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Clinical duration of eruption of deciduous teeth in Jordanian children: A cross-sectional study

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ABSTRACT

Objective: The aim of this study was to investigate the clinical duration of eruption (**CDE**) for deciduous teeth in Jordanian children, from the moment of gingival emergence until functional occlusal contact.
Design: This cross-sectional study included 1988 children (885 females, 1103 males) aged 1–45 months examined for deciduous tooth emergence. Through probit regression analysis (SPSS Version 16.0), the median ages of emergence (MAE) and of functional eruption (MAF) were calculated per tooth; time difference between the two events represented CDE in months. Mann Whitney *U* tests and two-tailed Spearman's bivariate correlation test were used to investigate sexual dimorphisms in CDE, and find relationships between MAE and CDE, respectively. Significance was set at $P \leq 0.05$.
Results: The average CDE was (4.45 ± 1.96) months; it was less in males (4.33 ± 1.99) than in females (4.57 ± 1.93) with no significant gender differences ($P = 0.38$). Longest and shortest CDE were for maxillary first molars and mandibular lateral incisors, respectively. None of the teeth showed statistically significant differences in CDEs between genders. In addition, there were insignificant positive moderate correlations between MAE and CDE ($r = 0.60, 0.52$, $P = 0.07, 0.12$ for males and females, respectively).
Conclusions: This study has established the first standards for CDE in deciduous teeth for Jordanian children with an average CDE (4.5 ± 2, range 1.6–8 months). Some variations in CDE can be explained by variations in age of emergence however, variations in CDE were not related to gender. The deciduous dentition in Jordanians is in active state of eruption between approximately 8.2–32 months.

1. Introduction

Teething is considered a significant event in the growth and development of the child by parents and health care professionals. Human teeth proceed through three phases of eruption; pre-emergent (when the dental follicle enlarges until partial root development has been completed and overall dental movement is minimal, but it may have a slight facial transposition in the alveolar bone) (Fanning, 1961), movement of the tooth intra-osseously (by resorption of overlying tissues thus, creating an eruptive path and eruptive force to move the tooth vertically) (Cahill & Marks, 1980), and post-emergent development (movement from the first emergence through the gingiva until it reaches occlusal contact with its antimere) (Haavikko, 1970).

The term 'eruption' refers to the full dynamic process of tooth movement both intra-osseously and clinically until an occlusal contact has been established (although teeth will still have some inherent eruption potential even after occlusal contact). However, the term 'eruption' has been interchangeably used with 'emergence' in some publications on timing of tooth development. A more appropriate term to denote the stage at which an erupting tooth has reached the occlusal plane and started to function in the mouth would be 'functional eruption' (Shaweesh, 2012). During clinical eruption of the tooth in the oral cavity, the duration from tooth emergence until functional eruption—termed clinical duration of deciduous tooth eruption (CDE) in this study—is clinically significant. It has been shown that teeth are vulnerable to plaque accumulation and caries initiation during this period (Carvalho, Ekstrand, & Thylstrup, 1989, 1991). In addition to other symptoms of gingival redness, gingivitis, eruption cysts, which in some cases require follow up of erupting teeth (Owais, Zawaideh, & Al-Batayneh, 2010).

In clinical practice, knowledge of the timing and sequence of tooth emergence helps dentists and health care professionals in identification of untimely emerging teeth, developmental anomalies, when to observe or intervene, and to estimate dental age for forensic purposes

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(Shaweesh, 2012). The variation in chronology of deciduous tooth emergence between different populations implies that standards of tooth emergence are ideally applicable to the population from which they were derived. Unfortunately, the dental literature is now deficient with published standards on tooth-specific standards of clinical duration of deciduous tooth emergence specific to Jordanian children, which could enable clinicians to estimate the frequency at which the examination of partially erupting teeth should be carried out.

To the best of the author's knowledge, standards of CDE have not been provided in the literature for all deciduous teeth, and particularly in Jordanians. A prospective cohort study of seven months' duration on 21 infants in Australia (mean age at commencement of the study was 14.4 months) reported on all teeth except the maxillary and mandibular second molars. They found that deciduous teeth take an average of two months to reach full eruptive position, and have a mean rate of eruption of 0.7 mm per month suggesting that young children were in an active state of eruption between 6 months until 3 years of age (Hulland, Lucas, Wake, & Hesketh, 2000). Therefore, through a cross-sectional approach in a sample of Jordanian infants, the aim of this study was to report the first standards on CDE for all deciduous teeth in a large sample which could be useful for pediatric dentists and other health care professionals in managing teething problems and eruption anomalies associated with emerging deciduous teeth such as caries, gingival inflammation, and others.

