

Original Article

Prevalence of eruption status of third molars in Libyan students

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ABSTRACT

Background: The aim of the present study is to determine the number of third molars per person, angulation, level, amount of space for eruption of third molar between ramus of mandible and second molar and the eruption status of third molar in a group of Libyan students, with different impaction patterns and agenesis of third molars.

Materials and Methods: In this descriptive retrospective study, a total of 200 students (100 male and 100 female students of bachelor of dental surgery, Faculty of Dentistry, Garyounis University, Benghazi, Libya) were enrolled. Students who had complete complement of teeth within the age group 17–26 years were selected for this study, while those cases who had history of extraction of any of the teeth or who refused to give consent were excluded. Before starting the study, ethical concern from the ethical committee, IRB and informed consent from each student who underwent radiography were obtained.

Results: The results showed that 5% of third molars were congenitally missing. Approximately 93.5% of the subjects had all four third molars, 1% had two third molars and 0.5% had one third molar with 2.5% having agenesis of all third molars. Third molar agenesis showed predilection for maxilla with higher proportion in females (3%) than males (2.1%). Angular position was maximum with vertical position (5.83%), with least being horizontal impactions. Level of occlusal plane of third molar similar to that of adjacent tooth was seen in 44.74%, below the occlusal plane in 24.76%, totally impacted noted in 30%.

Conclusion: The present study showed that 33% of the teeth were fully erupted and 66% were in various stages of eruption and 5% were congenitally missing in these students.

Key Words: Dental, epidemiology, impacted molar, prevalence

Received: April 2011
Accepted: October 2011

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INTRODUCTION

The third molars are the last teeth to erupt in all races despite racial variations in the eruption sequence. This late eruption is responsible for the third molar being the most frequently impacted tooth. Facial growth, jaw size, and tooth size differ among different races and population groups and exhibit definite inheritance patterns. Racial variation in facial growth, jaw size, and tooth size is crucial to the eruption pattern, impaction

status and incidence of agenesis of third molars.^[1] The cause of agenesis of one or more teeth is still unknown, but several reasons such as physical disruption of the dental lamina, space limitation, and an inherent defect of the dental lamina, or failure of induction of the underlying mesenchyme have been suggested.^[2]

To date, no information is documented regarding the pattern of third molar eruption status in the Libyans. The aim of the present study is to determine the number of third molar per person, angulation, level, amount of space for eruption of third molar between ramus of mandible and second molar.

MATERIALS AND METHODS

A total of 200 students (100 males and 100 females) who were in various phases of bachelor of dental surgery (between the age group of 17–26

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years) volunteered to get enrolled in the study. The duration of the study was 3 months. All students were examined in the department of Oral medicine, diagnosis and radiology at Faculty of Dentistry, Garyounis University, Benghazi, Libya. Before starting the study, ethics approval was obtained from the Garyounis University ethical committee. The details regarding the study were explained for each of the student and informed consent was taken. Among a total of 1240 students, only those students who had full complement of teeth (did not give any history of extraction due to impaction or orthodontia or caries) were included. Exclusion criteria were those cases who had history of extraction of any of the teeth or who refused to give consent. To avoid bias, all the students were examined by two well-trained dentists and intra and interobserver kappa correlation ranged from 0.8 to 0.76.

Based upon the feasibility of the students and the examiner, each student underwent thorough examination of the third molar region. On an average, five students per day were examined.

All students were examined clinically to see the status of third molar and based upon their clinical status they were classified as completely erupted, partially erupted and unerupted. The eruption status was assessed by using visual method and with the help of probe. The teeth which were partially erupted and unerupted were subjected for radiographic examination. Each student after clinical examination was subjected for panoramic radiography. The standard OPG machine (PANARAY PC- 1000 with 70-90 KvP and 6-100 mA) was used. The teeth radiographically noted are divided as mesioangular, distoangular, vertical and horizontal impactions. The following parameters were also considered: Number of impacted tooth per person, incidence of angulation, level of eruption, space of eruption of third molar.

Angulation

The angulation of the mandibular third molars was determined on the panoramic radiographs by drawing a line through the midpoint of the occlusal surface and bifurcation of the second molar and the third molar. These lines represent the long axes of the teeth. The angle formed between the intersected long axes gave either a mesial or distal inclination of third molar in relation to second molar. The inclination for vertical was $+10^{\circ}$ to -10° , mesioangular $+11^{\circ}$ to $+79^{\circ}$, distoangular -11° to 79° . The inclination

angle was then read in increments of 5° to a maximum of 65° , above which the tooth was considered to be horizontally impacted.

