ORIGINAL RESEARCH

Relationship of deciduous teeth emergence with physical growth

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ABSTRACT

Introduction: Tooth eruption, recognized as an aspect of human growth and development, could possibly be influenced by a number of factors. It may reflect the general body development.
Aim: The aim of the present research is to investigate the relationship of deciduous teeth emergence with physical growth (weight/height indices).
Materials and Methods: A study was conducted among a sample of 1132 Egyptian infants whose ages range from 4 to 36 months. The sample was collected from some randomly selected health centers affiliated to the ministry of health where various socioeconomic strata from different geographic localities were recruited. The children visit there regularly for vaccination at definite ages. Weight and height were evaluated as factors that might have influence on the time of deciduous teeth emergence.
Results: The results showed a certain degree of correlation between the number of deciduous teeth emerged and the studied anthropometric measurements which differed by sex and age.
Conclusion: All anthropometric parameters showed relationship with the number of teeth at different levels. Although weight showed influence on the number of teeth emerged, it was less significant than height.

Received : 08-03-10
Review completed : 19-06-10
Accepted : 05-10-10

Key words: Deciduous dentition, height, physical, weight

The age of eruption of the primary teeth has long been of interest for biological and physical anthropological studies. Tooth eruption, recognized as an aspect of human growth and development, could possibly be influenced by a number of factors. It reflects the general body development.[1] Literature suggests that factors like gender, race and physical development may influence tooth eruption reflecting considerable variation and little information is available on non-white/non-European derived population;[2] however, there is scarce literature on the subject regarding Egyptian children. And therefore studies on development of dentition and growth changes of body dimension, which are important growth criteria, are lacking. Consequently; growth data derived from studies on group of different genetic pools and living under different environmental condition are usually improperly used in evaluating developmental level of Egyptian children.[3] The aim of the present research is to investigate the relationship of deciduous teeth emergence with physical growth (weight/height indices).

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Access this article online	
Quick Response Code:	Website: www.ijdr.in
	DOI: 10.4103/0970-9290.100433

MATERIALS AND METHODS

A study was conducted among 1132 Egyptian infants whose ages range from 4 to 36 months. The sample composed of (565) girls and (567) boys. The sample was collected from some randomly selected health centers affiliated to the ministry of health where various socioeconomic strata from different geographic localities were recruited. The children visit there regularly for vaccination at definite ages. In those health centers, infants are seen six times in the first year (7^{th} day and 2^{nd}, 4^{th}, 6^{th}, 9^{th}, 12^{th} months), two times in the second year in life (18^{th} and 24^{th} month) and once yearly thereafter until they are five years. The sample was gathered from five different governorates so as to include children living under different conditions.

Only middle class subjects were enrolled in this study. Subjects belonging to the high and low socioeconomic classes were not included so that any factor that may affect that relation of the number of teeth with physical growth was excluded. SES categorization was characterized by the scoring of the parental education level and crowding index.

Each infant was subjected to full medical examination by the pediatric physician in those centers and only healthy normal subjects that are not suffering from any hereditary or congenital diseases were included in the study sample.

A questionnaire was designed in order to collect reliable well-defined information from parents. The data were collected and recorded in the subject's examination sheet. The sheet contained personal data including exact date of birth, address and place of living, subject gender, and medical and dental history. The number of teeth emerged were counted by the examiner. An emerged tooth was defined as having occurred if any part of the crown had pierced the alveolar mucosa. Weight and height measurements were also recorded.

Body weight was estimated using a sensitive balance Sica type, which is designed on the lever arm principle) up to the nearest 10 g, for which the data were not corrected. Each child was weighed with minimal clothing. Children under 24 months of age were weighed lying down or sitting on a leveled pan scale. The infant was placed on the scale so that the weight was distributed equally to the center of the pan. Children over 24 months were weighed in the standing position on a platform scale. The child would stand in the center of the platform, with the body weight evenly distributed between both feet. Some health centers also used a digital pediatric scale.

