Height, weight and the number of erupted permanent teeth among 6-16 years old children in Sulaimani City

Sulaimani Dental Journal

Arass Jalal Noori[1], Shokhan Ahmad Hussein[2] & Dilsoz Abdul Ali[3]

[1] B.D.S, M.Sc (Pediatric Dentistry). Lecturer of Pediatric Dentistry. Department of Pedodontics, Orthodontics and Preventive Dentistry. School of Dentistry, Faculty of Medical Science, University of Sulaimani, Iraq.
[2] B.D.S, M.Sc (Oral Medicine). Lecturer of Oral Medicine. Department of Oral Diagnosis. School of Dentistry, Faculty of Medical Science, University of Sulaimani, Iraq.
[3] B.D.S, M.Sc (Pediatric Dentistry). Lecturer of Pediatric Dentistry. Department of Pedodontics, Orthodontics and Preventive Dentistry. School of Dentistry, Faculty of Medical Science, University of Sulaimani, Iraq.

Correspondence to;
Dr. Arass J. Noori
dr.arass@yahoo.com
arass.noori@univsul.edu.iq

Received: *July, 2015*
Accepted: *September, 2015*
Accepted: *December, 2015*

Abstract

Objectives: This study was conducted in order to evaluate the influence of gender, weight, and height on number of permanent teeth emerged among 6-16 years age group children in Sulaimani city.

Material and Methods: This cross sectional study was carried out among randomly selected primary school in Sulaimani city including an oral clinical examination, and weight and height measurements. All measurements were carried out following standardized guidelines. Missing teeth due to extraction were counted as erupted and other cases were excluded from the study if missing of teeth were not approved to be due to tooth extraction.

Results: A total of 1125 children aged 6-16 years were recruited for the study. The overall mean age of the children was 10.7 ± 2.8 years (boys, 10.6 ± 2.6; girls, 10.9 ± 3.0). Females showed higher number of erupted teeth than males by an average of about 1.4 teeth/ child and the total number of erupted teeth was 18.2 teeth/ child in the total sample. Partial correlation coefficient of total numbers of erupted teeth was positively significant with weight in both males and females and was significant with height among females only. The partial correlation results of the eruption (presence) of individual teeth with height and weight were mixed as; all incisor teeth showed no significant relation, but the teeth number 17, 15, 13, and 47 showed positive significant correlation with height and weight.

Conclusions: The mean total number of erupted teeth per child increased with age and the mean total number of erupted teeth was higher in females than males. The influence of weight on the number of erupted teeth was obvious among both males and females, while the height of the child showed a significant influence on the number of erupted teeth only among females. Furthermore, the influences of height and weight on the eruption of individual teeth were inconclusive.

Keywords: *Height, weight, permanent teeth emergence, Sulaimani city.*

Cite this article as: Noori AJ, Hussein SH, Ali DA. Height, Weight and the Number of erupted permanent teeth among 6-16 years old children in Sulaimani City. Sulaimani Dent J. 2015;2(2):61-66.

Introduction:

Tooth eruption is a long and complex physiological process during which a tooth moves from the site in the jawbone where it developed until it comes into occlusion and becomes functional[1]. With the exception of third molars, the processes of tooth eruption and the development of the occlusion occur in the first 13 to 15 years of life. Both primary and secondary teeth erupt at a fairly specific age. However, there is variation and it is useful to know the age range when each tooth is due to erupt and the mean age of eruption[2,3].

Developing teeth provide a reliable indication of maturation and biological age. An understanding of the timing and sequence of tooth emergence allows dental professionals to assess whether patterns exhibited by patients fall within the expected range of normal dental development[4]. A balanced diet contains all the elements necessary for the growth of the teeth; malnutrition in children can lead to a variety of teeth disorders[5].

Generally, permanent teeth have been found to erupt between the ages of 5 to 13 years, except the third molars which do so between 17 and 21 years[6,7]. Furthermore, tooth eruption time as well as the sequence of tooth eruption have been reported to vary with races[6,8,9].

It's noted that important developmental and nutritional variables at birth and throughout the early life may predict the numbers of emerged teeth that children may have in their oral cavity later in life[10].

This study was conducted in order to evaluate the influence of gender, weight, and height on number of

permanent teeth emerged among 6-16 years age group children in Sulaimani city.

