Section: FMT

Original Research Article

STUDY ON CLINICAL STAGING OF THIRD MOLAR ERUPTION AS AN AID IN AGE ESTIMATION

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ABSTRACT

Background: Identification means determination of individuality of a person. The age of an individual is an important factor in determining identity. The eruption of third molar teeth is widely used to determine age, between the age 14-25 years. Clinical staging of third molar eruption can serve as a screening technique for age assessment. The purpose of this study was to determine the usefulness of the morphological appearance of the level of the third molar teeth as an extra tool in age estimation, when OPG X rays are not available. **Materials and Methods:** The present study is a cross sectional, observational study, was done at the Department of Forensic Medicine and Toxicology, Government Medical College, Srikakulam. The study was done between March and June 2025 on 400 people aged 18 to 25 years, who lived in the Srikakulam district of Andhra Pradesh. Olze, et al., suggested a classification of levels of third molar eruption. A modified form of it was used in observing the level of 3rd molar eruption. **Result:** It was found that Level C has the highest proportion of individuals. There was no significant difference between males and females in the distribution of levels with age. Chi square test showed that there is a significant association between age groups and levels, both in males and females. **Conclusion:** The study reveals a strong correlation between age groups and eruption levels in both males and females. It suggests that classification of 3rd molar eruptions based on morphological appearance could be beneficial for non-invasive age assessment in large samples, with prospective long-term follow-ups.

INTRODUCTION

Identification means determination of the individuality of a person.[1] Age is one of the characteristics that contribute to a person's overall identity, whether they are alive or deceased.[2] Legal consequences can be quite different if a subject of unknown age is judged to be a juvenile or an adult. The biological process of development of different systems of the body, and their wear and tear occurs with the aging of a person. Analysis of the resultant changes helps us determine the age. The age of a person in postnatal life can be estimated from physical features, laboratory tests, teeth eruptions, ossification centers, and the growth of bones.[3] The existence of deciduous dentition, their stages of eruption, the time of mixed dentition, and the stages of eruption of permanent teeth can all be used to estimate age with reasonable accuracy after birth and during the developing years. This can only be possible from 6 months to 25 years of age.[4]

The third molar is the only tooth that continues to develop after the age of 14; therefore, dental age estimation methods must rely on its development until the age of 25.[5] The eruption of the third molar or wisdom teeth is unknown and may be impacted. In impacted teeth, the depth or level of maxil¬lary and mandibular third molars was classified by the Pell and Gregory classification system, where the impacted teeth are assessed according to their relationship to the occlusal surface of the adjacent second molar.[6] The angulation of the impacted third molar was described in Winter's classification with reference to the angle formed between the intersected longitudinal axes of the second and third molars. Mandibular mesio-angular impaction is the most common type. The third molar eruption has been estimated to vary from 9–23 years of age radiographically.[7] After the eruption of the second molar tooth, the body of the jaw grows behind, and the ramus is elongated to make room for the appearance of the third molar tooth. Hence, during

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the examination of a person for determination of age, if the third molar is not visible, a note should always be made as to whether there is space in the jaw behind the second molar teeth or not.[8] A study found that the overall prevalence of third molar impactions in at least one of the four quadrants was only 27.4%.[9] In most quadrants, around 72.6% showed typical third molar eruption. This allows for the use of morphological criteria like as the staging of a third molar eruption to determine an individual's age. Demirjian, et al, in their work identified stages of eruption by orthopantogram (OPG) making dental age estimation scientifically uniform.[10] However some times, there may be need to provide estimation of age, based on appearance of 3rd molar alone as a screening tool.

The present study was done with the aim to know the usefulness of the morphological appearance of the level of the 3rd molar tooth as an additional tool in age estimation when OPG X-rays are not available. Accordingly, objectives were made to evaluate the level of eruption of the 3rd molar in each age group between 18 and 25 years and to see the difference between the male and female sexes.

