



Timing of clinical eruption of third molars in a Jordanian population



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ABSTRACT

Objectives: This study aimed at providing the first standards on the timing of third molar eruption in Jordanians.

Methods: A total of 571 healthy Jordanian adolescents and young adults aged 15–27 years (275 males and 296 females distributed into one-year age groups) were clinically examined for third molar eruption. Presence of four clinical eruption stages from crown emergence to full eruption were counted and expressed each as a frequency relative to the total of participants within a given age group. Using probit regression, median ages at each of the eruption stages were calculated for the whole sample and for both genders.

Results: In the whole sample, maxillary and mandibular third molars were found to emerge at 20 and 20.6 years and to reach full eruption at 22.7 and 23.5 years respectively. At all of the four clinical eruption stages, third molars of males and lower jaw slightly preceded those of females and upper jaw respectively. However, none of the differences were statistically significant.

Conclusions: The first data on the timing of clinical eruption of third molars in a Jordanian population have been provided to be utilized in various clinical and research fields of orthodontics, dental pathology, oral surgery, paleodontology, forensic dentistry and police sciences. As the clinical duration of third molar eruption ranges from 20 to 24 years, the responsibility for providing care of third molar eruption problems is shifted from secondary schools to tertiary education, governmental and private work bodies.

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1. Introduction

Timing of third molar eruption is crucial for some fields of dentistry, paleontology and forensic sciences. Orthodontists are often challenged with predicting the effect of third molar eruption on the final outcome of orthodontic treatment, which will have an impact on their treatment plans, operative procedures and/or postoperative patient follow-up. This is also complicated by the fact that third molars are commonly implicated in various localized pathologies such as impaction, malalignment, crowding, cystic changes, pathologic tooth resorption, pericoronitis and periodontitis (Garcia & Chauncey, 1989; Garcia, Sinclair, & Chauncey, 1986; Laskin, 1971). In oral pathology and oral surgery, when the population norms of normal eruption of third molars are clinically available, it becomes easier for a dental practitioner to distinguish

normal late eruption from impaction, which in turn, would affect the treatment plan.

In police investigations concerning adolescents or young adults such as illegal immigrants or asylum seekers who are unable or unwilling to provide date of birth records, providing an estimate of dental age may be the quickest and easiest approach to aid confirming legal adulthood (Age assessment in people smuggling cases, 2016; Roberts & Lucas, 2009) which would, in turn, reduce the likelihood of the minors being classified as adults. Similarly, dental age estimation is a reliable approach in forensic medicine for the identification of crime and disaster victims whose date of birth records have been lost especially when other body parts are missing.

While other body markers can be used for chronologic age estimation, such as bone maturity (e.g. hand wrist radiographs) and physical characteristics (e.g. body weight, height and sexual characteristics) (Cole, 2015), estimation of chronologic age using dental markers carries a smaller risk of misidentifying minors as adults when compared with bone radiographs (Cole, 2015). Besides, dental age estimation especially when established by

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clinical examination is less invasive and quicker than bone maturity tests when time is of the essence.

Demirjian's system is among the most widely used systems of dental age estimation, which was published in 1973 (Demirjian, Goldstein, & Tanner, 1973). However, Demirjian's system of age estimation is only effective for cases where permanent teeth except third molars are developing. Therefore, such systems of dental age estimation seem to be less accurate in older adolescents and young adults whose permanent teeth apart from third molars have been fully erupted and the roots fully developed. Therefore, for more effective and reliable dental age estimation in adolescents or young adult cases, data gathered on third molar development and eruption can sometimes be the only available dental measures for that age category.

Since the timing of eruption of third molars varies across different populations and ethnic groups, it is recommended that norms on the eruption of third molars be derived from the population or ethnic group to which they are applied (Shaweesh, 2012b). Therefore, norms on third molar eruption have been separately published for some specific populations or ethnic groups (Brkic et al., 2011; Byahatti & Ingafou, 2012; Caldas et al., 2012; Chagula, 1960; Fanning, 1962; Guo et al., 2014; Hassanali, 1985; Odusanya & Abayomi, 1991; Olze et al., 2008a; Olze et al., 2008b; Olze et al., 2010; Otuyemi, Ugboko, Ndukwe, & Adekoya-Sofowora, 1997). In other works, though very few, third molar eruption norms have been provided as part of full permanent dentition data (Brown, 1978; Clements, Davies-Thomas, & Pickett, 1957; Garn, Wertheimer, Sandusky, & Mc Cann, 1972).