Materials and Methods:

A cross-sectional study was carried out among randomly selected primary school children in Sulaimani city involving an oral clinical examination, and weight and height measurements. All measurements were carried out following standardized guidelines according to the Anthropometric Standardization Reference Manual[11] and researchers received proper training for this matter.

The weight was measured by weighting a child in kilograms using a digital weighing scale after removal of shoes and any overcoat. The values were corrected to the nearest one decimal point. The height of the child was measured when the child was standing while the back and knees were straight, feet drawn together and the line of vision was in the horizontal plane. Then the height was measured from the heel to the uppermost part of the head using a wall mounted tape measure in meters and corrected to the nearest one decimal point.

Missing teeth due to extraction were counted as erupted and other cases were excluded from the study if missing of teeth were not approved to be due to tooth extraction (Like congenital missing).

Ethical approval was obtained from School of Dentistry/ University of Sulaimani and proper permission to carry out the study was obtained from the Sulaimani Directorate of Education and school administrators.

A case recording form was prepared for every child including, in spite of the demographic data, height and weight and the eruption status of the dentition (i.e.; presence or absence of an individual tooth excluding the third molars). The collected data were analyzed using SPSS® version 20.0 for windows (SPSS Inc, Chicago, IL, USA). Statistical analysis involved descriptive statistics, Student's t-test and Partial correlations. Statistical significance was set at 5%.

Results:

A total of 1125 children aged 6-16 years were recruited for the study. The overall mean age (±S.D.) of the children was 10.7 ± 2.8 years (boys, 10.6 ± 2.6; girls, 10.9 ± 3.0). The distribution of boys and girls based on chronological age is shown in Table 1.

Females showed higher number of erupted teeth than males and the total number of erupted teeth was 18.2 teeth/ child in the total sample (excluding the third molars), Table 2.

The mean total number of teeth per child increased with age and by the age of 16 years almost all permanent teeth were erupted, Table 3. Among the majority of age groups, the mean total number of erupted teeth was higher in females than males with a significant difference in age groups 9 and 11 ($p<0.05$), Table 3.

Table 1: The frequency distribution of the study children by age and sex (n = 1125).

Age (in years)	Sex		Total
	Male	Female	
6	50	69	119
7	29	24	53
8	45	62	107
9	46	48	94
10	87	78	165
11	76	46	122
12	43	60	103
13	72	56	128
14	56	81	137
15	19	59	78
16	5	14	19
Total	528	597	1125

Table 2: Total number of erupted teeth

Sex	Male	Female	Total
Number of teeth	9390	11456	20846
Number of children	528	597	1125
Number of teeth/child	17.8	19.2	18.5

Partial correlation coefficients of total numbers of erupted teeth was positively significant with weight while controlling for age in both males and females ($p<0.001$). On the other hand, partial correlation coefficients of the total numbers of erupted teeth was positively significant with height among females only while controlling for age ($p<0.001$). Also the same results were present, females showed significant partial correlation, when the total numbers of erupted teeth were tested with height while controlling for both age and weight and with weight while controlling for both age and height, Table 4.

Table 5 shows the partial correlation results of the eruption (presence) of individual teeth with height and weight while controlling for age for the right side. The teeth number 17, 15, 13, and 47 (Teeth in FDI notation system) showed positive significant correlation with height and weight ($p<0.05$), while all incisor teeth showed no significant correlation ($p>0.05$).

Table 3: Total number of erupted teeth according to individual age and sex.

Age	Total				Male				Female				Sig.
	Number of children	Number of Erupted teeth	Mean Number of teeth	±SD	Number of children	Number of Erupted teeth	Mean Number of teeth	±SD	Number of children	Number of Erupted teeth	Mean Number of teeth	±SD	
6	119	769	6.5	3.49	50	295	5.9	3.35	69	474	6.9	3.56	N.S
7	53	507	9.6	2.45	29	279	9.6	2.50	24	228	9.5	2.43	N.S
8	107	1224	11.4	2.86	45	497	11.0	1.97	62	727	11.7	3.35	N.S
9	94	1152	12.3	3.03	46	535	11.6	2.60	48	617	12.9	3.31	S*
10	165	2556	15.5	4.07	87	1306	15.0	3.73	78	1250	16.0	4.39	N.S
11	122	2282	18.7	4.69	76	1369	18.0	4.56	46	913	19.9	4.74	S*
12	103	2585	25.1	3.49	43	1076	25.0	2.99	60	1509	25.2	3.84	N.S
13	128	3345	26.1	2.98	72	1849	25.7	3.60	56	1496	26.7	1.80	N.S
14	137	3752	27.4	1.29	56	1524	27.2	1.63	81	2228	27.5	0.99	N.S
15	78	2143	27.5	1.61	19	520	27.4	1.46	59	1623	27.5	1.67	N.S
16	19	531	28.0	0.23	5	140	28	0	14	391	27.9	0.27	N.S

* P<0.05, Student't-test

Table 4: Partial correlation coefficients of total number of erupted teeth with height and weight while ontrolling for age (with height or weight).

