	9.72	1.24
Pm_2	10.87	1.37	10.72	1.44
M_1	6.35	0.63	6.24	0.57
M_2	12.30	1.22	11.73	1.22
Mandibular				
I_1	6.80	0.75	6.60	0.63
I_2	7.89	0.91	7.20	0.75
C	10.97	1.18	10.08	1.14
Pm_1	10.42	1.44	10.07	1.15
Pm_2	11.20	1.55	10.79	1.45
M_1	6.28	0.60	6.17	0.54
M_2	11.66	1.06	11.17	1.16

Table 4. Sequence of eruption of teeth in each jaw (as two separate units) in males and females of the total sample

	Maxilla							Mandible						
	I_1	I_2	C	Pm_1	Pm_2	M_1	M_2	I_1	I_2	C	Pm_1	Pm_2	M_1	M_2
Male	2	3	6	4	5	1	7	2	3	5	4	6	1	7
Female	2	3	6	4	5	1	7	2	3	5	4	6	1	7

eruption of the permanent teeth with advanced eruption in females. Later studies have confirmed these findings (9, 10, 11, 12).

All teeth in females show an earlier eruption time than in males by an average of about 4.4 months. The females were ahead of males in the time of eruption of the first incisor and first molar by only about 2 months and for the canine by as much as 9 months. The difference in the mean eruption times of corresponding teeth between males and females for all teeth were highly significant ($p < 0.01$).

In the present series the females complete their dentition at an average of 5.56 years and males in 6.02 years. The total number of teeth at a given age also show a difference between males and females. This difference is well marked in the age groups between 8 and 12 years, females having 3.5 more teeth at the age of 11 years.

This highly significant gender difference in the time of eruption of the permanent teeth necessitates the norms for tooth eruption to be gender specific.

Bean (1) states "The teeth are more convenient as a means of determining the physiological standard than stature or weight or the growth of the bones, or secondary sex characters etc., and they may be of greater value than any other means that can be utilised. The teeth can be seen, recognised and counted by almost anyone after a little experience, and they are either present or absent, therefore very definite".

It is envisaged that the acceptance and wide use of the norms for the eruption of teeth established in this study will be of benefit in assessing the maturational status of children of the Kandy district between five and sixteen years of age.

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References

1. Bean RB. The stature and the eruption of the permanent teeth of American, German-American & Filippino children. Deduction from the measurement and examination of 1445 public school children in Ann Arbor, Michigan and 776 in Manila, P.I. *American Journal of Anatomy* 1919; 17(1): 143-160.

2. Hassanali J. Odhiambo A. Ages of eruption of the permanent teeth in Kenyan African & Asian children. *Annals of Human Biology* 1981; 8: 425-434.

3. Lee M M C, Low W D, Change K S F. Eruption of the permanent dentition of Southern Chinese children in Hong Kong. *Archives of Oral Biology* 1965; 10: 849-861.

4. Clements E M B, Davies-Thomas E, Pcikett K G. Time of eruption of permanent teeth in British children in 1947-48. *British Medical Journal* 1953; 1: 1421-1424.

5. Abeyratne S. A study of the eruption time & pattern of Sri Lankan children. *Sri Lanka Dental Journal* 1977; 10: 17-19.

6. Report of Consumer Finances and Socio-economic Surveys. Colombo: Department of Statistics, Central Bank of Ceylon, 1981/1982.

7. Hayes R L, Mantel N. Procedures for computing age of eruption. *Journal of Dental Research* 1958; 37: 938-947.

8. Scott J H, Symons N B B. Introduction to Dental Anatomy 9th Edition. London: Churchill, Livingstone 1982.

9. Cattel P. The eruption and growth of the permanent teeth. *Journal of Dental Research* 1928; 8(2): 279-287.

10. Dahlberg A A, Menegaz-Bock R M. Emergence of permanent teeth in Pima Indian children. A critical analysis of method and estimation of population parameters. *Journal of Dental Research* 1958; 37 (6): 1123-1140.

11. Garn S M, Sandusky S T, Nagy J M, Trowbridge F L. Negro Caucasoid differences in permanent tooth emergence at a constant income level. *Archives of Oral Biology* 1973; 18: 609.

12. Hoffding J, Maeda M, Yamagachi K, Tsuji H, Kuwabara S, Nohara Y, Yoshida S. Emergence of permanent teeth and onset of dental stages in Japanese children. *Community Dentistry & Oral Epidemiology* 1984; 12: 55-58.

13. Nanayakkara C. D. The chronological age & sequence of eruption of the permanent dentition of children in the Kandy district of Sri Lanka. PhD Thesis 1988; University of Peradeniya, Sri Lanka.