ORIGINAL ARTICLE

ERUPTION TIME OF PERMANENT FIRST MOLARS AND INCISORS AMONG FEMALE PRIMARY SCHOOL CHILDREN OF RIYADH

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ABSTRACT

Objective: To determine the mean eruption time of permanent first molars, central and lateral incisors and to compare the relationship of mean eruption time with body mass index (BMI) in Saudi female primary school children from Riyadh, Saudi Arabia.

Study design: Cross sectional study.

Subjects and methods: The study population comprised of 612 randomly selected primary school children of grade 1 to grade 3. The eruption time of permanent first molars, central and lateral incisors with age, height and weight were recorded.

Results: The mean age of children was 89.3 (SD 9.6) months ranging from 71 months to 109 months. The maxillary right first molar had the lowest mean eruption time of 77.4 (SD 3.9) months and the maxillary right lateral incisor was the last tooth to erupt with eruption time of 98.4 (SD 6.5) months. Furthermore, the mandibular incisors erupted significantly earlier than maxillary incisors. By the age of 100 months, 97% of the girls had all their first permanent molars erupted.

Conclusion: There was no significant correlation observed between eruption times with BMI of the studied teeth except the maxillary right lateral incisor. However, an inverse relationship may exist between the eruption times and BMI. The Saudi female primary school children showed later eruption time of permanent first molars, central and lateral incisors when compared with the reported results of other national studies.

Key words: Eruption time, permanent teeth, Saudi Arabia, female children.

INTRODUCTION

Permanent first molars are the first permanent teeth to erupt in the oral cavity after the age of 5 years. The eruption age of the first permanent molar is one of the milestones by which the normal physical development of the child is evaluated. It has been observed that most of the parents consider tooth eruption as an important event in the child's development; hence, they often are anxious and concerned about timing and the sequence of eruption. From clinical aspect, the specific standards on the timing and sequence of emergence of the permanent teeth represent an important resource for general dental practitioners and specialists involved in managing dental problems in growing children[1]. Therefore, the timing and sequence of eruption of permanent teeth are of great significance in children in relation to growth, development and management of dental problems, including the forensic dentistry[2].

There is no published information available on the eruption time of permanent teeth in all Middle Eastern countries. Therefore, the information utilized in academic and clinical situations on the eruption time of permanent teeth in Middle Eastern countries is still based on other populations[3,4]. Several studies were conducted from the middle of twentieth century in different populations on the eruption times of permanent teeth. These studies permanent teeth, and this may be attributed to racial

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showed that variation exists in the eruption times of differences[5-8]. It has also reported that some other variables like genetic and hormonal factors, geographical, tribal, gender, as well as economic status, nutrition and growth parameters have been shown to exert an influence on eruption timing and emergence[5,9,10]. Few studies have also reported a relationship between the eruption time, with the weight and height of children: children who are below average weight and height showed a later eruption time than those children who are within the standard range[6,7]. A recent study reported eruption times of primary dentition in Saudi children[11] and eruption time of permanent first molars and incisors in Saudi male primary school children[12] . However, there is no such information available on the eruption times of permanent teeth in Saudi female children. Therefore, the objectives of the present study were to determine the mean eruption time of permanent first molars, central and lateral incisors and to compare the relationship of mean eruption time with BMI in Saudi female primary school children from Riyadh, Saudi Arabia.

SUBJECTS AND METHOD

The population used for this cross-sectional study conducted from November to December 2004, corresponding Shawwal 1425 Hijri, comprised of students of grade 1 (G1) to grade 3 (G3) from female primary school children of Riyadh. Three primary schools were randomly selected from different regions of Riyadh by the list of schools provided by the Ministry of Education. In addition, a private school was also randomly selected to ensure representation from all segments of the society. Prior to the commencement of the study, permission was taken from Ministry of Education, Riyadh. Letters were sent to respective heads of the schools stating the aims and objectives of the study. All the children of G1 to G3 from the selected schools were screened and the children who fulfilled the inclusion criteria were selected for further examination. A total of 1300 children were examined and only 612 children were found suitable for the study. The data were collected over a period of one calendar month. All selected children in the sample were healthy and they satisfied the criteria of at least one tooth that had just erupted.