Level of eruption

Level of eruption was grouped as level A, where the occlusal plane of the third molar was on the same level or above the occlusal plane of adjacent second molar. In level B, the occlusal plane was below the occlusal plane but above the cervical line of the second molar. In level C, the occlusal plane was beneath the cervical line of the second molar.

Third molar space

Third molar space was measured as the distance between the distal surface of second molar crown and anterior border of the ramus on the occlusal plane in proportion to the width of third molar crown.^[3]

RESULTS

The collected data were analyzed by Chi-square test, *t* test and analysis of variance approach.

The mean age of the study group was 21.5 years (± 2.9). The number of third molars found in 200 subjects was 760; 381 teeth were in the upper jaw and 379 teeth in the lower jaw. The proportion of third molar agenesis was around 5% (40 of total 800 teeth).

Table 1 shows 93.5% subjects had all four third molars, 2.5% had three third molars, and 1% had two third molars, 1% had one third molar. Only 2.5% of the subjects had agenesis of all third molars.

Table 2 shows the angulation of maxillary and mandibular third molars. The mandibular third molars showed a higher frequency of mesial inclination (41.68%), followed by vertical (38.25%), with distal inclination of (13.45%), and followed by horizontal inclination (6.29%). The angulation of upper jaw showed a higher frequency of vertical angulations (72.17%), followed by distoangular (22.04%), with mesioangulation third in frequency (5.77%).

The mean and SD values of vertically, mesially,

Table 1: Total number of molars per person

Gender	No. of third molars per person					Total
	4	3	2	1	0	
Males	93	3	1	0	3	100
Females	94	2	1	1	2	100
Total (%)	187 (93.5)	5 (2.5)	2 (1)	1 (1)	5 (2.5)	200

Table 2: Angular position of mandibular and maxillary third molars

Site	Angular position (%)				Total (%)
	Vertical	Mesioangular	Distoangular	Horizontal	
Maxilla	275 (72.17)	22 (5.77)	84 (22.04)	-	381 (50.13)
Mandible	145 (38.25)	158 (41.68)	51 (13.45)	25 (6.59)	379 (49.86)
Total	420 (5.83)	180 (23.68)	135 (17.76)	25 (3.28)	760

and distally tilted third molars of the right and left side in both of the jaws were calculated. Each of the 3 sets of data was subjected to one-way analysis of variance (ANOVA) with 2 factors: A, upper versus lower jaw, and B, right versus left. In the vertical group, the third molar angulation averaged $5.41^\circ (\pm 2.8^\circ)$ in the mandible and $7.13^\circ (\pm 2.3^\circ)$ in the maxilla; the difference was highly significant ($P < 0.01$).

However, the third molar angulation averaged $6.31^\circ (\pm 2.64^\circ)$ on the right side and $6.01^\circ (\pm 2.6^\circ)$ on the left side in both jaws; the difference was statistically nonsignificant. The inclination angle of mesially tilted third molars averaged $25.41^\circ (\pm 8.28^\circ)$ in the mandible and $26.31^\circ (\pm 15.28^\circ)$ in the maxilla; the difference was statistically non significant. Similarly the difference between the right side [$26.91^\circ (\pm 12.8^\circ)$] and left side [$27.41^\circ (\pm 8.18^\circ)$] in both jaws was nonsignificant. The angle of distally inclined third molar averaged $15.41^\circ (\pm 2.8^\circ)$ in the mandible and $18.18^\circ (\pm 4.8^\circ)$ in the maxilla; this difference was significant at a level of $P < 0.05$. However, the difference between the right and left teeth in both jaws was statistically significant. Pearson's correlation coefficient was computed to find the relationship between right and left inclination angles in both jaws. A highly significant correlation in the mandible ($r = 0.543$); $P < 0.01$) and maxilla ($r = 0.643$); $P < 0.01$) was obtained.

Table 3 shows the level of eruption of third molars in the maxilla and mandible. Of the 751 teeth, 336 (44.74%) were positioned with their occlusal surfaces on the same level or above the occlusal plane of adjacent second molar (level A). The maxilla is the predominant site in 173 teeth (46.5%) over the mandible 163 teeth (43%). Level B eruption was the least frequent in occurrence among the other levels of eruption. Level B eruption showed a higher frequency in maxilla 95 teeth (25.53%) than in the mandible 91 teeth (24%). Two hundred and twenty nine third molars (30.49%) were erupted to level C. A Chi-square test was applied to find the presence or