MATERIALS AND METHODS

This is a cross sectional observational study. Prior Approval for this study was obtained from Scientific Committee on 06-02-2025, GMC-SKLM/ SC-A/ 2025/013 and Institutional Ethics Committee on 03-03-2025, IEC 2025 A/ GMC & GGH/ SKLM/ 220225/06. The present study was done at the Department of Forensic Medicine and Toxicology, Government Medical College, Srikakulam, Andhra Pradesh. The study was done between March and June 2025 on 400 people, 200 males and 200 females, aged 18 to 25 who lived in the Srikakulam district of Andhra Pradesh. Individuals who have given consent for oral examination, have fully erupted 2nd permanent molars, and are within the study age group are included in this study. Persons with extracted third molars, congenital anomalies, malformations, or trauma were excluded from the study. The selected participants' oral examination was conducted using a regular torch to illuminate the posterior regions of the mouth cavity. Only mandibular 3rd molars of the left and right quadrants were examined in this study because maxillary 3rd molar examination has a difficult viewing angle along with high inter-observer bias.

Findings on the presence of retro-molar space or the level of eruption of third molars on each side of the mandible were noted. Olze, et al,11 suggested a classification of levels of third molar eruption. A modified form of it was used for the present study as follows:

Level A: Retromolar space is much less than the width of the 2nd molar.

Level B: Retromolar space is almost equal to that of the 2nd molar.

Level C: Penetration of gingiva by at least one cusp.

Level D: Complete emergence of the 3rd molar in the occlusal plane.

Accordingly, the level of the 3rd molar on each side of the lower jaw is noted for analysis.

RESULTS

The present study was conducted on a total 800 3rd molar tooth of 400 participants after applying inclusion criteria, of whom 200 were males and 200 were females. The observations of the participants were divided into four age groups. The observations are tabulated as shown in Table 1 & 2. The data was analyzed statistically, which showed that in males, Level C has the highest proportion (47%) of individuals, while Level A has the lowest (4%). Level C is peaking in age groups 20-21 years and 22-23 years. In females also, Level C has the highest proportion (46%) of individuals, while Level A has the lowest (5.5%). Level C is peaking in age group 20-21 years. The age group 22-23 years in males and 20-21 years in females showed the highest variance and standard deviation, suggesting that these groups had the most diverse distribution across the levels. By applying the chi square test of independence, the p-value is less than 0.001, indicating that we reject the null hypothesis and observe that there is a significant association between age groups and levels, both in males and females. The pattern of eruption indicated that partial eruption stages of Levels B and C dominated in younger age groups of 18-21 years. Whereas fully erupted third molars with Level D have become more common with increasing ages. This trend is even more clearly appreciable in males when compared to females. Sample images for each level are shown in Figure 1.

Table 1: The findings seen in our study showing the level of 3rd molar eruption in different ages in males

MALE (n = 200 x 2 sides = 400)					
AGE	**Level A**	**Level B**	**Level C**	**Level D**	**TOTAL**
18,19	3	14	9	4	30
20, 21	9	45	72	14	140
22, 23	2	28	75	43	148
24, 25	2	5	32	43	82
TOTAL	16	92	188	104	400

Table 2: The findings seen in our study showing the level of 3rd molar eruption in different ages in females

FEMALE (n = 200 x 2 sides = 400)					
AGE	**Level A**	**Level B**	**Level C**	**Level D**	**TOTAL**
18,19	9	25	13	1	48

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20, 21	13	76	84	31	204
22, 23	0	38	68	18	124
24, 25	0	0	19	5	24
TOTAL	22	139	184	55	400

