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Time and sequence of eruption of primary teeth in relation to breastfeeding in sudanese children

Cronologia e seqüência de erupção de dentes decíduos em crianças sudanesas em relação ao aleitamento materno

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ABSTRACT

Background: The eruption age at which the deciduous teeth start appearing in the oral cavity has been of great significance and interest to investigators and parents mainly due to its relation to the growth and development of the child. **Objective:** To determine the mean eruption time and sequence of primary dentition among a sample of Sudanese children in Khartoum localities and to investigate the effect of gender and breastfeeding pattern on the timing and sequence of eruption. **Material and Methods:** Random sample of 563 Sudanese children (283 boys and 280 girls) aging 4-40 months were clinically examined and inspected for the eruption of primary teeth. The age of eruption of the teeth was estimated using Probit regression. In addition, an independent sample t-test was used for the comparison between genders as well as exclusive and non-exclusive breastfeeding. **Results:** All the primary teeth erupted earlier in boys than in girls except the first primary molars. The first primary teeth to erupt were the mandibular central incisors at the mean age of 8.02 ± 3.28 months. No significant difference was found in the eruption time between right and left sides of jaws as well as between children with exclusive breastfeeding and non exclusive breastfeeding. **Conclusion:** The first primary teeth to erupt were mandibular central incisors, with a mean age of eruption 8.02 ± 3.28 months followed by maxillary central incisors; mean age of eruption 10.64 ± 3.75 months and maxillary second molars was the last teeth to be erupted, at 26.22 ± 5.29 months.

KEYWORDS

Eruption time; Primary teeth; Lower incisors; Deciduous molars.

RESUMO

Introdução: A cronologia de erupção dos dentes decíduos na cavidade oral tem sido de grande importância e de interesse para pesquisadores e pais , principalmente devido sua relação com o crescimento e desenvolvimento da criança. **Objetivo:** Determinar a cronologiae sequência de erupção da dentição decídua em uma amostra de crianças sudanesas de localidades de Khartoum; e investigar o efeito do gênero e padrão de amamentação materna no tempo e sequência de erupção. **Materiais e Métodos:** Uma amostra aleatória de 563 crianças sudanesas (283 meninos e 280 meninas), com idade de 4-40 meses receberam exame clínico para verificar a erupção dos dentes decíduos. A idade de erupção dos dentes foi estimada por meio de regressão Probit . Além disso, foi utilizado o teste T para amostras independentes para comparação entre os gêneros e o aleitamento materno exclusivo e não exclusivo. **Resultados:** Todos os dentes decíduos irromperam mais cedo em meninos do que em meninas, exceto para os primeiros molares decíduos. Os primeiros dentes decíduos em erupção foram os incisivos centrais inferiores, com idade média de 8,02 ± 3,28 meses. Nenhuma diferença significativa foi encontrada no tempo de erupção entre os lados direito e esquerdo da mandíbula , bem como entre as crianças com aleitamento materno exclusivo e aleitamento materno não exclusivo. **Conclusão:** Os primeiros dentes decíduos em erupção foram incisivos centrais inferiores, com uma idade média de erupção 8,02 ± 3,28 meses, seguidos de incisivos centrais superiores,com idade de erupção de 10,64 ± 3,75 meses, e os segundos molares superiores foram os últimos dentes a irromperem, com 26,22 ± 5,29 meses.

PALAVRAS-CHAVE

Tempo de erupção; Dentes decíduos; Incisivos inferiores; Molares decíduos.

BRIEF LITERATURE REVIEW

Eruption is a developmental process responsible for moving a tooth from its crypt position through the alveolar process into the oral cavity and to the final position of occlusion with its antagonist.[1] The erupted tooth was defined as any tooth with any part of its crown penetrating the gingiva and visible in the oral cavity. [2,3]

The eruption age at which the deciduous teeth are appear in the oral cavity has been of great significance and interest to investigators and parents mainly due to its relation to the growth and development of the child. Numerous studies in literature have shown wide variations in the ages and patterns of individual tooth eruption among different populations and geographic areas. [3-8]

The birth day or actual age of individual was defined as the chronological age. While dental age refers to morphological state of individual's dentition without reference to their actual age. [9] Moreover, bone age is an indicator of physiological development, and it is distinct from the chronological age. Appropriate knowledge about bone age and dental age is essential for pediatrician and pediatric dentist. [10]

The methods of assessing the physiological age are either: weight and height of the child, the skeletal development or the dental age. There is evidence that dental development is less affected than skeletal development by malnutrition, endocrinopathies and other disturbances. Thus, radiographic and clinical examinations are the methods for assessing the dental age. [11,12]

Suitable standards references are requisite to ensure international comparability to assist clinicians in diagnosis of cases with delayed or advanced tooth eruption. [13] Reliability of the age estimation depends on the reference data available and each population group should preferably have its own standards. [5]

To date no studies have been conducted among Sudanese children for age estimation of deciduous dentition, which an important event in child development and fundamental aids for the dental professionals and scientific field in assessing the normal eruption pattern of deciduous dentition as well as recognition of the abnormalities. Therefore, this study aimed to establish a base line data and chronological time table for primary teeth eruption in a sample of Sudanese children.