Table 3: Level of eruption of maxillary and mandibular third molars

Site	Level of eruption (%)			Total (%)
	A	B	C	
Maxilla	173 (46.5)	95 (25.53)	104 (27.95)	372 (49.53)
Mandible	163 (43)	91 (24)	125 (32.98)	379 (50.46)
Total	336 (44.74)	186 (24.76)	229 (30.49)	751

association if any, between eruption levels of third molar in the upper and lower jaw. As per analysis [Table 2], the computed value of Chi-square test (95.3; Pearson coefficient of contingency (=0.39) turned out to be highly significant ($P < 0.02$); at A and B levels. The proportions of third molar in upper jaw were smaller than those of mandible, whereas at level C, the pattern was just the opposite. Similarly, at each of the 3 levels of eruption, the proportion of male cases was significantly higher than that of female cases [Table 3]. However, no association could be detected between the levels of eruption and sex of the patients (computed Chi-square test=0.1, critical Chi-square test=4.9).

Table 4 describes the level of eruption in both males and females. Females demonstrate a higher frequency (20%) of level A eruption than males. Males had 9.4% more third molar at Level B eruption than females. Females 118 teeth (31.29%) had higher level C frequency than males 111 (29.67%). This was statistically significant where Chi-square test was applied (computed Chi-square test value and critical Chi-square test found no association between level of eruption but association was found with sex of the patient.

Table 5 shows the occurrence of different angulations of impaction in male and female students. Vertical angulation was the common, with horizontal angulation being the least common.

Table 6 shows the status of eruption of maxillary and mandibular third molars in which 32.6% of teeth were completely erupted, 39.4% of them were partially erupted and unerupted teeth were 27.9%.

Table 4: Level of eruption of third molars in males and females

Gender	Level of eruption (%)			Total (%)
	A	B	C	
Males	153 (40.90)	110 (29.41)	111 (29.67)	374 (49.80)
Females	183 (20.15)	76 (20.15)	118 (31.29)	377 (50.19)
Total	336 (44.74)	186 (24.76)	229 (30.49)	751

Table 5: Distribution of angulation of impaction in third molar

Angulation	Female no. of impacted teeth (%)	Male no. of impacted teeth (%)	Total (%)
MA	85 (22.54)	95 (24.80)	180 (23.68)
DA	69 (18.30)	66 (17.23)	135 (17.76)
V	220 (58.35)	200 (53.05)	420 (55.26)
H	3 (0.79)	22 (5.74)	25 (6.63)
Total	377 (49.60)	383 (50.39)	760

Table 6: Status of eruption of maxillary and mandibular third molars

Status of eruption	Maxilla (%)	Mandible (%)	Total (%)
Completely erupted	149 (44.34)	96 (23.35)	245 (32.62)
Partially erupted	170 (50.59)	126 (30.65)	296 (39.41)
Unerrupted	17 (5.05)	203 (49.39)	210 (927.96)
Total	336 (44.74)	411 (54.72)	751

DISCUSSION

Third molars are most often congenitally missing. As racial variation, nature of diet, degree of use of masticatory apparatus, and genetic inheritance can affect the jaw size and tooth size, studies of prevalence and incidence of impacted third molars have been carried out on different population groups.^[4-11]

In our study, about 33% of the teeth were found to be completely erupted and remaining 66% of the teeth were in various stages of eruption. In Sandhu *et al.*'s^[5] study, 24% of the teeth were found to be erupted and 76% were in various stages of eruption.

The mean age of our study group was 21.58 years (± 2.9079 std deviation), Hellman^[12] reported a mean age for eruption as 20.5 years among Americans. In African races, the period of eruption ranges from 13 to 20 years. Fanning^[11] found the median age of eruption to be 19.8 years in men and 20.4 years in women among Bostonians. Sandhu *et al.*,^[5] Quek^[13] and Schersten *et al.*,^[7] study have shown mean age of their subjects as 19.3, 26.5 \pm 5 and 20 to 25 years, respectively.

The proportion of students having all 4 third molars was higher (93.5%) than a study by Sandhu^[5] (76%) in Indian population and Hattab^[6] (73%) in Jordanians.

Our observation showed that incidence of congenitally missing third molars was 5% which is lower than the data reported by Sandhu *et al.*,^[5] (11.5%), Levesque *et al.*,^[14] for French Canadians (9%), Hattab^[6] for Jordanians (9.1%), Gorgani *et al.*^[15] for Americans, Venta *et al.*,^[16] for Finnish students (12%) and Kruger *et al.*^[12] for New Zealand population (15.2%).