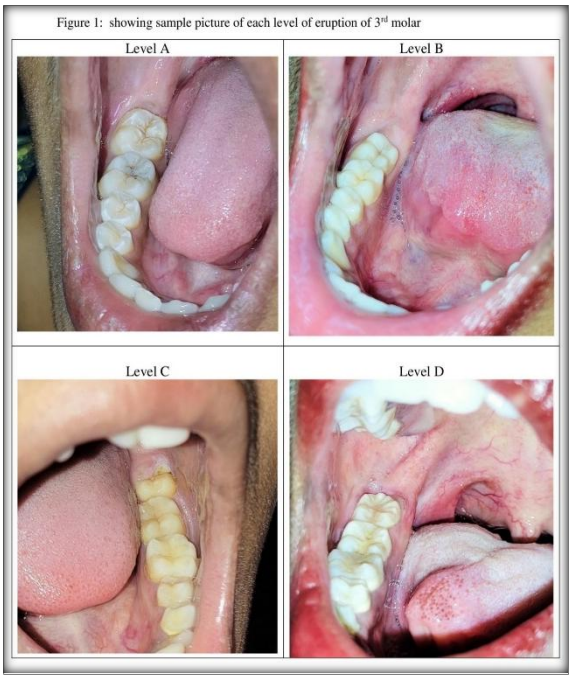

Figure 1: showing sample picture of each level of eruption of 3rd molar

DISCUSSION

Between the ages of 14 and 25 years, dental age is mostly determined by the stage of development of the third molars. There is significant fluctuation in these, and the accuracy of dental age prediction during this time period ranges by around three years.[12] One study by S Pankaj, et al, conducted on a population aged 17 to 24 found that 3.3% of third molars were congenitally missing, while roughly 94% of patients had all four third molars.[13] Staging third molars remains a valuable feature for estimating age, particularly in areas without radiological capabilities to assess impacted thirds molars. It is also useful for quickly evaluating big samples for age. Third molar eruption is a natural aspect of the tooth growth process, and it does not happen at the same time or pace in all four sockets.

In our analysis, we found that Level C has the highest proportion (47%) of males, whereas Level A has the lowest. In females, Level C has the highest proportion (46%), whereas Level A has the lowest. There is also an increase in the number of higher levels as people get older, with little variation between men and women. This could be due to the fact that the teeth's appearance improves with age, and the majority of them may have already reached level C, given that the study group was above the age of 18. However, there are fewer Level D than Level C due to the possibility of few impactions and partial deviations throughout the eruption process, which halts the process at Level C of gingival eruption.

The findings are consistent with Varun Garg's, et al,[14] study, which found that the average age for partially erupted teeth (equivalent to Level C) in the four quadrants for males is 17-18 years, and for females it is 16.9-18.0. The average age for completely erupted teeth (equivalent to Level D) ranges from 21-21.9 years for males and 21-21.6 years for females. There is no statistically significant difference in mean age between males and females in each quadrant during the partially and entirely erupted stages. They also discovered that for all four quadrants, chronological age had a positive linear link to dental stage. This result from our study also closely follows the findings of another study conducted by Priyadarshini, et al,[15] who calculated the mean age to be 22.4 years in men and 23.8 years in females. The same study found a statistically significant difference between the sexes, with males experiencing maxillary sequence eruption earlier than females.

In our study, the age group of 22-23 had the highest variance and standard deviation in males, while it was in the age group of 20-21 years in females. Taware A.A, et al,[16] found that standard deviations for ages 17 to <20 years are lower than those for ages 20 to <22 years. Using the chi square test of independence, the p-value is less than 0.001, suggesting that we reject the null hypothesis and find a significant correlation between age groups and levels in both males and females. This is comparable to a study by Monica Tuteja, et al,[17] who discovered a strong relationship between age and eruption levels. In the study, there were significant differences in the mean age of eruption between males and females for teeth 18 and 28 in Stage B. However, there was no statistical difference in Stages A, C, and D for teeth 18, 28, 38, and 48, or Stage B for teeth 38 and 48. Taware A.A, et al, 16 found a correlation coefficient of 0.98 and an R2 value of 0.96. They claimed that the presence of all four third molars indicates that the person is over the age of 18, whereas their absence provides no indication of age.

CONCLUSION

The current study found a strong connection between age groups and eruption levels in both males and females. An overall suggestion that third molar eruption follows an age related pattern with higher levels of eruption becoming more common with increasing age. So, in situations where there is no OPG facility, classification of 3rd molar eruption based on morphological appearance may be beneficial as an extra tool in estimating a person's age. This can also be used as a non-invasive, simple, and quick screening approach for assessing age in big samples for forensic and anthropological purposes. It is advised that a prospective study with long-term follow-up, rather than a cross-sectional study, be

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conducted on this third molar, with a larger sample size, to examine whether a detectable sex difference exists and to refine the results using radiological correlations.

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