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ERUPTION DATES OF PRIMARY AND PERMANENT TEETH AMONG A GROUP OF EGYPTIAN CHILDREN

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ABSTRACT :

The regularity of the eruption process is so unique that it is used as one of the markers of assessing physiological maturity of an individual in the comparison of chronological age versus dental age. ***Aim:*** *to determine the eruption dates of primary and permanent teeth in a group of Egyptian children.* ***Subjects and Methods****: This is a cross-sectional observational study consisting of* ***about twelve thousand*** *healthy Egyptian children of both sexes. They were randomly selected from children attending maternal and child welfare centers, public hospitals as well as governmental schools. Children were selected according to certain criteria then examined and the status of the eruption of each primary and permanent tooth was recorded on a specially designed survey sheet.* ***Results:*** *There was no statistically significant difference in mean ages of eruption of primary and permanent teeth between right and left sides. The prevailing sequence of eruption of primary teeth among boys and girls was central incisors, lateral incisors, first primary molars, canines, second primary molars. However, for permanent teeth the sequence of eruption differed between boys and girls. For primary dentition, there was a statistically significant difference between mean ages of eruption and the standard range for some teeth;this was also noted in most of the permanent teeth.* ***Conclusions:*** *The primary dentition exhibited less deviation from the standard range than the permanent dentition. Dates and sequence of eruption of primary and permanent teeth differ among populations.*

KEYWORDS : *Children, Primary Teeth, Permanent Teeth, Dates of Eruption.*

INTRODUCTION

The origin of the term “eruption” is derived from the Latin word “eruptione”, which means output with momentum (Neto and Falcão, 2014).Clinically, tooth eruption is the appearance of any part of the crown through the gingiva. The trait is qualitative as it can be reported as present or absent (Sharma, 2014). The movements of the teeth till the development of adult occlusion lasts (excluding third molar) for approximately 13-15 years, during which teeth erupt successively (Rãducanu and Feraru, 2007). Eruption of primary teeth begins around 4-8 months of age with the eruption of the lower incisors, and is completed at around 24-36 months of age upon the eruption of the second primary molars (Al-Batayneh *et al.*, 2015). The regularity of the eruption process is so unique that it is used as one of the markers of assessing physiological maturity of an individual in comparing of chronological age versus dental age (Sharma, 2014). Understanding of the eruption process aided in age estimation for children, shed light on management of teething issues and likely points towards a treatment philosophy of minimal intervention with definite building blocks of close observation and monitoring (Hernandez *et al.*, 2008).Both longitudinal and cross-sectional studies had beenreported differences in tooth eruption times among different ethnic groups (Aly, 2009). Permanent

teeth erupt considerably earlier in human populations with African ancestry than in populations from Asia and Europe. Both heredity and environmental factors have been probed to explain inter-population and intra-population differences in tooth eruption times (Sharma, 2014).Population-specific standards of primary tooth eruption are valuable for the detection of temporal disturbances or anomalies affecting tooth development during early childhood. In addition, the estimation of dental age by referral to available standards of primary and permanent teeth eruption is important if caries preventive programs are to be introduced. Moreover, population-specific standards of teeth eruption should be available for reliable dental age estimation for forensic and police investigations and for anthropological applications[4]. Clinical eruption of teeth has always been of particular interest to various specialists and scientists because knowledge of teeth eruption chronology and sequence is essential in children healthcare planning and numerous fields of clinical dentistry (Aly, 2009 and Almonaitiene*et al.*, 2012). Disturbance in tooth eruption time could be a symptom of a general condition or indication of altered physiology and craniofacial development (Almonaitiene *et al.*, 2010).An accurate knowledge of contemporary dental eruption pattern is important for monitoring occlusal development, diagnosing malocclusions, and efficiently planning the dental treatment of children and adolescents (Kaur *et al.*, 2010). Therefore, the specific standards of the time of eruption of teeth characterize an important resource for general dental practitioners, orthodontists and pedodontists (Khan, 2011); such standards help diagnose untimely developmental odontogenic anomalies and make the decision upon whether to treat or extract badly carious primary teeth and whether to provide space maintenance following their extraction (Shaweesh, 2012).