MATERIALS AND METHODS

A cross-sectional study for a sample of 563 Sudanese children (283 boys and 280 girls) aged 4-40 months, attending the outpatients clinics at the health centers in Khartoum and Jabalawliya localities for mandatory vaccinations at the age of 4, 9, 12 and 18 months old and children 4 to 40 months coming for the outpatient clinic, were selected throughout the year 2013.

Inclusion Criteria were, Sudanese nationality, clinically healthy, full term born children, age from 4 to 40 months old.

A list of all health centers addresses in Khartoum and Jabal Awliya were obtained from the Ministry of Health – Khartoum State. In addition, the total number of children from 0 to 40 months old in the years 2012- 2013 was obtained from each locality. The sample size was calculated from the formula

$$n = \frac{(z\,\sigma)^2}{(d)^2} def$$

Where:

n = the required sample size

Z = the critical value of normal distribution

σ = the standard deviation that was taken from previous study.

d = the margin of error.

Deff = design effect which is the factor used for adjusting sample size when using

complex design like cluster; it always takes the value 1.5 - 2.

From a previous study conducted by M. Folayan et al.[2] in Nigeria the mean age of the eruption for mandible right central incisor was 8.07 with SD = 2.77 months.

Taking z = 1.96, consider error of 4% and deff = 2 we got a sample size of 566 children.

Data collection form included gender, age of the child, the breastfeeding status, and number of teeth present in the mouth. The date of birth was obtained from vaccination or insurance cards and the age was calculated in months.

The health centers were first selected using the systematic sampling technique. A total of 25 centers out 102 were included in the present study for data collection. Children who fulfill the inclusion criteria from different age groups attending vaccinations or those in the outpatient clinic were selected 23 to 24 children from each center.

An ethical clearance letter was obtained from the Research Committee faculty of Dentistry, University of Khartoum prior to carry out the study.

In addition a written approval of children's parents or caregivers was obtained before starting the interview. A questionnaire was completed by direct interview of the parents or caregiver by the main researcher prior to carry out the clinical examination.

Oral examination carried out for each child, using a dental mirror or tongue blade, in the presence of good illumination while the child was seated on their parent's lap on an ordinary chair

The deciduous dental formula was recorded in each child's examination sheet using an FDI (Federation Dentaire Internationale) Chart. The erupted tooth was defined as any tooth with any part of its crown penetrating the gingival and visible in the oral cavity. [2,3]

Statistics analysis

Data were collected, summarized, coded and entered to the Statistical Package for Social Sciences (SPSS) program (version 17). Descriptive statistics; frequency distribution tables, graph, means and standard deviations were used. Independent sample t-test was used to compare between boys and girls also between exclusive and non exclusive breastfeeding. For all statistical tests if the P-value < 0.05 considered as significant.

The age was calculated in months from the date of birth to the date of interview; the age in months has been treated as explanatory and binary variable an estimated probit regression model was used; the eruption (No = 0 and Yes = 1) each tooth was treated as a dependent variable, so 20 probit regression models were constructed.

RESULTS

Although maxillary anterior teeth received lighter occlusal loads than posterior teeth, coronal fractures occur mainly in devitalized teeth due to the oblique stress directions [2]. Accordingly, the rehabilitation of endodontically-treated teeth is an important factor for treatment success [1].

A total of 563 Sudanese children (283 boys and 280 girls) aged 4 - 40 months who met the inclusion criteria were included in the present study. Three girls were excluded from the study during data entry due to accidental distortion of some data form.

There were no statistical significant differences between the right and left side of both jaws in regards to any tooth eruption, so the sides were pooled in the further calculation. It was noted that the average time from the first to the last tooth eruption was 17.33 months in the mandible and 15.58 months in the maxilla in both genders (for boys 18.65 months in the mandible and 15.77 months in the maxilla and for girls 16.63 months in the mandible and 15.88 months in the maxilla) table 1.

