ORIGINAL ARTICLE

Socioeconomic and nutritional factors associated with age of eruption of third molar tooth among Ugandan adolescents

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Abstract

This study aimed to establish the influence of socioeconomic and nutritional factors on the age of eruption of the mandibular third molar among Ugandans aged 10–20 years. **Materials and Methods:** This was a cross-sectional study carried out in a dental clinic of Mulago Hospital between January and December 2017. The background information was obtained from the participants using a questionnaire in the form of an oral interview. The anthropometric measurements were obtained using a tape measure and a weighing scale, while dental radiographs were used to determine the eruption stages of the mandibular third molar. **Statistical Analysis:** The data were analyzed using STATA 13 and summarized using descriptive statistics and multivariate analyses. Statistical significance was inferred at $P < 0.05$. **Results:** Participants in the overweight body mass index category were statistically significantly associated with the age of the mandibular third molar eruption ($P < 0.05$) compared to their normal counterparts. There was no statistically significant association between socioeconomic status and age of eruption of third molar teeth ($P > 0.05$). Age of eruption was statistically significantly higher among males than females ($P > 0.05$). **Conclusion:** The findings of the present study reveal that overweight influences early eruption of the mandibular third molar tooth, although there is no trend between socioeconomic status and the age of eruption of the mandibular third molar.

Key words: Adolescents, age of eruption, nutritional status, socioeconomic status, third molar

Introduction

Third molar growth and development shows variability especially in terms of its size, shape, agenesis and eruption patterns.[1] It is a tooth which continues to develop during late adolescence and beyond. It is thus serving as an important tool for age estimation during the transition period between adolescence and adulthood. It is also widely used to determine the timing of orthodontic treatment and the selection of treatment modalities in growing children.

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Owing to the simplicity and low-cost implications associated with the use of third molar eruption for age estimation, this method is particularly popular in developing countries including Uganda. In this case it is routinely used in age estimation among juveniles undergoing judicial procedures. However, this method is prone to errors and inaccuracies due to a number of factors that have been found to directly affect the tooth emergence process. These factors include tooth ankylosis, early or delayed extraction of the deciduous tooth, tooth impaction and crowding of the permanent teeth, and nutritional, and socio-economic status among others.[2]

The nutritional status of an individual has been found to affect tooth eruption, where chronic malnutrition extending beyond early childhood is associated with delayed tooth eruption.[3] On the other hand, obesity is associated with early maturity of children and accelerated tooth eruption[4] although other studies showed no relationship.[5] Most studies have mainly related the nutritional status of an individual to the number of teeth that have emerged[4] as opposed to the eruption stages of the specific teeth. Despite these reports, there is paucity of information relating nutritional status of an individual to permanent tooth emergence, particularly the third molar.

The socioeconomic status of an individual has also been associated with variations in the timing and pattern of tooth eruption of the primary dentition in some populations. Children with a higher socioeconomic status have been shown to have earlier tooth emergence compared to those with a low socioeconomic status.[6] It is stipulated that the better health care received by children from higher socioeconomic status influences earlier dental development. However, this theory is disputed by other studies[7] where no association has been observed among different socioeconomic groups.

It is reported that 29% of Ugandan children under 5 years are stunted and 21.4% live with poverty;[8] thus, it is imperative to determine whether these factors influence age at eruption of the third molar in this population. The aim of the present study was to establish the influence of socioeconomic and nutritional factors on the age of eruption of mandibular third molar among Ugandans aged 10–20 years.

Materials and Methods

Study design and setting

This was a cross sectional study carried out at Mulago Hospital. Mulago Hospital is a National Referral and teaching facility located in the capital city, Kampala, with a capacity of 1500 beds. The hospital has many specialized clinics including a dental clinic which handles patients that use it as a primary care setting and refer patients from lower health facilities in Uganda. Based on the dental records, the clinic attends to between 1500 and 2000 patients per month, of which approximately 50% are aged 10–20 years. These patients are routinely attended to by a team of oral health workers who include oral and maxillofacial surgeons, registrars, dental surgeons, intern doctors, and nurses.