Differences in the permanent tooth eruption between ethnic groups and genders have been reported by (Al Quahtani *et al.*, 2010). Eruption of primary teeth has been investigated in different racial and ethnic groups. The general trend was that children of African descent have their teeth erupt earlier and those of Asian descent later than children of European descent (Nystrom *et al.*, 2000). The timing of eruption of primary teeth in Egyptian children was comparable to that of Saudi Arabians and Nigerians, but earlier than Iraqis and Nepalese. The Americans showed the earliest dates in relation to other countries. Nepalese children were slightly delayed in the eruption of incisor teeth compared with all other populations (Soliman *et al.*, 2011).A study on dental maturation assessment was conducted on a group of 378 Egyptian children (186 males and 192 females) within the age range of 6 to 15 years applying Nolla's technique. Lower teeth were found to be ahead of upper teeth in all age groups. It also found that the development of maxillary and mandibular teeth in girls were significantly higher than those of boys (Abou El-Yazeed *et al.*, 2008).

METHODOLOGY

The articles used in this meta-analysis were obtained by a project including various master's thesis among a large number of Egyptian governorates, a literature search using the titles of articles and, where available, abstracts, as well as full-length articles were analyzed. From the references in these articles other relevant literature was accessed. To be included in this meta-analysis the article had to have used emergence of primary or permanent teeth or be very similar; show the number of subjects; used simple regression analysis and used upper and lower teeth. Sex, age, and present permanent teeth were recorded. Wisdom teeth were excluded.

Tables (1) and (2) show the timing of eruption of primary teeth (month) for children in some countries while the tooth numbering was written using the two digit system [International Dental Federation]. It is noteworthy that comparisons with other populations' data were made in terms of means or medians of eruption ages.

Table 1: Timing of eruption of primary teeth (month) for boys in some countries.

Tooth No.	Egypt 1987	Egypt 2011	Egypt 2015	Nigeria 2008	Saudi Arabia 2003	Australia 2010	India 2014	Jordon 2015	Arizona 2003
	Average of eruption dates (month)								
51, 61	14.5	9.8	20.3	9.3	11.2	10.8	14.5	10.5	9.4
52, 62	15.9	12.0	21.2	12.0	13.1	12.2	15.5	12.9	10.6
53, 63	22.0	19.4	25.2	17.8	21.1	19.3	26.0	20.6	19.5
54, 64	18.4	17.1	23.8	16.0	16.9	15.9	21.5	15.5	15.7
55, 65	29.9	25.4	28.7	26.1	28.2	27.8	36	27.7	27.9
71, 81	10.4	8.0	18.8	7.6	8.4	8.6	13.5	8.3	6.6
72, 82	16.7	13.0	22.2	12.4	14.4	14.1	17.5	14.6	12.5
73, 83	22.3	20.3	25.8	18.2	21.0	19.8	26.0	20.9	19.5
74, 84	19.0	17.0	23.9	16.3	17.2	16.6	22.0	16.1	16.0
75, 85	29.8	25.6	27.7	24.1	27.9	26.9	35	27.7	27.0

Cited from El-Beheri *et al.*(1987), Soliman *et al.*(2011), Abd El Hakam(2015), Owotade *et al.*, (2008), Al-Jasser *et al.*(2003),Woodroffe *et al.*(2010), Rao *et al.*(2014), Al-Batayneh(2015) and Poster *et al.*(2003).

Table 2: Timing of eruption of primary teeth (month) for girls in some countries.