Although the standards of permanent and deciduous tooth eruption in Jordanians have been recently provided (Al-Batayneh, Shaweesh, & Alsoreeky, 2015; Shaweesh, 2012a, 2012b, 2013; Shaweesh, Al-Omiri, & Alsoleihat, 2011; Shaweesh & Alsoleihat, 2013), no data on the timing of third molar eruption have yet been published. Therefore, the current study aimed at providing the first standards on the timing of third molar eruption in Jordanians adolescents and young adults. Such data are expected to be usefully used in orthodontics, forensic dentistry and police investigations particularly with the urging need of confirming legal adulthood for a high number of illegal young adult immigrants who have been fleeing the current Syrian Civil War and crossing the Syrian-Jordanian borders with missing or unreliable date of birth proof documents.

2. Materials and methods

The third molar eruption data of this cross-sectional study were collected from 571 healthy adolescent and young adult Jordanian participants. The sample comprised 275 males and 296 females aged from 15 to 27 years. The average age of all participants was 19.9 years (20.1 years for males and 18.8 years for females). All participants were Jordanian citizens of Arab ancestry. About 98% of Jordanians are Caucasian Arabs¹ who have been living there for some generations. Therefore, the participants in this study are assumed to be of pure ancestry with trivial ethnic divergence.

Data related to the 15–17 year-old participants in the current study were derived from the unpublished third molar eruption data of secondary school students who took part in a previous cross-sectional study on timing of eruption of permanent teeth in the Jordanian population. The latter study was published in 2012 reporting the timing of emergence of all permanent teeth except third molars (Shaweesh, 2012b). The rest of the participants (aged 18–27 years) were undergraduate and postgraduate students of Jordan University of Science and Technology (JUST) who were

clinically examined by final year undergraduate dental student of JUST on two separate occasions during the Faculty of Dentistry's Oral Health Awareness Campaigns in March and October 2013.

The current study was part of an extended project related to the chronology of eruption of permanent dentition in the Jordanians which had previously received the ethics approval from the Deanship of Research at JUST. In addition, the approval of the Ministry of Education had been previously received for collecting data from younger participants (secondary school students in Jordan). All participants who took part in the current study provided written and signed consent after they had received invitation letters and plain language information statements about the study.

Each of JUST's participants underwent a clinical dental examination to detect the unerupted or the eruption level of their third molars by a trained and calibrated fifth year undergraduate dental student under the supervision of a registered and qualified dental practitioner (the author A.S.). The dental examinations took place in JUST's dental clinics. The examiners collected information about the participants' date of birth, gender, height, weight, medical and dental history. The dental history questions were particularly related to any previous extraction of any third molar, oral or jaw surgeries, jaw trauma and orthodontic treatment. Participants confirmed to have had chronic medical illness or skeletal/growth disorders or received oral or jaw surgeries, trauma or orthodontic treatment were excluded.

The procedure of examining the younger participants (secondary school students or the 15–17 year-olds) was similar to examining the older group (the 18–27 year-olds) although the former were examined at their schools as detailed in the previous publication on timing of permanent tooth eruption in the Jordanians (Shaweesh, 2012b).

During participants' examination, the examiners recorded the clinical level of eruption of all third molars according to the following scale:

- Stage 0: unerupted third molar. The following criteria should have been met for this stage:
 - In the upper jaw the bulging of the tooth in the tuberosity behind the second molar should be present.
 - In the lower jaw there should be an enough space for the tooth to erupt.
 - When uncertain, a P.A radiograph was taken to confirm that the tooth is normally present and has yet to erupt and not impacted or congenitally missing.
 - All cases where any of third molars was congenitally missing or impacted were excluded from the study.
- Stage 1: Gingival Emergence (GEM). This is confirmed when one or more of the cusps has/have just penetrated the overlying gingivae for less than 2 mms
- Stage 2: Occlusal Surface Eruption (OSE). This stage is confirmed when the whole occlusal table is clinically visible above the gingivae.
- Stage 3: Half Crown Eruption (HCE). This is determined with the eruption of nearly half of the crown (at least there should be 3 mm of the buccal or lingual side of the tooth visible) and the tooth is still apical to the occlusal plane by at least 2 mm.
- Stage 4: Full Functional Eruption (FFE). This is confirmed when the tooth has reached the occlusal plane and has contacted the opposing tooth (if the opposing is present). An articulation paper was used to check for the occlusal contact in cases where the examiner was uncertain.

The examiners were five GPA-distinguished final year undergraduate dental students who had been previously trained and calibrated by the author (AS). Prior to data collection, the

¹ <https://en.wikipedia.org/wiki/Jordan#Demographics>

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