Study population

The targeted population was dental patients aged 10–20 years of Ugandan descent attending Mulago Hospital between January and December 2017.

Data collection procedure

Participants' enrollment

The participants were consecutively recruited based on their date of birth ascertained from their birth, baptism, or immunization certificate for those aged 10–15 years, whereas a national identity card was used for those aged 16–20 years. Those who consented to participate in the study were enrolled. The background information such as sex and place of residence of the participants were recorded through an oral interview by a research assistant. The chronological age was determined as the difference between the date of birth and the date when the orthopantomograph (OPG) was taken.

Socioeconomic status measurement

The socioeconomic status of the participants was determined using the wealth index checklist from the Ugandan Bureau of Statistics.[9] This was calculated by using easy-to-collect data on household ownership of 13 items including electricity, radio, cassette player, television, mobile phone, fixed phone, refrigerator, table, chair, sofa set, cupboard, bed, and clock. The principal component analysis was used to generate the socioeconomic score tertiles.

Anthropometric measurement

Height of the participants was measured using a standard measuring tape with the participants standing upright. Weight was measured using a calibrated weighing scale with the participant lightly clothed. Gender-specific body mass index (BMI) was calculated and classified as thin, normal, and overweight as described by the CDC (2000) growth reference tables.[10] The thin-weight category had BMI ≤5th percentile, whereas the normal-weight category lay between the 5th and 85th category, and the overweight category was >the 85th percentile. The nutritional status of the participants was expressed by the BMI.

Radiographic assessment

The participants' OPGs were taken in the dental clinic of Mulago Hospital. The OPGs were read by two of the investigators Annet Kutesa Mutebi (AKM) and Catherine Mwesigwa Lutalo (CML) following calibration in radiographic interpretation by an oral radiologist. The OPGs of good quality, not blurred, and showing the right mandibular molar without any abnormality were selected.

The outcome variable was defined as the mean chronological age when any part of the right mandibular molar had emerged at least through the gingiva, i.e. gingival eruption as seen on OPG termed eruption Stages C and D as described by Olze *et al*.: [11]

- Stage A – occlusal plane covered with alveolar bone
- Stage B – alveolar eruption; complete resorption of alveolar bone over occlusal plane
- Stage C – gingival emergence; penetration of gingiva by at least one dental cusp
- Stage D – complete emergence in occlusal plane.

Data analysis

The data were entered into a computer and analyzed using STATA 13 (StataCorp. 2013. *Stata Statistical Software: Release 13*. College Station, TX: StataCorp LP). The data were summarized using descriptive statistics. Linear regression was used to assess the association between nutritional status and socioeconomic factors with chronological age when the right mandibular molar attained eruption Stage C or D. The level of significance was set at $P \leq 0.05$.

Reliability test

Duplicate scoring of Stage D of the right mandibular third molar was done in twenty patients (i.e. eighty third molar teeth) by the two investigators AKM and CML. The inter-observer reliability test yielded Cohen's Kappa coefficient of 0.96, whereas the intra-observer agreement of the two investigators yielded Cohen's Kappa values of 0.81 and 0.96, respectively, with no evidence of systematic error ($P < 0.05$).

Ethical considerations

The study proposal was approved by Makerere University School of Health Sciences' Institutional Review Board. Permission to carry out the study was obtained from Mulago Hospital authorities and the Uganda National Council of Science and Technology. Informed consent was obtained from the adult participants (i.e. ≥18 years) and parents/guardians of children aged 10–17 years. Assent was also obtained from the children in accordance with the Helsinki declaration.

Results

Description of the study participants

The study recruited 1025 participants who met the inclusion criteria. However, 13 participants were excluded because of having poor-quality OPG images, leaving a total of 1012 participants. The participants were from all the four regions of the country although the majority were from the central (539 [53.3%]) and western (135 [13.3%]) parts of the country. The number of participants having the right mandibular molars totaled 881, and these were the ones included in the study [Table 1]. All ages included in the study were almost equally distributed [Table 1]. Four hundred and seventy-five (53.9%) of them were female, with the overall mean age of the study participants being 14.8 ± 3.2. The mean age of the participants when any part of the right mandibular molar had emerged through the gingiva (combined Stages C and D) was 17.7 ± 2.0 years [Table 2].