Body length was measured using an infantometer from head to heels, up to the nearest millimeter. Each infant was measured lying down in supine position. The infantometer is composed of a horizontal board with an attached metric ruler and a vertical immovable headboard that could contact the uppermost part of the head and a movable footboard at its end to contact the heels. The crown of the infant's head touched the immovable vertical headboard. The head was held with the line of vision aligned perpendicular to the plane of the measuring surface. The shoulders and buttocks were flat against the table top. The legs were placed flat against the table top with the toes pointing upwards and the movable footboard was placed against the heels. As for older children they were weighed standing up, shoulders relaxed and the back straight and erect. The hands and arms were kept relaxed with palms facing medially.

The body mass index (BMI) was calculated as weight (kg)/ square length (meter).[3]

$$BMI = \frac{weight}{length^2}$$

Statistical analysis

Statistical analysis was attempted using the SPSS version 17.5 software designed by University of California at Los Angeles (UCLA). The analysis included frequencies and descriptive statistics. Association between categorical variables was assessed using Pearson's coefficient of correlation.

RESULTS

Pearson's correlation coefficient of the number of teeth emerged with other anthropometric measurements is shown in Table 1. A significant correlation could be detected between the number of teeth emerged and weight at the marked ages, also significant correlations between number of teeth and height and body mass index are marked. In order to eliminate the effect of age, partial correlation was performed. The results are demonstrated in Table 2 for the whole sample where it is clear that there is a significant correlation between weight, height and BMI with the number of teeth emerged in both sexes. The sample was further classified into four age groups to study each sex separately. First group included children aged from 4 to12 months, second group from 12 to 18, third group from 18 to 23 and forth group from 23 to 36 months.

Table 1: Coefficient of correlation between number of teeth emerged and anthropometric measurement by age in both sexes combined

Age (months)	Number	Weight		Height		BMI	
		r	*P*	r	*P*	r	*P*
4	54	0.3078*	0.024	-0.3599	n.s	0.6301	n.s
6	48	0.1645*	n.s	0.0221*	0.0221	0.0976	n.s
7	25	0.6342*	0.001	0.3522	n.s	-0.1092	n.s
8	21	0.2293	n.s	0.4464*	0.042	-0.3005	n.s
9	84	0.2919*	0.007	0.1843	n.s	0.0549	n.s
10	42	0.1628	n.s	-0.261	n.s	0.461*	0.002
11	15	0.2086	n.s	0.2211	n.s	-0.0014	n.s
12	107	0.0582	n.s	0.1365	n.s	-0.0676	n.s
13	84	0.3388*	0.002	0.5505*	0.027	0.3419*	0.001
14	26	0.7498*	0.000	0.5505*	0.004	0.7076*	.000
15	17	-0.5446	0.024	0.4004	n.s	-0.4968	0.042
16	17	-0.197	n.s	-0.5811	0.014	0.5313*	0.028
17	46	0.0364	n.s	-0.3018	0.042	0.4444*	0.002
18	82	0.5324*	0.000	0.5888*	0.000	0.0125	n.s
19	121	0.3586*	0.000	0.0944	n.s	0.3863*	0.000
20	63	0.2744*	0.03	0.2156	n.s	0.1573	n.s
21	29	0.538*	0.003	0.1855	n.s	-0.0763	n.s
22	12	0.4795	n.s	0.8386*	0.001	-0.4652	n.s
23	8	0.2722	n.s	0.8178*	0.013	-0.922	0.001
24	35	0.702*	0.000	0.8912*	0.000	0.0334	n.s
25	24	0.6371*	0.001	0.8252*	0.000	0.1679	n.s
26	45	0.59*	0.000	0.3839*	0.009	0.6157*	0.000
27	15	-1.0000	0.000	1.0000*	0.000	-1.0000	0.000
28	15	0.8952*	0.000	0.2744	n.s	0.2038*	n.s
29	13	0.1323	n.s	-0.6068	0.028	0.9708	0.000
33	7	0.874*	0.01	0.8534*	0.015	-0.1227	n.s
34	11	-1.0000	0.000	1.0000*	0.000	-1.0000	0.000
36	13	0.949*	0.000	0.5987	n.s	0.3302	n.s

* Denotes significance ($P < 0.05$), n.s Denotes none significant, BMI = Body mass index

Table 2: Partial correlation of number of teeth emerged with studied anthropometric measurements

