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## Third molar observations in a sample of British male young offenders

Sally E. Andrews

Bengough's Lodge, Breadstone, Berkeley, Glos GL13 9 HF, United Kingdom

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### ABSTRACT

Development, morphology and eruption of third molars are highly variable, and it is generally accepted that the emergence time is between the ages of 17 and 21 years. This study reports on variation in timing encountered in a sample of 155 young males (15–18 years) of British nationality who were detained at Her Majesty's Prison and Young Offenders Institution (HMP&YOI) Ashfield as young offenders. All 155 participants were self-reported in terms of their chronological age and their ethnic origin. Of the 17 year-olds, 68% of Black males displayed one or more erupted third molars compared to 39% of the White males. For those who were of mixed ancestry, 50% showed evidence of eruption of at least one third molar in this age group. This difference between Black and White ethnicity was further supported when missing first or second molars were taken into consideration. Whilst it has been suggested in the literature that ethnicity plays no major part in eruption timings for the third molars, this clinical observation poses some interesting questions about the accuracy of dental age assessment.

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### 1. Introduction

Dental age assessment is acknowledged as an important, although not necessarily precise, process for assigning age around the 18 year threshold and is utilised when individuals present without documentation, for example, asylum seekers, disaster victims, forensic and archaeological cases [1]. The accuracy of age assessment can have far reaching implications for those who seek protection under international humanitarian laws and for those who are sentenced under criminal law [2].

Population differences in third molar development had been reported until the early 1960's [3,4] yet interest in this appeared to wane when investigation into tooth development using radiographic methods seemed to take precedence with little attention to ethnicity [5,6]. However, in more recent years, there has been a resurgence of interest reflecting the legal requirement to assign an age to an individual who attempts to enter a country without documentation or who comes to the attention of the courts without possessing the authorised means to confirm their age. Population differences in dental development are being investigated more thoroughly and there is increasing debate surrounding possible ethnic, geographical or social causes and their significance [7,8]. Even though some ethnic differences have been reported in the literature, it has been suggested that geographical or environmental effects may be of greater relevance [9], and some debate as to whether ethnic differences can be substantiated [10,11]. It has also been suggested that steroid hormones could be involved with dental development [8,12].

Based on data from Schour and Massler [13], standard textbooks cite 17–21 years as the standard eruption time for third molars which are the most variable of all human teeth. The atlas approach of pictorial comparison is widely used for dental assessments in individuals under 15 years of age but precision is lost in the older stages of childhood, mainly because all teeth but the third molars have completed their development. More recently, the London Atlas [14] has provided one pictorial representation for each year between 16.5 and 23.5 years of age. Demirjian et al. [5] and Moorrees [6] have established age estimation systems relying on radiographic appearance of developing teeth. These are well-accepted methods and very good correlation between the estimated age and actual age has been reported [15]. Demirjian's method, incorporating the third molar, has been used to evaluate third molars in a number of populations including American Black and White, British, Texas Hispanic and Indian [1,16–19]. Using clinical and radiological methods, studies have confirmed wide age ranges at each third molar stage [3,4,8,16,18–29] and, whilst highlighting the need for more population-specific data, have specifically suggested that ancestry affects the development of third molars.

Odusanya and Abayomi [21] studied third molars in 258 Nigerian adolescents and found that the average age at initial clinical eruption was as young as 13 for females and 15 for males. Moreover, all third molars had clinically erupted by age 19 and lower molars erupted before upper molars in both sexes. Harris [8] has highlighted significant ethnic variation in a sample of American Blacks and Whites. Blankenship et al. [16] found third molar developmental stages occurring a year or so earlier in American Blacks compared to Whites, and earlier in males than females. They stated that the likelihood that an African American having fully developed third molars and is at least

E-mail address: [salgallia@gmail.com](mailto:salgallia@gmail.com).

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18 years old is 93%, and 90% for Whites. Using their own and worldwide data, Liversidge and Marsden [10] also calculated the probability of an individual being over or under 18 on the basis of third molar development. They concluded that, for all populations, if the third molar has its apex half or fully complete, age is more than likely to be at least 18 and reported that a single individual from any ethnic group is not significantly different from one in any other group.

Demirjian's method for assessment of tooth development requires a radiograph to be taken. As a general rule, radiographs should only be taken to benefit a person's health. There is no therapeutic benefit in taking a radiograph for age estimation and informed consent becomes dubious if a child feels under pressure to agree to a radiograph in order for an asylum claim to be properly dealt with. Considering these two issues together with lack of accuracy in age determination, it has been argued that exposure to radiation would unlawfully inflict harm upon a person [30]. However, Demirjian's method is considered to be one of the most reliable methods to conduct age assessment in children and young adults. As justice hangs on the outcome of the age assessment, it is imperative that it must be accurate in order to justify the exposure to radiation. Without radiographs, forensic odontologists would lose the benefit of Demirjian's methods and would have to be reliant upon clinical eruption of teeth.