Description of the nutritional and socioeconomic status of the study participants

Majority of the participants (n = 758, 86.0%) were in the normal BMI category [Tables 2 and 3]. Nearly

Table 1: Frequency distribution of the study participants based on chronological age and sex (n=881)

Age (years)	Females, *n* (%)	Males, *n* (%)	All*, *n* (%)
10	59 (12.4)	37 (9.1)	94 (10.9)
11	56 (11.8)	32 (7.9)	88 (10.0)
12	48 (10.1)	33 (8.1)	81 (9.2)
13	55 (11.6)	32 (7.9)	87 (9.9)
14	42 (8.8)	32 (7.9)	74 (8.4)
15	45 (9.5)	25 (6.2)	70 (7.9)
16	37 (7.8)	27 (6.7)	64 (7.3)
17	36 (7.6)	41 (10.1)	77 (8.7)
18	42 (8.8)	55 (13.5)	97 (11.0)
19	32 (6.7)	50 (12.3)	82 (9.3)
20	23 (4.8)	42 (10.3)	65 (7.4)
Total	475	406	881

Table 2: Frequency distribution of participants according to demographic, socioeconomic, and nutritional characteristics (n=881)

Characteristics	All*
Demographics	
Mean age of the participants	14.8±3.2**
Mean age at combined stage C and D	17.7±2.0**
Sex, *n* (%)	
Females	475 (53.9)
Males	406 (46.1)
BMI categories (n=881), *n* (%)	
Thinness	61 (6.9)
Normal	758 (86.0)
Overweight	62 (7.0)
Anthropometric measurements, mean±SD	
Height (cm)	153.6±15.9**
Weight (kg)	47.9±24.2**
Socioeconomic status (n=878), *n* (%)***	
Poor	354 (40.3)
Middle	173 (19.7)
Rich	351 (40.0)
Right mandibular stages of eruption (n=881), *n* (%)	
Stage A	380 (43.1)
Stage B	169 (19.2)
Stage C	54 (6.1)
Stage D	278 (31.5)

*The participants constituted the Ugandan adolescent population aged 10-20 years, **Age, height, and weight are represented as mean±SD, ***Three people had missing socioeconomic information. SD: Standard deviation, BMI: Body mass index

4.6% (25/475) of the girls and 9.8% (46/406) of the boys were in the thin BMI category. Overall, 70 participants were in the overweight category, of whom 65 (92.9%) were female, with about 1/3rd aged 15 years [Table 3]. The mean age of the participants when any part of the right mandibular molar had at least emerged through the gingiva (Stages C or D) was lower among the overweight category (16.4 ± 2.7 years) compared to their normal (17.7 ± 1.9 years)- and thin (17.9 ± 2.2 years)-weight counterparts [Table 4]. The participants were of the same proportion among the poor and rich categories [Table 2].

Association between chronological age and nutritional and socioeconomic status

Based on bivariate analysis, there was a significant association between BMI, specifically the overweight category and age at eruption at combined Stages C and D; β = −1.4 (95% confidence interval [CI]: −2.16, −0.54, *P* = 0.001) [Table 4]. The overweight participants erupted at about 14 months earlier than the normal- and thin-weight participants.

In the multiple linear regression analysis, the overweight category was significantly associated with age of eruption at combined Stages C and D; β = −0.95 (95% CI: −1.79, −0.11, *P* = 0.026). The overweight participants erupted at about 10 months earlier than their normal-weight counterparts.

There was no significant association between socioeconomic status and age at eruption [Table 4]. The age at eruption was statistically significantly higher among the males than the females (β = 0.7, 95% CI: 0.27–1.16, *P* = 0.002).

Discussion

The present study recorded more girls categorized as overweight, whereas more boys were categorized as thin [Table 3]. Being overweight was significantly associated with lower age at eruption of the right mandibular third molar. The overweight participants had the right mandibular third molar erupting at about 10 months earlier than their normal- and thin-weight counterparts [Table 4].