2. Materials and methods

2.1. Subjects

A total of 1988 Jordanian children (885 females and 1103 males) aged 1 to 45 months were selected from different public and private nursery schools and maternity and child health centers in three governorates in Jordan: Irbid (north), Amman (middle) and Karak (south). The children were participants in a cross-sectional observational study (Al-Batayneh, Shaweesh, & Alsoreeky, 2015) on the timing and sequence of deciduous tooth emergence in the Jordanian population. The study had been approved by the Institutional Review Board at Jordan University of Science and Technology (JUST), Irbid, Jordan (Ref.: 3/31/2011). All participants were Jordanian citizens of Arab ancestry; ethnically 95–97% of Jordanian citizens are Caucasoid Arabs who had lived in the region for several generations. Therefore, the subjects of this study were assumed to have common ancestry with minimal ethnical heterogeneity.

2.2. Sample selection

The Governorates of Irbid, Amman and Karak are the most populous in each represented region; north, middle and south. Each of the selected governorates contained urban and rural districts that were all included in the sampling process. In the urban districts, there were two types of nursery schools; governmental and private. On the other hand, all rural districts contained governmental schools and none contained private schools. The sampling was based on multistage clustering. Within each urban district, two schools per school type and one maternity and child health center were randomly selected. All of the selected private schools were mixed gender schools. In the rural districts, two governmental schools and a maternity and child health centers (if present) were selected. In each school, ten students were randomly chosen; five boys and five girls. The total numbers of selected schools and maternity and child health centers were 18 altogether.

2.3. Data collection

Based on previous work by the research team (Al-Batayneh et al., 2015), a calibrated examiner recorded the date of birth of each subject and collected data on emerged (**EM**) and functionally erupted (**FE**) deciduous teeth; a tooth was considered as emerged (EM) if any part of it was visible or had penetrated the oral mucosa but had not yet reached the occlusal plane or made contact with a tooth in the opposing arch. On the other hand, a functionally erupted (FE) tooth should have reached the occlusal plane or made contact with a tooth in the opposing arch. In the case of uncertainty, a thin sheet of articulating paper was used to verify that a given tooth had reached occlusal contact. In this respect, the outcome for either of emerged teeth or functionally erupted teeth was binary; EM/non-EM and FE/non-FE, respectively. Deciduous teeth that were believed to have been extracted before examination were considered functionally erupted. On the other hand, in cases of uncertainty, teeth thought to have been missing (due to agenesis) or impacted were excluded, as the inclusion of such subjects would give misleading results given the type of analysis followed in this study. Where anterior teeth did not reach the occlusal plane, we used incisal edge levelling with the occlusal plane to determine functional eruption.

The chronological age of each subject was calculated by subtracting the date of birth from the date of examination. Then, the age was approximated to the nearest full 3 months to give age groups from 3 to 45 months. Within each age group and for a given deciduous tooth, emerged and functionally erupted cases were counted separately. The output of each count represented the 'response frequency' of the outcome of the dependent variable for a given case (age group). The total number of the subjects in the given age group represented the 'total observed' of the dependent variable. The lists of response frequencies for emerged and functionally erupted teeth along with the total observed for all age groups were separately imported into SPSS (Version 16.0) for probit regression analysis for each deciduous tooth at a given time.

2.4. Statistical analysis

The statistical tests used required that chronological ages be approximated to the nearest full 3 months, which yielded fifteen 3-month-apart age groups. Through Probit regression (SPSS Version 16.0), the median age of emergence (**MAE**) as detailed in Al-Batayneh et al. (2015), and the median age of functional eruption (**MAFe**) were calculated per tooth along with the 5th and 95th percentiles. According to Al-Batayneh et al. (2015), the differences in MAE of all corresponding pairs of contra-lateral teeth were found to be statistically insignificant at a $P \leq 0.05$, indicating that the MAE for all deciduous teeth was significantly bilateral. This was indicated by the finding that the null value of 1.0 was located within the 95% confidence limits of the relative median potency across sides. Therefore, only the data for the right side are presented. A single-sided presentation is consistent with the approach followed by many relevant studies (Al-Batayneh et al., 2015; Diamanti & Townsend, 2003; Shaweesh, 2011)

The CDE was calculated by subtracting the smaller MAE from the greater MAFe. The average and standard deviation of the CDE was also calculated for all of the teeth collectively. Mann Whitney *U* test (SPSS Version 16.0) was used to investigate the significance of the difference in CDE between males and females for each tooth separately. In addition, two-tailed Spearman's bivariate correlations (SPSS Version 16.0) were run to find out if a relationship existed between the MAE and the CDE in all deciduous teeth. The significance level was set at $P \leq 0.05$.

3. Results

Table 1 presents the 15 three-month-age groups and the number of subjects per group with details for the total sample and each gender. The number of subjects per group ranged from 13 (45 month-olds) to 365 (9 month-olds) (Al-Batayneh et al., 2015). Tables 2 and 3 show the results for males and females, respectively of the median age of functional eruption/MAFe (with the 5th and 95th percentiles), the MAE (with the 5th and 95th percentiles), and the resultant CDE for each deciduous tooth for the total sample.