Tooth No.	Egypt 1987	Egypt 2011	Egypt 2015	Nigeria 2008	Saudi Arabia 2003	Australia 2010	India 2014	Jordan 2015	Arizona 2003
	Average of eruption dates (month)								
51, 61	13.5	9.9	20.3	10.2	11.2	10.8	13.5	10.6	9.4
52, 62	16.8	13.2	21.7	13.0	13.3	12.2	15.0	13.1	10.6
53, 63	24.5	19.8	26.5	18.3	21.0	19.3	26.5	19.8	19.5
54, 64	20.6	17.0	21.8	16.9	16.9	15.9	20.5	15.5	15.7
55, 65	30.8	28.9	30.5	26.1	28.3	27.8	36.5	27.2	27.9
71, 81	11.1	7.9	18.96	7.9	8.5	8.6	12.5	8.1	6.6
72, 82	17.8	13.2	23.2	12.9	14.6	14.1	17.5	13.9	12.5
73, 83	26.4	19.6	27	18.8	21.1	19.8	26.0	19.8	19.5
74, 84	22.1	16.7	24.7	16.0	17.1	16.6	23.5	15.8	16.0
75, 85	30.6	28.1	29.2	24.2	27.6	26.9	35.0	27.2	27.0

Cited from El-Beheri *et al.*(1987), Soliman *et al.*(2011), Abd El Hakam(2015), Owotade *et al.*(2008), Al-Jasser *et al.*(2003),Woodroffe *et al.*(2010), Rao *et al.*(2014), Al-Batayneh(2015) and Poster *et al.*(2003).

Tables (3&4) show timing of eruption of permanent teeth (year) for children in some countries while the tooth numbering was using the **I**nternational **D**ental **F**ederation system. It is noteworthy that comparisons with other populations' data were made of means or medians of eruption ages.

Table 3: Timing of eruption of permanent teeth (year) for boys in some countries.

Tooth No.	Egypt 2011	Egypt 2015	Spain 2008	India 2010	Lithuana 2012	Jordan 2012	Australia 2003
	Average of eruption dates (year)						
11, 21	7.25	9.16	7.17	7.10	6.89	7.25	7.4
12, 22	7.50	9.78	8.21	8.10	7.96	8.45	8.6
13, 23	10.83	10.90	11.63	10.80	11.09	11.56	11.8
14, 24	9.79	10.34	10.86	10.40	9.91	10.45	11.3
15, 25	10.00	10.66	11.48	11.80	10.83	11.37	12.1
16, 26	6.75	8.64	6.28	6.13	6.41	6.35	6.7
17, 27	12.00	11.21	12.48	12.84	12.31	12.61	12.7
31, 41	6.25	8.71	6.29	6.30	6.13	6.48	6.6
32, 42	6.80	9.28	7.52	7.42	7.20	7.51	7.8
33, 43	9.75	10.89	10.61	10.67	10.37	10.63	11.0
34, 44	9.05	10.65	10.65	10.10	10.12	10.54	11.2
35, 45	10.42	10.63	11.66	11.64	11.06	11.73	12.1
26, 46	6.92	7.12	6.32	5.12	6.21	6.24	6.6
37, 47	12.04	10.83	11.96	12.75	11.69	12.19	12.2

Cited from Sharaf (2011), Abd El Hakam *et al.* (2015), Hernández *et al.* (2008), Kaur *et al.*(2010), Almonaitiene *et al.* (2012), Shaweesh(2012) and Diamanti *et al.* (2003).

Table 4: Timing of eruption of permanent teeth (year) for girls in some countries.

Tooth No.	Egypt 2011	Egypt 2015	Spain 2008	India 2010	Lithuania 2012	Jordanian 2012	Australia 2003
	Average of eruption dates (year)						
11, 21	7.13	9.13	6.89	7.04	6.75	7.11	7.2
12, 22	7.50	9.58	7.37	8.39	7.55	8.07	8.2
13, 23	10.75	12	10.95	10.89	10.51	11.09	11.2
14, 24	9.63	11.04	10.36	9.80	9.51	10.01	10.8
15, 25	10.00	10.71	11.15	11.50	10.63	11.00	11.7
16, 26	6.50	6.23	6.16	5.80	6.26	6.20	6.6
17, 27	11.63	11.29	12.24	12.20	12.08	12.32	12.3
31, 41	6.38	8.74	6.00	6.57	5.87	6.32	6.4
32, 42	6.75	9.22	7.26	7.80	6.86	7.34	7.5
33, 43	9.34	10.25	9.79	10.50	9.58	9.84	10.1
34, 44	8.71	10.51	10.29	10.22	9.65	10.12	10.6
35, 45	10.25	10.92	11.28	11.20	10.56	11.20	11.7
36, 46	6.50	7.2	6.09	4.64	5.99	6.08	6.4
37, 47	11.92	11.10	11.46	12.21	11.28	11.66	11.8

Cited from Sharaf (2011), Abd El Hakam *et al.* (2015), Hernández *et al.*(2008), Kaur *et al.*(2010), Almonaitiene *et al.*(2012), Shaweesh (2012) and Diamanti *et al.*(2003).