Test variable	Control variable	Gender	Height		Weight	
			Correlation coefficient	p-value	Correlation coefficient	p-value
Total number of erupted teeth	Age	**Male**	0.103	0.18	0.171	0.000
		Female	0.348	0.000	0.293	0.000
		Total	0.217	0.000	0.240	0.000
	Age and Height	**Male**	-	-	0.138	0.002
		Female	-	-	0.154	0.000
		Total	-	-	0.156	0.000
	Age and Weight	**Male**	0.014	0.745	-	-
		Female	0.248	0.000	-	-
		Total	0.117	0.000	-	-

Table 5: Partial correlation coefficients of erupted individual teeth with height and weight while controlling for age for the right side.

Tooth	Correlation coefficient	Male		Female		Both	
		Height	Weight	Height	Weight	Height	Weight
17*	Correlation	0.100	0.206	0.262	0.263	0.162	0.236
	Significance (2-tailed)	S**	S	S	S	S	S
16	Correlation	0.000	-0.032	-0.017	0.047	-0.007	0.009
	Significance (2-tailed)	N.S†	N.S	N.S	N.S	N.S	N.S
15	Correlation	0.112	0.122	0.266	0.186	0.179	0.158
	Significance (2-tailed)	S	S	S	S	S	S
14	Correlation	0.069	0.059	0.274	0.165	0.169	0.117
	Significance (2-tailed)	N.S	N.S	S	S	S	S
13	Correlation	0.113	0.164	0.216	0.183	0.150	0.176
	Significance (2-tailed)	S	S	S	S	S	S
12	Correlation	0.019	-0.038	0.020	0.013	0.024	-0.008
	Significance (2-tailed)	N.S	N.S	N.S	N.S	N.S	N.S
11	Correlation	-0.026	-0.048	-0.032	-0.015	-0.024	-0.029
	Significance (2-tailed)	N.S	N.S	N.S	N.S	N.S	N.S
41	Correlation	-0.071	-0.006	-0.003	0.013	-0.031	0.004
	Significance (2-tailed)	N.S	N.S	N.S	N.S	N.S	N.S
42	Correlation	-0.048	-0.035	0.030	0.018	0.000	-0.006
	Significance (2-tailed)	N.S	N.S	N.S	N.S	N.S	N.S
43	Correlation	0.007	0.081	0.175	0.138	0.085	0.114
	Significance (2-tailed)	N.S	N.S	S	S	S	S
44	Correlation	0.073	0.125	0.201	0.166	0.132	0.148
	Significance (2-tailed)	N.S	S	S	S	S	S
45	Correlation	0.080	0.119	0.229	0.202	0.144	0.165
	Significance (2-tailed)	N.S	S	S	S	S	S
46	Correlation	-0.049	-0.008	0.017	0.031	-0.017	0.013
	Significance (2-tailed)	N.S	N.S	N.S	N.S	N.S	N.S
47	Correlation	0.126	0.192	0.284	0.281	0.184	0.239
	Significance (2-tailed)	S	S	S	S	S	S

* Teeth in FDI notation, ** Significant value ($p<0.05$), † Non significant value ($p>0.05$).

Discussion:

In the medical literature, the majority of studies documenting the chronology and presence of permanent teeth is related to the eruption time and emergence sequence of these teeth with a significant difference among different population[12]. The eruption or emergence of a tooth is the biological process that follows the formation of the dental crown and is essentially the penetration of the covering oral mucosa by any part of a tooth [13]. In the present study, clinical assessment of penetration of the oral mucosa by any part of the tooth was so obvious and did not require any reliability assessment of the examiners[7,14].