The likelihood of successful eruption can be improved markedly by removing a molar anterior to a third molar lacking space. Fanning [4] showed that third molars emerge earlier when teeth anterior to them have been removed and pointed out the importance of comparing third molar eruption in "non-mutilated" dentitions. Another factor is agenesis, or failure of formation, which is not uncommon for third molars but its incidence varies. Chagula [3] quotes studies ranging from as much as 30% in Chinese to 0% in West African Negroes and gives 1.6% in his own study of East Africans. In White American women third molar agenesis has been put at 9% by Nanda [31] and also at 9% in Whites by Levesque et al. [32]. In a study by Forjani et al. [33] of White and Bangladeshi UK citizens, all with third molar agenesis, one missing third molar was found in 45% of the sample, whilst 34% had 2 missing third molars, 6% had 3 missing and 15% had agenesis of all four third molars.

The aim of this study was to assess whether there is ethnic variation in third molar emergence by evaluating ethnically diverse young male offenders at HMP&YOI Ashfield.

## 2. Methods

Ethical permission was granted by the University of Glamorgan Ethics Committee and HMP&YOI Ashfield for every young person (YP)

attending the dental unit for treatment to be invited to take part in the study. At the time of the study, HMP&YOI Ashfield accommodated up to 400 males between the ages of 15 and 18 years, representing about 18% of the UK young male offender population. The proportions of ethnic groups in young offenders' institutions (YOI) differ in comparison with the general population. The majority are White, but Black and Minority Ethnic (BME) groups are significantly over-represented compared to the general population.

The following data was collected for each individual: date of birth, confirmation of UK citizenship and upbringing, self-assessed ethnicity, any relevant medical history, medication, missing teeth and history of extractions. Third molars were assessed by clinical observation only and data recorded on one single visit. No radiographs were taken for the purposes of this research and therefore it is accepted that missing, unerupted and/or impacted third molars could not be assessed. If not visible, third molars were classified as unerupted. Eruption, or gingival emergence, was defined as penetration of the gingiva by at least one dental cusp. Erupted third molars were further classified as partially-erupted or, if in occlusion with an opposing tooth, fully-erupted. Participants were asked to self assign to one of fifteen possible ethnic groups (Office of National Statistics classification) and were later assigned by the author to five broader ethnic groups: Asian, Black, White, Mixed or Other.

There was a concern that YPs might present with third molar symptoms thereby creating a bias in the sample but this occurred on only one occasion and was not the main presenting complaint. Data was collected from 155 males between the ages of 15 and 18 years.

## 3. Results

The Ashfield sample consisted of 155 British males between 15 and 18 years of age and of diverse ethnicity (Table 1). 88%, were either 16 or 17 years of age, 5% were 15 years of age and 7% had attained 18 years of age.

Fifty-six percent of the total sample self-assessed as White, 19% as Black, 17% as being of mixed ethnicities 7% as Asian and 1% gave their ethnicity as "Other".

In total, 83 mandibular and 55 maxillary third molars had emerged. On the left, 27 maxillary and 42 mandibular third molars had emerged (a total of 69 left third molars). On the right, 28 maxillary and 41 mandibular third molars had emerged (a total of 69 right third molars).

In the small group of 15 year olds, two of the three Black YPs had erupted third molars and the single mixed ethnicity YP had two partially erupted lower third molars, one in a quadrant where another molar had been lost (Table 2). No third molars were observed in

**Table 1**  
Distribution of ethnic groups in the Ashfield sample of British males.

Ethnic group	Age 15	Age 16	Age 17	Age 18	Total number	Broad ethnic group	Total number (% of total)
Asian-Indian		1			1	Asian	11 (7%)
Asian-Other			3		3		
Asian-Pakistani		3	4		7		
Black-African	1	2	6		9	Black	29 (19%)
Black-Caribbean	2	4	13		19		
Mixed Black-African/Black-Caribbean		1			1		
Mixed Other	1		5		6	Mixed	26 (17%)
Black-African/Asian		1			1		
Black-African/Black-African			3		3		
Black-African/Black-Caribbean		4	12		16		
Other		1	1		2	Other	2 (1%)
White-British	4	13	54	11	82	White	87 (56%)
White-Irish		1	1		2		
White-Irish traveller		1			1		
White-Other			2		2		
Total number	8	32	104	11	155		155

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