RESULTS

No significant differences existed when comparing the sides of each jaw. However, The sequence of tooth eruption differs significantly in the lower and upper jaws. In comparing the upper and the lower jaws of both genders, it becomes evident that there is a tendency for earlier tooth eruptions in the lower jaw. In respect to the tooth eruption sequence, a change was noted in the upper jaw. In contrary to the reports of

other authors, the second premolar has changed places with the canine and erupts prior to this tooth. This could also be demonstrated in recent studies from New York and Bremen (Germany). Otherwise no major differences concerning the sequence of tooth eruption were observed, when compared with the results obtained from other populations. Concerning the entire dentition, no acceleration of the tooth eruption could be noted. The computed differences of teeth eruption as a mean value calculated over all teeth was ±1 year at maximum, compared with studies from different continents. In tables(5) and (6) the tooth numbering was done using the Palmer **N**otation **S**ystem and it show the mean dates of eruption for both primary and permanent teeth among the studied groups.

Table 5: Eruption dates (month) of primary teeth among Egyptian studied children by jaws for both sexes.

Tooth	Dates of Eruption (year)							
	Upper jaw				Lower jaw			
	Boys		Girls		Boys		Girls	
	Mean ± SD		Mean ± SD		Mean ± SD		Mean ±SD	
A	14.54	2.93	14.77	2.91	13.52	3.12	15.48	3.86
B	15.96	2.82	18.18	2.71	16.82	3.42	18.29	3.56
C	22.96	2.59	24.35	2.68	23.14	2.59	20.60	2.53
D	20.56	2.44	19.40	2.59	20.01	2.48	21.26	2.39
E	28.05	2.77	25.05	1.94	27.52	2.60	28.20	1.98

Table 6: Eruption dates (year) of permanent teeth among Egyptian studied children by jaws for both sexes.

Tooth	Dates of Eruption (year)							
	Upper jaw				Lower jaw			
	Boys		Girls		Boys		Girls	
	Mean ± SD		Mean ±SD		Mean ± SD		Mean ±SD	
1	7.71	1.26	7.71	1.41	6.91	1.37	6.79	1.52
2	8.45	1.23	8.17	1.42	7.52	1.46	7.56	1.47
3	10.81	1.11	10.74	1.15	9.88	1.35	9.72	1.41
4	10.02	1.11	10.02	1.22	9.80	1.72	9.74	1.42
5	10.30	1.25	10.36	1.18	10.45	1.31	10.45	1.37
6	7.03	1.42	6.79	1.55	6.70	1.51	6.90	1.66
7	11.21	1.47	11.14	1.32	11.26	1.62	11.16	1.69

DISCUSSION

Human eruption is a unique developmental process in the organism. The etiology or the mechanism behind eruption has never been fully understood and the scientific literature in the field is extremely sparse. Meta-analyses can organize results and thereby facilitate new findings, or put old findings in a new perspective. However, they also raise problems. A frequent criticism is about the number of studies included in the meta-analysis. In some cases, there is a few studies that meet the inclusion criteria. For example, in the present study few studies did. However, inspection of the literature shows that researchers start with a large number of studies and then split them into smaller groupings. In this meta-analysis, well-defined criteria for inclusion of studies were applied. The selection of studies was based on strict distinctions such as age. To avoid bias, the present analysis was carried out considering only the criteria for inclusion. From a dentist's point of view, it is necessary to reconsider tooth eruption times occasionally (Emilia *et al.*, 2011). For valid clinical assessment of the timing and sequence of tooth eruption in a child, it was always recommended that dental practitioners refer to the standards of tooth eruption derived from the population