The level of congenitally missing teeth was not possible to be determined as the present study was school based (not clinical) and no radiographic examinations were taken and any case of missing teeth not report to be extracted was excluded from the study. Despite that, some cases of missing teeth may be misreported by children as being extracted, especially in case of multiple missing teeth. However, Holman and Jones[15] had concluded that estimates of eruption time without considering congenitally missing teeth were biased upward, but in any case less than 1% and stated that for adequate sample sizes, agenesis does not lead to substantially biased estimates. Our study recruited a moderate sample size of children (n = 1125, 528 Boys and 597 Girls), implying that the influence of congenitally missing teeth may not be significant[7].

This cross sectional study examines the total number of erupted permanent teeth and height and weight measurements in a group of Kurdish school children aged between 6 to 16 years in Sulaimani, Iraq. Weight and height of children at a given age are frequently used as an index of state of nutrition. It was reported that tall children exhibited delayed tooth eruption irrespective of their weight while heavy and short children had early tooth eruption[7].

With increasing age the mean total number of teeth present were also increased as more teeth erupts and in all age groups, although not always statistically significant, females had more teeth than males by an average of about 1.4 teeth per child (Average factor = Females mean total number of teeth per child – Males mean total number of teeth per child = 19.2 – 17.8 = 1.4 teeth/child), Table 2 and 3. These findings shows that females had earlier tooth emergence than males and these findings go with other research findings from around the world that females had earlier eruption times, hence larger number of erupted teeth present at any specific age/ age groups, and the dentition is completed earlier in females than males[9,16–21].

It has been said that females generally precede males in the eruption timing by an average of about 5 months. While, the reason for this differences of tooth eruption times between both genders are poorly understood, it is assumed that the earlier onset of the permanent dentition is a part of the different sexual maturity of both sexes at a given age[20,22].

For the total sample, weight showed positive significant correlation while height was not correlated with the total numbers of erupted teeth. On the other hand, weight, when controlling for both age and height, was positively correlated in both genders with the total number of erupted teeth and only females showed positive significant correlation with height, when controlling for age and weight.

These results shows a greater impact of child's weight on the eruption of teeth and the total number of erupted teeth present at any age group where as height only affected the total numbers of erupted teeth among females and this may be due to sexual differences between the genders. Previous studies regarding the influence of height and weight draws some different conclusions. In a study among the Japanese children in Hiroshima, tooth eruption times were found to be directly influenced by height and weight[23] and among the Pakistani children in Karachi, it was observed that tall children exhibited delayed tooth eruption irrespective of their weight while heavy and short children had early tooth eruption[24]. Furthermore, a recent study among 4-15 years old children in Kampala (Uganda)[7] reported that the height of the child did not show any significant influence on the tooth eruption times while the influence of weight on tooth eruption times was non-conclusive.

The effect of Body Mass Index (BMI) is not reported in this study because previous studies[7,24,25] did not observe any specific relationship between tooth eruption times and total numbers of emerged teeth with BMI and this may possibly be due to the conflicting outcomes of weight and height as BMI is measured directly from these two variables.

As previous studies[8,21,26] showed no significant difference regarding eruption of teeth between the right and left side, that's why only the results for the right side dentition are presented. Regarding correlations of the total numbers of individual teeth erupted with height and weight there were mixed results, but the second permanent molars and maxillary second premolar and canine showed significant relations and this may be due to the eruption age of these teeth where it's around puberty and growth spurts of the children.

Conclusions:

The mean total number of erupted teeth per child increased with age and the mean total number of erupted teeth was higher in females than males. The influence of weight on the number of erupted teeth was obvious among both males and females, while the height of the child showed a significant influence on the number of erupted teeth only among females. Furthermore, the influences of height and weight on the eruption of individual teeth were inconclusive.

References:

1. *Koch G, Kreiborg S, Andreasen JO. Eruption and shedding of teeth. In: Koch G, Poulsen S, editors. Pediatric Dentistry: A Clinical Approach. 2nd ed. Oxford: Wiley-Blackwell; 2009. p. 197-199.*
2. *Suri L, Gagari E, Vastardis H. Delayed tooth eruption: pathogenesis, diagnosis, and treatment. A literature review. Am J Orthod Dentofacial Orthop. 2004;126(4): 432–45.*
3. *Moslemi M. An epidemiological survey of the time and sequence of eruption of permanent teeth in 4-15-year-olds in Tehran, Iran. Int J Paediatr Dent. 2004;14(6): 432–8.*
4. *Woodroffe S, Mihailidis S, Hughes T, Bockmann M, Seow WK, Gotjamanos T, et al. Primary tooth emergence in Australian children: timing, sequence and patterns of asymmetry. Aust Dent J. 2010;55(3):245–51.*
5. *Department of Health Republic of Indonesia. Teeth and healthy. Heal mag. 2006;170:66.*
6. *Agarwal KN, Gupta R, Faridi MMA, Kalra N. Permanent dentition in Delhi boys of age 5-14 years. Indian Pediatr. 2004;41(10):1031–5.*
7. *Kutesa A, Nkamba EM, Muwazi L, Buwembo W, Rwenyonyi CM. Weight, height and eruption times of permanent teeth of children aged 4-15 years in Kampala, Uganda. BMC Oral Health. 2013;13:15.*
8. *Billewicz WZ, McGregor IA. Eruption of permanent teeth in West African (Gambian) children in relation to age, sex and physique. Ann Hum Biol. 1975;2(2):117–28.*
9. *Pahkala R, Pahkala A, Laine T. Eruption pattern of permanent teeth in a rural community in northeastern Finland. Acta Odontol Scand. 1991;49(6):341–9.*
10. *Bastos JL, Peres MA, Peres KG, Barros AJD. Infant growth, development and tooth emergence patterns: A longitudinal study from birth to 6 years of age. Arch Oral Biol. 2007;52(6):598–606.*
11. *Lohman TG, Roche AF, Martorell R. Anthropometric Standardization Reference Manual, Human Kinetics, Champaign, Ill, USA, 1988.*
12. *Demirjian A. Human growth. In: Falkner F, Tanner J, Editors, editors. Human Growth. London: Baillere Tindall; 1986. p. 413–44.*
13. *Bailit HL, Sung B. Maternal effects on the developing dentition. Arch Oral Biol. 1968;13(2):155–61.*
14. *Virtanen JI, Bloigu RS, Larmas MA. Timing of eruption of permanent teeth: standard Finnish patient documents. Community Dent Oral Epidemiol. 1994; 22(5 Pt 1):286–8.*
15. *Holman DJ, Jones RE. Longitudinal analysis of deciduous tooth emergence: II. Parametric survival analysis in Bangladeshi, Guatemalan, Japanese, and Javanese children. Am J Phys Anthropol. 1998;105(2): 209–30.*
16. *Wedl JS, Schoder V, Friedrich RE. Tooth eruption times of permanent teeth in male and female adolescents in Niedersachsen. Arch Kriminol. 2004;213(3-4):84-91.*
17. *Feraru I-V, Rãducanu AM, Feraru SE, Herteliu C. The Sequence and Chronology of the Eruption of Permanent Canines and Premolars in a Group of Romanian Children in Bucharest. OHDM. 2011;10(4):193–8.*
18. *Heinrich-Weltzien R, Zorn C, Monse B, Kromeyer-Hauschild K. Relationship between Malnutrition and the Number of Permanent Teeth in Filipino 10- to 13-Year-Olds. Biomed Res Int. 2013;2013(205950):1–8.*
19. *Mugonzibwa EA, Kuijpers-Jagtman AM, Laine-Alava MT, van't Hof MA. Emergence of permanent teeth in Tanzanian children. Community Dent Oral Epidemiol. 2002;30(6):455–62.*
20. *Wedl JS, Schoder V, Blake FAS, Schmelzle R, Friedrich RE. Eruption times of permanent teeth in teenage boys and girls in Izmir (Turkey). J Clin Forensic Med. 2004;11(6):299–302.*
21. *Lakshmappa A, Guledgud M, Patil K. Eruption times and patterns of permanent teeth in school children of India. Indian J Dent Res. 2011;22(6):755-63..*
22. *Bishara SE. Textbook of Orsthodontics. 1st ed. Philadelphia: W.B. Saunders company; 2001.*
23. *Niswander JD, Sujaku C. Dental eruption, stature, and weight of Hiroshima children. J Dent Res. 39:959–63.*
24. *Khan N. Eruption time of permanent teeth in Pakistani children. Iran J Public Health. 2011;40(4):63–73.*
25. *Khan N, Chohan A, AlMograbi B, AlDeyab S, Zahid T, AlMoutairi M. Eruption time of permanent first molars and incisors among a sample of Saudi male schoolchildren. Saudi Dent J. 2006;18:18–24.*
26. *Almonaitiene R, Balciuniene I, Tutkuviene J. Standards for permanent teeth emergence time and sequence in Lithuanian children, residents of Vilnius city. Stomatologija. 2012;14(3):93–100.*