The criterion for a just erupted tooth was defined as; a tooth deemed to have emerged if any part of it (tip of incisal edge or one cusp of molars) was visible in the mouth[2]. The calibration of the examiners was carried out by showing them the clinical pictures of just erupted teeth. The dental examination was carried out by two authors (LN and NS) using a wooden spatula to retract soft tissue and then by direct visual inspection. The status of eruption of permanent tooth was recorded. In some cases disposable mirror was also used to confirm the eruption status. The selected children were then sent to third author (MH) to record the weight and height. Students were weighed in kilograms using a commercial digital scale after removal of the shoes only. The height of the children was measured using a wall-mounted ruler on the child's head with their back and knees completely straight, and their feet together. The height was then rounded to the nearest centimeter. The demographic information about the children such as age, educational level, date of birth, place of birth, and family name was recorded on the form, taken from children's personal data files of the school. The data were then entered into the computer utilizing the Statistical Package of Social Science (SPSS) program version 10. Descriptive statistics (minimum, maximum, mean, standard deviation, median and range [R]) of eruption time was computed for each tooth. Different percentiles (P3, P10, P25, P75, P90 and P97) of the time of eruption of permanent teeth were also calculated. Body mass index was calculated using the following formula:. $BMI = \frac{\text{Weight (kg)}}{(\text{Height(m)})^2}$ Independent-sample t-test was used to find any significant difference in the mean eruption time of right and left side, and also upper with lower teeth. Pearson correlation was utilized to find the correlation between eruption time and BMI.

RESULTS

The mean age of 612 children was 89.3 (SD 9.6) months ranging from 71 months to 109 months. Table 1 shows

Table 1: Descriptive statistics of eruption time (months) of girls for permanent first molars and incisors

Tooth Number	n	Minimum	Maximum	Mean	SD	Median	Range
16	14	71	84	77.4	3.9	77.0	13
12	103	77	109	98.4	6.5	99.0	32
11	98	72	108	89.0	7.4	89.0	36
21	100	72	103	88.2	7.1	88.0	31
22	81	76	104	96.0	5.7	96.0	28
26	21	71	88	78.7	5.3	79.0	17
36	75	71	96	83.4	6.9	84.0	25
32	150	71	105	92.1	8.3	92.0	34
31	97	71	103	82.6	7.7	81.0	32
41	84	72	103	82.6	8.2	80.5	31
42	162	72	109	92.7	8.8	93.0	37
46	83	71	101	84.0	7.6	84.0	30

the descriptive statistics (minimum, maximum, mean, standard deviation, median and range [R]) of eruption time of permanent first molars, central and lateral incisors. The mean BMI was 15.8(± 2.6) kg/m^2 .The maxillary right first molar (# 16) had the lowest eruption time of 77.4 ± 3.9 (R: 71-84) months and maxillary left first molar (# 26) had second lowest mean value of 78.7 ± 5.3 (R: 71-88) months. The difference of these two means was only 1.3 months. However, the difference of median values of eruption time of these two molars was 2 months. The mandibular central incisors (# 31, # 41) succeeded the maxillary first molars with mean values of 82.6 ± 7.7 (R: 71-103) and 82.6 ± 8.2 (R: 72-103) months, and the left and right mandibular first molars closely followed with mean values of 83.4 ± 6.9 (R: 71-96) months and 84.0 ± 7.6 (R: 71-101) months respectively. The left and right maxillary lateral incisors were the last teeth to be erupted in our sample with mean values of 96.0 ± 5.7 (R: 76-104) months and 98.4 ± 6.5 (R:77-109) months respectively. There was statistically significant difference between the mean eruption times of maxillary and mandibular permanent first molars, central and lateral incisors ($p < 0.05$). However, there was no significant difference observed between the mean eruption times of right and left sides ($p > 0.05$).