Table 3: Categorization of the body mass index among the participants according to age and sex (*n*=1012)

Girls, *n* (%)				Boys, *n* (%)		
Age	Thinness* ≤5th percentile	Normal** 5th to 85th percentile	Overweight*** >85th percentile	Thinness* ≤5th percentile	Normal** 5th to 85th percentile	Overweight*** >85th percentile
10	5 (7.6)	58 (87.9)	3 (4.5)	1 (2.6)	37 (94.8)	1 (2.6)
11	4 (6.7)	49 (81.7)	7 (11.6)	4 (11.8)	30 (88.2)	0 (0.0)
12	2 (3.8)	45 (86.5)	5 (9.6)	0 (0.0)	36 (97.3)	1 (2.7)
13	2 (3.3)	55 (90.2)	4 (6.6)	4 (12.1)	27 (81.8)	2 (6.1)
14	2 (4.4)	36 (80.0)	7 (15.6)	8 (22.2)	27 (75.0)	1 (2.8)
15	2 (3.8)	39 (73.6)	12 (22.6)	3 (9.4)	29 (90.6)	0 (0.0)
16	0 (0.0)	36 (90.0)	4 (10.0)	2 (6.5)	29 (93.5)	0 (0.0)
17	6 (13.3)	31 (68.9)	8 (17.8)	4 (8.5)	43 (91.5)	0 (0.0)
18	1 (1.9)	46 (86.8)	6 (11.3)	8 (12.5)	56 (87.5)	0 (0.0)
19	1 (2.7)	31 (83.8)	5 (13.5)	6 (9.5)	57 (90.5)	0 (0.0)
20	0 (0.0)	25 (86.2)	4 (13.8)	6 (10.9)	49 (89.1)	0 (0.0)
Total	25	451	65	46	420	5

*The thin BMI category had weight ≤the 5th percentile, **The normal BMI category was between the 5th and 85th percentiles, ***The overweight category was >the 85th percentile. The source of the BMI categorization was CDC BMI categorization tables for ages between 2 and 20. BMI: Body mass index[10]

Table 4: Association between sex and nutritional and socioeconomic status with the age of eruption of the mandibular third molar (*n*=1012)

Factors	Mean age at Stages C and D	Unadjusted coefficient	95% CI	*P*	Adjusted coefficient	95% CI	*P*
Sex							
Female	17.2±2.2	Reference	Reference	Reference	Reference	Reference	Reference
Male	18.1±1.7	0.9	0.45-1.29	<0.001	0.7	0.27-1.16	0.002
Nutritional status							
Normal	17.7±1.9	Reference	Reference	Reference	Reference	Reference	Reference
Thin	17.9±2.2	0.1	−0.80-1.08	0.779	−0.04	−0.97-0.89	0.933
Overweight	16.4±2.7	−1.4	−2.16-−0.54	0.001	-0.95	−1.79-−0.11	0.026
Socioeconomic status							
Poor	17.5±1.9	Reference	Reference	Reference	Reference	Reference	Reference
Middle	17.6±2.0	0.1	−0.54-0.72	0.771	0.08	−0.53-0.69	0.795
Rich	17.8±2.0	0.3	−0.15-0.83	0.173	0.28	−0.20-0.76	0.255

CI: Confidence interval

These findings corroborate that of earlier studies among various populations in America[12] and Asia.[13] Dunger *et al*.[14] postulated that the earlier tooth eruption among the overweight category is explained by the high BMI which accelerates the overall growth of individuals including attainment of first menarche among girls and their dental development. This finding further supports other studies[15] where advancement in dental development among the overweight children has been found to range from a few months to years when compared to normal-weight children. In the present study, this difference was 10 months, which falls within this range. Despite this significant association, the present study had small proportions (7%) of overweight and underweight participants leading to limited variation, which calls for more research in this area based on bigger samples of the overweight and underweight categories in order to confirm our conclusions.