Control variable		Weight (kg)	Height (cm)	BMI (kg/m²)
Age (months)	Correlation	0.415	0.317	0.153
	Significance (2-tailed)	0.000	0.000	0.000

BMI = Body mass index

Pearson's coefficient of correlation of the number of teeth emerged was studied in these groups as well in Table 3. In both sexes weight showed a significant correlation with the number of emerged teeth in all four groups. With the exception of the third age group, the height showed a significant correlation with the number of teeth emerged in both sexes. As for BMI, girls showed significant correlation in the second group, but boys showed this significance in the third and forth age groups. For eliminating the factor of age, partial correlations are shown in Table 4 for each sex separately. It is obvious that in both sexes, Group 3 showed significance of weight, height and BMI on the number of teeth. While in Group4, only weight showed significance at higher level (P<0.01) in both sexes. Girls' height showed a significant correlation with the number of teeth emerged and the BMI of boys were significantly correlated. (P<0.001).

DISCUSSION

Previous epidemiological studies of dental growth concentrated either on dating emergence of a specific tooth or counting the total number of teeth present in the oral cavity at a certain age. It is worthy to note that attempts to study the total number of emerged teeth in the oral cavity combine the consequences of multiple factors related to the process of movement and emergence of teeth. Variation in tooth emergence is believed to be multifactorial.[4] Factors that could influence the time of tooth emergence are gender, low birth weight, growth parameters and nutritional status, which are the factors that were demonstrated in previous studies also.[5] Growth studies in different parts of the world have been attempted in an effort to trace developmental differences which may be related to race, sex, nutritional standards and socioeconomic levels. The existence of a general connection between dental development and indicators of physical development demonstrates that growth is an unified process even though parts of that process may move at varying speed. Though explanation of the relationship between deciduous teeth emergence and somatic growth attracted the attention for many decades, the scarce literature on the subject revealed wide variations and contradicting opinions. While some studies reported that primary teeth emergence is relatively an independent process and unrelated to most anthropometric measurements that are used as somatic growth criteria,[6] other studied revealed significant correlation.[3,7-9]

Contradicting findings over the extent to which deciduous

Table 3: Correlation of teeth number with anthropometric measurements at different age groups in each sex

Age group	Gender		Weight (kg)	Height (cm)	BMI (kg/m²)
Group 1	Boy	Pearson correlation	0.530**	0.407**	0.122
		Sig. (2-tailed)	0	0	0.126
		N	160	160	160
	Girl	Pearson correlation	0.611**	0.587**	0.038
		Sig. (2-tailed)	0	0	0.66
		N	133	133	133
Group 2	Boy	Pearson correlation	0.221**	0.083	0.099
		Sig. (2-tailed)	0.008	0.323	0.238
		N	145	145	145
	Girl	Pearson correlation	0.257**	-0.037	0.306**
		Sig. (2-tailed)	0.001	0.652	0
		N	152	152	152
Group 3	Boy	Pearson correlation	0.711**	0.758**	0.210**
		Sig. (2-tailed)	0	0	0.003
		N	193	193	193
	Girl	Pearson correlation	0.677**	0.701**	-0.067
		Sig. (2-tailed)	0	0	0.399
		N	161	161	161
Group 4	Boy	Pearson correlation	0.704**	0.489**	0.477**
		Sig. (2-tailed)	0	0	0
		N	69	69	69
	Girl	Pearson correlation	0.688**	0.837**	0.115
		Sig. (2-tailed)	0	0	0.214
		N	119	119	119

*Correlation is significant at the 0.05 level (2-tailed), ** Correlation is highly significant at the 0.01 level (2-tailed)

teeth emergence is associated with variations in prenatal and post natal growth cannot pass unnoticed. It was reported that nutritional status at birth, whether expressed as full-term birth weight or as maternal supplementation during pregnancy, influence the timing of deciduous teeth emergence.[10] Still, other researchers assume that the number of emerged deciduous teeth is more associated with postnatal weight than birth weight.