The minimum range of variation of eruption (13 months) was seen in the permanent maxillary right molar (tooth # 16); the maximum range of variation was seen in permanent maxillary right lateral incisors (37 months) as shown in Table 1. Table 2 shows different percentiles 3rd, 10th, 25th, 75th, 90th and 97th for the eruption times. In 3% of the girls examined, the maxillary right permanent first molar (#16) had erupted by the age of 71 months, and by the age of 100 months 97% of the girls had their four permanent first molars (#16, #26, #36, #46) erupted. In addition, the four permanent central incisors erupted between the ages of 72 and 103 months in 94% of the girls. The correlation of BMI and the eruption times is illustrated in Table 3. There was no statistically significant correlation between these two features except for tooth # 12. However, there were more negative correlations than positive ones, which show that there may be an inverse relationship between eruption time and BMI. Comparison of mean eruption time of permanent first molars and incisors of the present study with male Saudi primary school children is shown in Table 4. The data of mean eruption time of Saudi male children was taken from the authors' earlier publication[12]. There was no significant difference between the mean eruption time

Table 2: Percentiles (3rd, 10th, 25th, 75th, 90th and 97th) for eruption time (months) for girls

Tooth number	P3	P10	P25	P75	P90	P97
16	71.0	72.0	74.0	83.3	83.5	84.0
12	82.0	90.4	94.0	104.0	106.0	108.0
11	74.0	78.8	84.4	94.0	99.0	103.1
21	74.0	77.0	84.0	93.0	98.0	101.0
22	80.9	88.2	93.0	100.0	103.0	104.0
26	71.0	72.0	73.5	82.5	87.6	88.0
36	72.0	74.0	77.0	89.0	92.4	95.0
32	75.0	80.0	87.0	99.0	103.0	105.0
31	72.0	74.0	76.5	88.0	94.2	100.0
41	72.0	73.0	76.0	88.0	95.0	100.0
42	75.0	81.0	87.0	100.0	104.0	107.0
46	71.0	73.0	77.0	90.0	93.6	99.5

Table 3: Correlation of eruption time of permanent first molar and incisors of girls with their BMI

Tooth type	Pearson correlation		
	n	r	p-value
16	14	0.042	0.860
12	103	-0.270	0.006**
11	98	0.111	0.278
21	100	-0.074	0.462
22	81	-0.123	0.274
26	21	0.209	0.364
36	75	-0.034	0.772
32	150	-0.054	0.511
31	97	-0.106	0.301
41	84	-0.015	0.891
42	162	-0.131	0.097
46	83	0.095	0.395

Table 4: Comparison of eruption time of boys and girls for first molars and incisors

Tooth number	Mean (girls)	Mean (boys)	p-value
16	77.4	78.5	0.546
12	98.4	97.8	0.570
11	89.0	88.7	0.803
21	88.2	87.4	0.486
22	96.0	94.7	0.262
26	78.7	80.6	0.259
36	83.4	81.2	0.081
32	92.1	91.4	0.474
31	82.6	82.1	0.609
41	82.6	81.1	0.152
42	92.7	91.2	0.097
46	84.0	81.3	0.044*

between male and female children.

DISCUSSION

Several reported studies have targeted different populations to determine the mean eruption times of the permanent teeth. However, until the near past, there was no reported data available on eruption times of permanent teeth for Saudi children. Due to this reason, the standards for eruption times of permanent teeth were based on non-Saudi populations. The documented variation in eruption time values in different populations makes it necessary to investigate the normal values of eruption times for Saudi children. Recently a study was conducted on eruption time of permanent first molars and incisors teeth in Saudi male primary school children[12]. The present study provides the basic information on the mean eruption time of permanent first molars, central and lateral incisors in Saudi female primary school children of G1 to G3 aged between 71 to 109 months.