The present study found no difference in the age of eruption of the thin-weight participants compared to their normal-weight counterparts [Table 4], contributing to the existing literature showing no specific trend between age of tooth eruption and thin weight of children. Our finding was contrary to findings from other studies[16] where stunted or underweight children have been associated with delayed tooth eruption. Shetty[17] revealed that nutritional deficiencies delay most body systems including skeletal growth and dental development in growing children. On the other hand, although in a few selected cases, malnutrition has been associated with early tooth eruption. Ahmed and Al-Dahan[16] found that lateral incisors had erupted earlier among stunted Iraq boys compared to their well-nourished counterparts, although the difference was not statistically significant. It could be argued that the similar eruption of the third molars among the thin-weight participants to the normal-weight participants in this study could be explained by inaccuracies in the participants' age ascertainment. Whereby the thin-weight participants could have presented younger ages than actual because it is more socially acceptable to appear young. However, this is highly unlikely given that the study participants were recruited at different times. In addition, all participants presented their birth certificates or identity card for ascertainment of their birthdates. We can cautiously say at this point that the relationship between nutrition and third molar eruption still needs a lot of research in order to establish it clearly. This is because of findings from earlier studies where no association between nutrition and tooth eruption was observed. Majority of these studies, however, were done mainly among other teeth other than the third molar.[5] It should be noted that there are no earlier reports that have particularly studied third molars that we may precisely compare with. The third molar being a tooth with a lot of variabilities during eruption[1] may probably behave differently under varying nutritional status.

The present study observed no association between age of eruption of third mandibular molars and socioeconomic status of the children [Table 4], in support of findings in primary teeth among Indian children.[7] We were again not able to precisely compare our findings with those of previous studies as there are no similar ones that studied permanent dentition. However, previous studies among the Nigerians[6] and Portuguese[18] reported earlier primary tooth emergence among children of higher socioeconomic background as compared to those from a low socioeconomic status. The reported relationship has been attributed to the fact that the socioeconomic status of individuals could be used as an indicator of their nutritional status. It is stipulated that good socioeconomic status would indicate access to adequate nutrition and thus have an effect on growth and development.[19] We would thus have expected similar findings in this study; however, we did not observe any significant association between socioeconomic status of the participants and the mean age at eruption of the third molars [Table 4]. Although there were a few differences within the classes, nonetheless, these differences were not statistically significant. However, it is important to note that previous studies mainly compared primary tooth eruption to the nutritional status of the children, whereas the present study was based on the (permanent) third molar eruption. Similar findings to the present study were reported in primary tooth eruption among Indian children.[7]

Comparing our findings with those of other studies with certainty may be difficult because of the differences in the methods used to ascertain dental advancement and the teeth studied. Most of the literature available consider the number of teeth (excluding the third molar) that have erupted in an individual as a measure of dental advancement.[4] Such that the more teeth erupted, the higher the dental advancement would be. On contrary to the present study, dental advancement was measured using the third molar eruption stages,[11] whereby the more advanced tooth stage would show advanced dental maturity. However, despite these differences, we can still go ahead and compare our findings to others because both these methods are recognized as valid measures of dental advancement in relation to chronological age in living humans. In addition, the age range for the participants used in other studies determining dental maturity was much lower at 6–15 years compared to 10–20 years in the present study. We used the 10–20 age range because of the nature of the third molar which has been known to erupt during late adolescence within the age range of 13–20 years among Ugandans.[20] We believe that the method used for this study would give a better measure of dental advancement considering that tooth counts may miss out both the missing and impacted teeth, which could be a source of error.

Conclusion

The present study indicated that the age at eruption of the mandibular third molar is influenced by the nutritional status of the child, i.e. the higher the BMI, the earlier the tooth erupts. Thus, when estimating the age of a child based on tooth eruption, BMI should be taken into consideration. In addition, the age at which any part of the mandibular third molar emerged through the gingiva did not seem to be different among adolescents from the poor, middle, or rich socioeconomic status.