In addition four active phases of eruption were observed in this study. The first one eruption of the central and lateral incisors

Table 1 - Mean eruption times on left, right and both sides of primary dentition in the maxilla and mandible for both genders

	Mandible		Maxilla	
	Mean	SD	Mean	SD
Right Side				
Central Incisor	7.91	3.29	10.48	3.79
Lateral Incisor	14.98	4.67	13.71	4.59
Canine	21.36	4.52	20.47	4.37
First Deciduous Molar	17.66	3.80	16.71	3.21
Second Deciduous Molar	25.46	5.13	26.38	5.32
Left Side				
Central Incisor	8.14	3.27	10.79	3.72
Lateral Incisor	15.01	4.50	13.33	4.83
Canine	21.37	5.15	20.41	4.55
First Deciduous Molar	17.47	3.98	16.72	3.25
Second Deciduous Molar	25.23	5.56	26.06	5.26
Combined Sides				
Central Incisor	8.02	3.28	10.64	3.75
Lateral Incisor	15.00	4.59	13.52	4.71
Canine	21.37	4.84	20.44	4.46
First Deciduous Molar	17.56	3.89	16.71	3.23
Second Deciduous Molar	25.35	5.34	26.22	5.29

SD = Standard Deviation.

within 7.1 months, followed by an interval period, 2.46 months in the mandible and 3.01 months in the maxilla. The second active phase is the eruption of the four molars occurred within a period of less than one month (at the average age of 16 .87 months). The third phase is the eruption of the canines after a resting period of 3.7 months in the mandible and 3.69 months in the maxilla. The last phase is the eruption of the second molars, which start after a rest period of 4.98 months in the mandible and 5.59 months in the maxilla.

Table 2 shows the mean eruption time of primary teeth among gender in both jaws. It clears that all erupted teeth in maxillary and mandibular arches in boys was in advance relative to the girls. A significant difference was observed between gender in regards to the eruption of the central incisors and canines in both jaws as well as the second primary molar in the maxilla.

There was no significant difference observed in the timing of eruption between exclusive and non exclusive breastfeeding for 6 months, except for the maxillary first primary molar p value 0.001 table 3.

Table 2 - Mean eruption time of primary teeth among gender

Tooth	Boys		Girls		
	Mean	SD	Mean	SD	p-value
Mandible					
Central Incisor	6.67	3.91	9.07	2.72	0.000
Lateral Incisor	14.83	4.69	15.15	4.43	0.412
Canine	20.84	5.02	21.81	4.55	0.016
First Deciduous Molar	17.66	3.80	17.44	3.99	0.490
Second Deciduous Molar	25.05	5.68	25.64	4.94	0.190
Maxilla					
Central Incisor	10.01	3.95	11.31	3.50	0.000
Lateral Incisor	13.15	4.57	14.21	4.73	0.263
Canine	19.43	4.34	21.37	4.31	0.000
First Deciduous Molar	16.83	3.50	16.68	2.93	0.583
Second Deciduous Molar	25.49	5.83	26.84	4.49	0.002

Table 3 - Mean eruption time of primary dentition in both jaws for exclusive and non exclusive breastfeeding sample

Mandible	exclusive		not exclusive		p-value
	Mean	SD	Mean	SD	
Central Incisor	7.93	2.39	8.15	3.47	0.472
Lateral Incisor	14.51	4.06	15.22	4.74	0.106
Canine	21.49	5.42	21.29	4.62	0.673
First Primary Molar	17.58	4.07	17.63	3.88	0.897
Second Primary Molar	25.48	5.83	25.27	5.19	0.686
Maxilla					
Central Incisor	10.55	3.61	10.60	3.85	0.897
Lateral Incisor	13.25	3.55	13.57	5.11	0.484
Canine	19.95	4.88	20.67	4.24	0.094
First Primary Molar	15.98	3.12	17.03	3.25	0.001
Second Primary Molar	26.75	6.60	25.93	4.72	0.108

DISCUSSION

Previous studies worldwide found differences between genders in the pattern of primary tooth eruption. Most studies reported that the anterior teeth in boys advance relative to the girl's dentition, and the pattern reverses so that the girls lead boys in the eruption of posterior teeth. [3,14-16]

The mean times for eruption of primary teeth has been established for most children, differences in eruption times between populations were existed, therefore, it essential for each population to establish their own eruption time schedule.

In the present study, the sequences of eruption of primary teeth followed the typical trend in other populations; the central incisors; lateral incisors followed by first molars then canine and terminate by the eruption of second molars. [7,14,15,17,18]

In the current study the first teeth to erupt were the mandibular central incisors at a mean age of 6.67 months and 9.07 months for boys and girls, respectively. The result showed that the Sudanese boys had the earliest time of eruption when compared with mean eruption time among Egyptian, Nigerian, American, Nepalese and Icelander children [2,16,19-21] whereas, the Sudanese girls as well as the Nepalese girls showed the same delayed eruption time of primary teeth as the Nepalese girls (table 4 and 5).