to which that child belongs to Shaweesh (2012).The population-specific times of tooth eruption had been published in the dental literature using different methodological and statistical approaches. Cross-sectional approaches as in the present study involved observing the teeth that had erupted into the mouth at a single cross-section of time. This enabled the investigator to recruit large samples of subjects with less expenses and efforts. The age of children selected for primary dentition ranged from 5 to 36 months, this age was selected to include eruption of all primary dentition similar to studies conducted by Soliman *et al.*(2011) from Egypt and Owotade *et al.* (2008) from Nigeria. While the age of children selected for permanent dentition ranged from 5 to 13 years to include eruption of the permanent dentition from the first tooth to the last tooth excluding the third molars due to its large variability of eruption time, this came in agreement with Friedrich *et al.* (2009) from Syria and Sharaf (2011) from Egypt.

Apart from some modifications in the sequence of eruption, in the last decades it was noticed that permanent teeth tended to appear at a younger age. This process was related to the accelerated process of general development and the beginning of puberty at a younger age which were determined by the growth of the life standards (Nichifor *et al.*, 2011). In comparing levels of asymmetry between the primary and permanent dentition according to Guatelli-Steinberg *et al.* (2006), it was suggested that symmetry in tooth eruption directly associated with the developmental time span for each specific class of teeth (Helmy *et al.*, 2016). This would suggest that the primary dentition may exhibit less asymmetry than the permanent dentition due to the controlled intrauterine environment and shorter period of calcification and development (Darwish *et al.*, 2016). From the results of the present study it was obvious that mean ages of eruption of primary and permanent teeth in Egyptian population was different from that of other populations due to several racial, socioeconomic, environmental, or genetic factors which indicate that considering Egyptian standards in preventive, orthodontic, pedodontic and educational fields would be more reliable.

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REFERENCES

1. Abd El-Hakam R., Taha S., Abou El Yazeed M. and Nasr R. 2015. A study on the eruption sequence of primary and permanent teeth in a group of children in Kafr El-Sheikh Governorate. Rev Res J, 4: 1-11.
2. Abou El-Yazeed M., Abou-Zeid A.W. and Tawfik W. 2008. Dental maturation assessment by Nolla's technique on a group of Egyptian children. Aust J Basic Appl Sci, 2: 1418-24.
3. Al Quahtani S., Hector M. and Liversidge H. 2010. Brief communication: The London atlas of human tooth development and eruption. Am J Phys Anthropol, 142: 481-90.
4. Al-Batayneh O., Shaweesh A. and Alsoreeky E. 2015. Timing and sequence of emergence of deciduous teeth in Jordanian children. Arch Oral Biol, 60: 126-33.
5. Al-Jasser N. and Bello L. 2003. Time of eruption of primary dentition in Saudi children. J Contemp Dent Pract, 4: 65-75.
6. Almonaitiene R., Balciuniene I. and Tutkuviene J. 2010. Factors influencing permanent teeth eruption. Part One - General factors. Stomatologija Baltic Dent Maxillofac J, 3: 67-72.
7. Almonaitiene R., Balciuniene I. and Tutkuviene J. 2012. Standards for permanent teeth emergence time and sequence in Lithuanian children - Residents of Vilnius city. Stomatologija Baltic Dent Maxillofac J, 3: 93-100.
8. Aly R. 2009. Pattern of deciduous teeth emergence in a sample of Egyptian children. MD Thesis, Faculty of Dentistry, Ain Shams University.
9. Darwish Y., Taha S., Abou El Yazeed M. and Nasr R. 2016. Eruption sequence of children primary and permanent teeth in an urban area of El Qualubia Governorate. Indian Streams Res J, 6: 1-15.