Moreover, it is reported that heavier babies at birth had more number of deciduous teeth than lighter newborns.[11] Children having low birth weight were shown to have delayed tooth emergence pattern on the first 24 months of life.[12]

In this study, birth weight and height were collected from the records of the health centers. The data was inconsistent and insufficient, so birth weight and length were not evaluated as factors in the emergence of deciduous teeth.

Generally, certain degree of correlation between the number

Table 4: Partial correlation of anthropometric measurements and number of teeth in each sex

Age	Gender		Weight (kg)	Height (cm)	BMI (kg/m^2)
Group 1	Boy	Correlation	-0.002	-0.022	-0.019
		Significance (2-tailed)	0.978	0.783	0.815
		df	157	157	157
	Girl	Correlation	0.432*	0.379*	0..032
		Significance (2-tailed)	0.000	0.000	0.716
		df	130	130	130
Group 2	Boy	Correlation	0.213	0.087	0.091
		Significance (2-tailed)	0.010	0.297	0.278
		df	142	142	142
	Girl	Correlation	0.107	-0.178	0.29*
		Significance (2-tailed)	0.191	0.028	0.000
		df	149	149	149
Group 3	Boy	Correlation	0.57*	0.60*	0.26*
		Significance (2-tailed)	0.000	0.000	0.000
		df	190	190	190
	Girl	Correlation	0.41*	0.37*	0.091
		Significance (2-tailed)	0.000	0.000	0.254
		df	158	158	158
Group 4	Boy	Correlation	0.60*	0.27*	0.55*
		Significance (2-tailed)	0.000	0.021	0.000
		df	66	66	66
	Girl	Correlation	0.69*	0.83*	0.135
		Significance (2-tailed)	0.000	0.000	0.144
		df	116	116	116

*Correlation is significant at the 0.05 level (2-tailed), BMI = Body mass index

of deciduous teeth emerged and body size was reported and differ by sex and age. Increase in growth measurements as well as dental growth is a function of age, and the idea behind searching for association between them is to find common biological controlling factors of the two growth criteria other than time.

Height and weight are strong physical features that reflect the degree of cell and tissue development as well as the nutritional status of the child.[9] The BMI is considered as an acceptable nutritional and growth indicator.[3]

In this study, boys were ahead of girls in both anthropometric measurements and total number of teeth emerged. In El Nofely's study[3] that was similar to the present one, it was noticed that boys were ahead of girls in all anthropometric measurements, but not in the total number of teeth emerged. It was also noticed that sexual dimorphism is evident as regards body size, but is absent as regards dental growth and emergence in the whole sample or after dividing it into groups. The differences in the results may be attributed to the sample studied regarding the SES and the locality and also the difference in the time elapsed between the two studies.

Previous studies[7,13,14] demonstrated a relationship between a child's general somatic growth and primary teeth emergence. Haddad and Correa (2005) concluded that deciduous teeth emergence is highly influenced by the height of the child[8] The application of this correlation was put to practice by constructing a chart, where the number of emerged primary teeth can be considered together with the age and height of the child in a more integrated evaluation of growth and development. Oziegbe *et al.*[9] suggested that height might be a strong factor in predicting the number of emerged teeth.[9]

Sahin *et al.* also concluded that the height seemed to be more effective on the sixth months of age. They also reported that infants, whose height measurements were below 50 %, emerged their teeth late. From their results, they suggested that in the early months of life when growth rates are fastest, growth parameters affect the teething time.[12]

In agreement with the previously mentioned studies, height showed a statistically significant relation with the number of teeth emerged. Eliminating the influence of age through computation of partial correlation was very important to accurately evaluate the effect of anthropometric measurements on the number of teeth without the interference of age as an important factor. All anthropometric parameters showed significance with the number of teeth at different levels.

These results indicate the biological association between bone growth and elongation in one side and teeth formation and emergence from the other side. Although weight shows influence on teeth emergence, it is less significant than height. It is important to underline that BMI which is considered as an acceptable nutritional indicator, shows a significant correlation with the total number of teeth.

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How to cite this article: Soliman NL, El-Zainy MA, Hassan RM, Aly RM. Relationship of deciduous teeth emergence with physical growth. Indian J Dent Res 2012;23:236-40.

Source of Support: Nil, **Conflict of Interest:** None declared.