In the present study eruption time was found to be significantly earlier in boys than girls in regard to central incisors and canines in both jaws as well as maxillary second molars which is in line with the longitudinal studies for Hispanic

Table 4 - The mean age in months of the eruption of primary teeth in girls in different country

Teeth	Sudan	Nigeria (2)	Nepal (19)	Egypt (21)	U.S.A (16)	Iceland (20)
51,61	11.31	10.46	10.3	9.9	8.76	9.21
52,62	14.21	13.19	11.5	13.2	11.76	10.16
53,63	21.37	19.55	18.8	19.9	20.76	17.98
54,64	16.68	16.35	14.7	17.0	16.32	14.95
55,65	26.84	25.63	25.0	28.0	31.44	25.11
71.81	9.07	8.39	9.5	7.8	7.6	6.8
72,82	15.15	13.42	12.0	13.1	13.3	11.7
73,83	21.81	19.75	21.5	19.5	20.5	18.1
74,84	17.44	16.08	16.2	16.7	16.4	15.4
75,85	25.64	25.22	27.0	28.1	29.5	23.7

Table 5 - The mean age in months of the eruption of primary teeth in boy in different country

Teeth	Sudan	Nigeria (2)	Nepal (19)	Egypt (21)	U.S.A (16)	Iceland (20)
51,61	10.01	10.37	12.6	9.8	9.3	8.9
52,62	13.15	12.67	14	12.0	12.0	10.3
53,63	19.43	19.3	19.1	19.4	21.0	17.5
54,64	16.83	16.58	15.8	17.1	17.5	15.1
55,65	25.49	24.7	26.6	25.6	30.9	26.1
71.81	6.67	7.86	10.5	8.0	7.2	8.0
72,82	14.83	12.92	13.5	13.0	13.0	12.0
73,83	20.84	19.9	21.4	20.3	20.8	19.1
74,84	17.66	16.6	14.4	17.0	16.5	16.1
75,85	25.05	24.5	25.3	25.6	30.0	25.6

and French-Canadian children. [15] Also Al-Jasser and Bello [3] and Nanda [16] found that gender appears to play a significant role in the eruption of teeth in which boys erupted earlier than girls but the difference was marginal.

In contrast studies carried out by Singh K et al. [14] and Soliman et al. [21] reported that eruption time of girls preceded boys with exception of some mandibular and maxillary teeth. Moreover Reddy KN, Snakes K. found that all the deciduous teeth erupt earlier in girls than in boys. [22]

Gupta A et al. stated that "there is a general tendency for the teeth to erupt earlier in girls than boys both in the maxilla and mandible except for the mandibular first molars which erupt late in girls." However, the difference was not statistically significant. [19]

Regarding eruption time in the right and left side of jaws, no significant difference were observed between the mandible and maxilla in the present study which in agreement with previous studies. [2-4,41-44,48] In contrast, Lysell et al. [23] reported a significant difference in which eruption time in the left side of the jaw preceded the right side.

The different in the eruption time among different studied population may be partially attributed to the study design, such as cross sectional vs. longitudinal as well as the environmental factor and ethnic back ground.

In this study there was no significant difference of the mean time of eruption of primary teeth between children that had exclusive breastfeeding and non exclusive breastfeeding. Similar, however, same results were obtained by Patrianova ME etal and Folayan MO and Sowole CA, [24,25], while they disagree with Oziegbe EO et al. [26].

CONCLUSION

• The first primary teeth to erupt were mandibular central incisors, with a mean age of eruption 8.02 ± 3.28 months. The Maxillary central incisors mean age of eruption was 10.64 ± 3.75 months.

• The last teeth to erupt were maxillary second molars, at 26.22 ± 5.29 months.

• All the primary teeth erupted earlier in boys than in girls except the first primary molars, which erupted first in girls. Significant differences were found in the maxillary and mandibular central incisors, the maxillary and mandibular canines and maxillary second molars.

• There was no significant difference of eruption time between right and left sides and in children with exclusive breastfeeding and those of non exclusive breastfeeding.

RECOMMENDATIONS

The present study set a good board of the eruption date of primary dentition. As Sudan is a big country, further study with a larger sample size including different states is recommended. Moreover, future longitudinal studies are recommended to observe the eruption stages of each tooth all owing for more accuracy. Socioeconomic status, environmental factors as well as nutritional factors should be considered.

More data should be collected in regard to exclusive and non exclusive breastfeeding in order to draw a more precise result since the sample size in the present study was not representative, (26.1%) non exclusive compared to (73.9%) to exclusive breastfeeding.

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