10. Diamanti J. and Townsend G. 2003. New standards for permanent tooth emergence in Australian children. Aust Dent J, 48: 39-42.
11. El-Beheri S. and Hussein M. 1987. Sequence and age of emergence for deciduous teeth among a group of children in urban and rural areas of Egypt. Egypt Dent J, 33: 13-30.
12. Emilia A., Alexandru O., Szabo K,. Tudor A. and Bratu E. 2011. Dental maturity - A biologic indicator of chronological age: digital radiographic study to assess dental age in Romanian children. Int J Biol Biomed Eng, 5: 32-40.
13. Friedrich R., Habib S. and Scheuer H. 2009. Eruption times of permanent teeth in children and adolescents in Latakia (Syria). Arch Kriminol, 223: 84-97.
14. Guatelli-Steinberg D., Sciulli P. and Edgar H. 2006. Dental fluctuating asymmetry in the Gullah: Tests of hypotheses regarding developmental stability in deciduous vs. permanent and male vs. female teeth. Am J Phys Anthropol, 129: 427-34.
15. Helmy R., Taha S., Abou El Yazeed M. and Nasr R. 2016. Eruption sequence of primary and permanent teeth in a group of Egyptian children at Giza Governorate. Indian Streams Research Journal, 6: 1-15.
16. Hernandez M., Espasa E. and Boj J. 2008. Eruption Chronology of the Permanent Dentition in Spanish Children. J Clin Pediatr Dent, 32: 347-350.
17. Kaur I., Singal P. and Bhatnagar D. 2010. Timing of permanent teeth emergence and dental caries among Jatsikh children of public and government schools of Patiala District. Anthropologist, 12: 141-8.
18. Khan N.2011. Eruption time of permanent teeth in Pakistani children. Iranian J Publ Health, 40: 63-73.
19. Neto P. and Falcão M. 2014. Eruption chronology of the first deciduous teeth in children born prematurely with birth weight less than 1500g. Rev Paul Pediatr, 32: 17-23.
20. Nichifor M., Scutariu M., Mocanu C., Crauciuc E., Ungureanu E., Toma O. and Scutariu M. 2011. Study regarding the sequence of eruption of permanent teeth in a group of children from Buzau. Sci Ann "AL. I. Cuza" Univ IASI, Series Mol Genet Biol, 12: 85-94.
21. Nystrom M., Peck L., Kleemola-Kujala E., Evalahti M. and Kataja M. 2000. Age Estimation in Small Children: Reference Values Based on Counts of Deciduous Teeth in Finns. Forensic Sci Int, 110: 179-188.
22. Owotade F., Oziegbe E., Sofowora C., Esan T. 2008. Eruption chronology of primary teeth in Nigerian children, 32: 341-5.
23. Poster W., Morse D., Pendrys D., Zhang H. and Mayne S. 2003. Median ages of primary teeth in White and Hispanic children from Arizona. Pedaitr. Dent., 25: 257-61.
24. Rãducanu A. and Feraru I. 2007. Delayed eruption- Case study. Oral Health Dent Manag in the Black Sea Countries, 6: 58-65.
25. Rao A., Rao S., Shenoy R. and Ghimire N. 2014. Changing trends in tooth eruption-survey among children of Mangalore, India. Int J Adv Res, 2:449-4.
26. Sharaf R. 2011. A study on the sequence of eruption of permanent teeth in a group of Egyptian children. MD. Thesis, Faculty of Oral and Dental Medicine, Cairo University.
27. Sharma k. 2014. Genetic determinants and dynamics of permanent teeth emergence in Northwest Indian twins: A Chrono-genetic study. HOMO-J Comp Hum Biol, 65: 450-63.
28. Shaweesh A. 2012. Clinical duration of permanent tooth eruption in Jordanians: from emergence to functional eruption. Intl J Stomatol Occl Med, 5:70-6.
29. Soliman N., El-Zainy M., Hassan R. and Aly R. 2011. Timing of Deciduous Teeth Emergence in Egyptian Children. East Mediterr Health J, 17(11): 875–881.
30. Woodroffe S., Mihailidis S., Hughes T., Bockmann M., Seow W. and Gotjamanos T. 2010. Primary tooth emergence in Australian children: timing, sequence, and patterns of asymmetry. Aust Dent J, 55: 245-51.