The results of the study showed that the difference in the mean eruption time of permanent first molars and incisors (central and lateral) was statistically significant for both the jaws. It was observed that the mandibular central and lateral incisor teeth have an earlier eruption time than the maxillary counterparts. These results are in agreement with several other similar studies carried out in various countries[1,2,5,13-17]. However, an opposite pattern of eruption time was observed in case of permanent first molars, which is not in agreement with most of the reported studies[1,5,13,17]. Table 5 illustrates the comparison of mean eruption time of permanent first molars and incisors of present study with Ghana, Nigeria, Iran, Japan, Australia and USA. Saudi female children showed later eruption than all other countries, except Iranian females. When comparing the eruption time difference between the right and left sides, the greatest temporal difference was seen in maxillary lateral incisors, which was about 2.4 months, followed by maxillary first molars with a time difference of 1.3 months, and the difference was not statistically significant. Stewart et al[18] have reported that these time differences are not systematic, and can be of any length between 2 months to 2 years. Recent studies show a very high caries prevalence among Saudi preschool and primary school children in Riyadh[19-22]. Prevalence of caries affects the emergence time of permanent teeth due to premature loss of their predecessors[23]. This hypothesis is supported by another study which reported that premature extraction of deciduous teeth does not advance the emergence of their succedaneum counterparts[24]. Since the caries severity in Saudi school children has increased in the last decade, probably this factor may contribute to the observed advancement in tooth emergence.

Table 5: Mean tooth eruption time (months) of girls for permanent first molars, and incisors in various countries

Tooth number	Ghana	Nigeria	Iran	Japan	Australia	USA	Saudi Arabia
16	60	68	80	-	78	74	77
12	87	96	103	96	98	98	99
11	72	85	93	85	86	86	89
21	72	85	88	85	86	86	88
22	87	96	108	96	98	98	96
26	60	68	81	-	78	74	79
36	53	68	80	-	76	69	84
32	76	87	96	81	89	87	92
31	61	68	78	-	76	75	81
41	61	68	78	-	76	75	81
42	76	87	94	81	89	87	93
46	53	68	80	-	76	69	84

The results of the present study did not reveal any significant correlation between BMI and eruption time except for maxillary right lateral incisor (# 12). However, more negative correlations than positive indicate an inverse relationship between BMI and eruption time. This finding is in agreement with Nishwander and Sujaku study[25], who have reported that a trend was observed of general advancement in physical development with early eruption. Similarly, Hoffding et al[26] reported that only minor changes in tooth emergence was observed with pronounced acceleration in physical development.

Considering the permanent first molars, central and lateral incisors of these Saudi children, the mean eruption time was later than that reported in children from Ghana[14], Nigeria[8] and Japan[26]. Similarly, USA[15] and Australian[1] children had earlier eruption time than Saudi children except for maxillary lateral incisors. However, Saudi children exhibited earlier eruption time than the Iranian children except for mandibular molars and central incisors. When comparing the mean eruption times of permanent first molars and incisors between male and female Saudi children, no statistically significant difference was observed except for mandibular right first molar (# 46). Several studies in various populations have thought that factors like nutrition, socio-economic status, genetics and geographic location could have an influence on the emergence time of teeth[7,14,28-30]. Clemens et al[30] claimed that mean emergence time was earlier in the children with higher socio-economic status.

The study was limited to the female primary school children, as it was conducted by the female dentists in all-female schools only due to socio-religious norms of Saudi Arabia. Nevertheless, the study has provided useful information about the eruption time in permanent teeth in Saudi female primary school children of G1 to G3 of Riyadh, Saudi Arabia.

CONCLUSIONS

The mandibular central and lateral incisors teeth erupted before the maxillary counterparts and reverse trend were observed in permanent first molars. The mean eruption time of Saudi children was later than most of the reported populations. There may be an inverse relationship between BMI and eruption time.

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