The findings of this study are consistent with those from other populations and reflect the challenges of basing age estimation on tooth eruption methods. This study provides a platform for utilizing locally generated research as evidence to strengthen forensic practice in the Ugandan context. The current forensic practice is less than optimal and hence, recommendations for new guidelines with more credible and robust methods should be embraced.

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Conflicts of interest

There are no conflicts of interest.

References

1. Levesque G. Y, Dermirjian A, Tanguay R. Sexual dimorphism in the development, emergence and agenesis of the mandibular third molar, J. Dent. Res. 60 (1981) 1735–1741.
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. Almonaitiene R, Balciuniene I, Tutkuviene J. Factors influencing permanent teeth eruption. Part one–general factors. Stomatologija. 2010;12 (3):67-72.
4. Vasconcelos KRF, Xavier TA, Oliveira S, Dutra ALT, Nelson-Filho P, Silva LABd, *et al*. Timing of Permanent Tooth Emergence is Associated with Overweight/Obesity in Children from the Amazon Region. Braz. Dent. J. 2018;29 (5):465-8.
5. Elamin F, Liversidge HM. Malnutrition has no effect on the timing of human tooth formation. PloS one. 2013;8 (8):e72274.
6. Enwonwu CO. Influence of socio-economic conditions on dental development in Nigerian children. Arch Oral Biol. 1973;18 (1):95-IN15.
7. Singh N, Sharma S, Sikri V, Singh P. To study the average age of eruption of primary dentition in Amritsar and surrounding area. J Indian Dent Assoc. 2000;71:26.
8. UNICEF Uganda: Annual Report. 2017. https://www.unicef.org/about/annualreport/files/Uganda_2017_COAR.pdf (cited 31 Jan 2018)
9. Uganda Bureau of Statistics (UBOS). Uganda Demographic and Health Survey 2006 Macro International Inc. Calverton, Maryland, USA: UBOS and Macro International Inc.: 2007.
10. National Center for Health Statistics 2000 CDC growth charts: United States. Available from: http://www.cdc.gov/growthcharts/ (cited 31 Jan 2018)
11. Olze A, Pynn B, Kraul V, Schulz R, Heinecke A, Pfeiffer H, *et al*. Dental age estimation based on third molar eruption in first nations people of Canada. J Forensic Odontostomatol. 2010;28 (1):32-8.
12. Nicholas CL, Kadavy K, Holton NE, Marshall T, Richter A, Southard T. Childhood body mass index is associated with early dental development and eruption in a longitudinal sample from the Iowa Facial Growth Study. Am J Orthod Dentofacial Orthop 2018;154 (1):72-81.
13. Dimaisip-Nabuab J, Duijster D, Benzian H, Heinrich-Weltzien R, Homsavath A, Monse B, *et al*. Nutritional status, dental caries and tooth eruption in children: a longitudinal study in Cambodia, Indonesia and Lao PDR. BMC pediatrics. 2018;18 (1):300.
14. Dunger DB, Ahmed ML, Ong KK. Effects of obesity on growth and puberty. Best Pract Res Clin Endocrinol Metab. 2005;19 (3):375-90.
15. Olszewska K, Mielnik-Błaszczak M, Plechawska P, Przybyś J. Overweight and obesity affect skeletal maturation and dental development in children and adolescents–a retrospective study. J. Educ Health Sport. 2018;8 (6):139-52.
16. Ahmed HS, Al-Dahan ZA. Time of Emergence of Permanent Teeth and Impact of Nutritional Status among 4-15 Years Old Children and Teenagers in Basrah City/Iraq. J. Baghdad Coll. Dent. 2016;28 (4):134-40.
17. Shetty P. Malnutrition and undernutrition. Medicine. 2006;34 (12):524-9.
18. Carneiro J, Caldas I, Afonso A, Cardoso H. Examining the socioeconomic effects on third molar maturation in a Portuguese sample of children, adolescents and young adults. Int J Legal Med. 2017;131 (1):235-42.
19. Mohammed A. Socio-economic determinants of nutritional status of children in Ethiopia: Jimma University; 2015.
20. Chagula W. The age at eruption of third permanent molars in male East Africans. Am J Phys Anthropol. 1960;18 (2):77-82.