In the present study conducted on Libyan students, 2.5% had agenesis of all third molars, which is slightly higher than the results obtained from Hattab *et al.*,^[6] (1.7%) and Hugoson and Kugelberg^[11] on Swedish population (2%). But our observation is considerably less than that for the Scandanavian population (10% to 13%)^[7,17,18] and Americans (7% to 10%).^[15]

The proportion of agenesis of third molars for Libyan females (3%) was higher than males (2.1%) which were similar to the findings of Sandhu *et al.*,^[5] {where Indian females showed 12.8% and males 8.3%}, Hellman *et al.*,^[12] and Shah *et al.*,^[19] but differ from those of Levesque *et al.*,^[14] Gorgani *et al.*^[15] and Hattab *et al.*^[6]

Our results show that mandibular agenesis was more common than the maxillary, which differ with the results of previous studies.^[5,6,18,20,21]

There was no equal distribution between right and left side as noted by Hattab, Hellman,^[12] Granen^[18] and Shah *et al.*^[19] Results of our study showed that about three quarters of the subjects had all four third molars, which was similar to the results obtained by Hattab *et al.*,^[6] and Sumeeth sandhu *et al.*^[5] But this proportion was higher compared with the findings of Hellman^[12] on American students and Schersten *et al.*,^[7] on Scandanavians, who also noted that one half of the persons had all four third molars.

Our results showed differences in both male and female group, which was statistically significant (Chi-square test), which was in agreement with the results obtained from Hellman^[12] Schersten,^[7] but differ from Hattab,^[6] Dachi and Howell.^[21]

The order of frequency for missing teeth in the present study is 1 (1 subjects), 2 (2 Subjects), 3 (5 subjects), 4 (187 subjects) which were in accordance with the findings of Hattab *et al.*,^[6] and Nanda and Kruger *et al.*,^[9] but differ from Banks^[11] (where it is most common for 2 third molar to be missing, followed by 1, 4 and 3.

In the Libyan students with a mean age of 21.5 years, 30% of the third molars were unerupted (Level C of eruption). This finding is in agreement with Sumeeth sandhu *et al.*,^[5] (34% mean age 19.3 years), also with Bjork^[17] and Venta^[22] (between 22.3% and 66.6%, with age between 19.5 and 20.5 years).

Table 6 shows that mandible had a higher frequency of unerupted teeth (49.39%) than the maxilla (5.05%). These findings were in agreement with Kruger *et al.*,^[9] (age, 18 years), and differs from Sandhu *et al.*,^[5] (mean age 19.3 years), Hattab^[6] (Mean age 20.4 years) and Venta *et al.*,^[23] (age 20 years).

In this study, 32.62% of third molars were fully erupted, this value is close to Venta *et al.*,^[16] ((35%) but more than that reported by Sandhu *et al.*,^[5] (24%), Kruger *et al.*,^[9] (17%) and less than that reported by Hattab *et al.*,^[6] (11) (58%); Odusanya *et al.*,^[1] (1) (100%).

In this study, 41.68% of the mandibular third molars were found to be in the mesioangular position. This number is close to the observations by Sandhu *et al.*,^[5] (49%), Hattab *et al.*^[6] and Richardson.^[24] This number is considerably higher than that reported by Sewerin and Wowern^[25] (18%) and less in proportion to that noted by Kruger *et al.*,^[9] (62.9%), Richardson^[24] and Venta *et al.*^[23] (71%).

Our observation that 38.25% of the lower third molar was in vertical position is close to the findings of Hattab *et al.*,^[6] and Kruger *et al.*,^[9] and Venta *et al.*,^[23] and less than the finding of Sandhu *et al.*,^[5] (42%).

The frequency of distoangular mandibular third molar in the present study (13.45%) is more compared with the findings of Sandhu *et al.*,^[5] Hattab *et al.*,^[6] Kruger *et al.*,^[9] and Venta *et al.*^[23]

The present study showed that 22.04% of the maxillary third molars were in the distoangular position. This value is similar to the results obtained from Venta *et al.*,^[23] (23%), but less than the results reported by Sumeet Sandhu *et al.*,^[5] (48%) but higher than that by Kruger *et al.*,^[9] (12.2%).

Our observation that 72.17% of maxillary third molars were in the vertical position is also more compared with the findings of Sandhu *et al.*,^[5] (43%), Venta *et al.*,^[23] (54%), and Kruger *et al.*,^[9] (18.1%).

The frequency of mesioangular maxillary third molars 5.77% is less than that reported by Venta *et al.*,^[23] Kruger *et al.*,^[9] and Sandhu^[5] (10) (9%).

CONCLUSION

The present study showed that 33% of the teeth were fully erupted and 66% were in various stages of eruption and 5% were congenitally missing in these students.

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How to cite this article: Byahatti S, Ingafou MS. Prevalence of eruption status of third molars in Libyan students. *Dent Res J* 2012;9:152-7.

Source of Support: Nil, **Conflict of Interest:** None declared.