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Prevalence and Patterns of Impacted Maxillary third Molar in a Private Dental Institution

Research Article

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Abstract

Tooth impaction can be defined as that failure of the tooth to erupt into its normal physiological position and oftentimes, it is associated with a third molar. Third molar is also known as wisdom tooth, meaning it is the last tooth to erupt into the oral cavity even in the age of adolescent or adulthood. Although third molar impaction remains indefinitely asymptomatic, some individuals may be presented with tenderness and swollen gums. Impacted teeth are commonly treated with tooth removal. Conservative approach is recommended in asymptomatic cases and when the risks of the procedure outweigh the expected benefit. The aim of this study was to investigate the prevalence and pattern of maxillary third molar impaction, angulation and level of eruption among patients treated in Saveetha Dental College. Data collection was done in a university setting. Data regarding patients having impacted teeth were retrieved after analyzing 86000 case sheets. The following parameters were evaluated based on the dental records; age, gender, level of eruption and angulation pattern. Radiographs and intraoral photographs were used to assess the patterns of maxillary third molar impaction. Excel tabulation and SPSS version 23 was used for data analysis. The statistical test used for the demographics was frequency, percentage and for tests of association between categorical variables was Chi-square test. P value less than 0.05 was considered as statistically significant. Women had more prevalence (58.5%) of impaction than men and was seen most in the age group of 21-40 years. 64.6% and 35.4% of the total teeth were 18 and 28, respectively. The most common angulation of impaction in maxilla was vertical (55.4%). Position C impaction had greater occurrence (61.5%) compared to other two levels of impaction. No significant difference was found between right and left sides in maxilla, (p=0.447). There was no significance of angulation and level of impaction with respect to age and gender. Within the limits of the study, impacted maxillary third molars were more prevalent in female and younger patients. Vertical angulation and level C position were more frequently seen in impacted maxillary third molars.

Keywords: Angulation; Impaction; Maxillary Third Molar; Prevalence; Pattern; Position.

Introduction

A tooth becomes impacted when it is pathologically unable to erupt or develop into its normal functional position. Third molars are the most frequently impacted of all teeth, precisely mandibular third molars [46]. Impacted maxillary third molars occur frequently in people followed by mandibular third molars and may require surgical removal for several reasons. Nevertheless, the occurrence of impacted third molars vary according to the populations and was reported to range from 18% to 70%. Racial variations in the regards of facial development, jaw and teeth size are the important attributes for the process of teeth eruption [9].

Third molars impaction has been related with some pathological changes. For instance, root resorption, pericoronitis, periodontal disease, neoplasms and damage to the adjacent teeth [2]. A study by Meisami et al had reported a weakened angle of mandible that is prone to fracture due to the third molar impaction [28]. Che et

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al found periodontal loss more than 5 mm of second molar next to the impacted mandibular third molar. Also, 7% of the 2115 subjects were diagnosed with dental caries in their second molars in Chinese population [8]. Impaction can be attributed to the trauma, pathologies and insufficient space in the jaw, leading to pain, swollen gums, infections, dental caries and cyst formation. Impacted maxillary third molars can cause several complications if they are in close proximity to the surrounding anatomic structures like maxillary sinus. On the other hand, impacted teeth can also be classified due to systemic and local factors [26]. Systemic factors that possibly can affect the pattern of tooth eruption are cleidocranial dysplasia, Down syndrome, endocrine deficiencies, febrile disease and irradiation [6]. Retained deciduous teeth, malposed tooth germs, supernumerary teeth, odontogenic tumors and cleft lip and palate are the common local factors that might influence teeth impaction [17, 37, 29].

Multiple classification systems have existed to describe the third molar impactions in the terms of angulation of the impaction, level and depth of the impaction and the relation to the anterior border of ascending ramus of mandible. These classifications help in developing optimal treatment plans in regard to the difficulty of the surgical extraction and reduce associated complications during surgery. In the Pell & Gregory classification system, impacted teeth are determined based on their level of eruption in relation to the occlusal surface of the second molar vertically, dental longitudinal axis and relationship to the anterior border of the ascending ramus of mandible [36].

Winters classified impactions based on the angulation of the third molar to the longitudinal axis of the second molar. The system consists of mesioangular, distoangular, vertical and horizontal [54]. Orthopantomography (OPG) is considered as the best choice technique of evaluating dental pathologies, especially dental impaction. The level of impaction, angulation of impaction, amount of bone covered in impacted teeth and proximity between third molar and inferior alveolar nerve can be easily assessed with OPG [36].

Dentists diagnose patients' teeth, gums and other related parts of the mouth. They are responsible for giving advice in terms of oral hygiene care and diet choice that affect oral health. Among these, orthodontists are obligated to treat malalignments of the teeth. Therefore, early assessment of a third molar eruption in young growing patients will definitely be helpful for the treatment outcome.

According to most orthodontists, consideration of mandibular and maxillary third molar impaction are really important in preventing relapse in the lower anterior region, molar distalization, pericoronitis, dental caries prevalence and arch crowding. Castella et al stated that third molar impaction was an estimated event seen in extraction and nonextraction patients. Oftentimes, agenesis of third molars happens in the order of two, one, three and all the four third molars [19].

Considering the rarity of retrospective studies investigating the pattern of maxillary third molar impaction in the southeast area of India, this study was aimed to investigate the prevalence and patterns of maxillary third molar impaction among dental patients treated in Saveetha Dental College. Previously our team has a rich experience in working on various research projects across multiple disciplines [18], [50], [4], [30], [20], [10], [12], [32], [39], [14], [53], [33], [31], [45]. Now the growing trend in this area motivated us to pursue this project. The objectives were to determine the relationship between the angulation and level of impaction with different age groups and gender.

Materials and Methods

Study design and study setting

This retrospective study was conducted in Saveetha Dental College and Hospital, Saveetha University, Chennai, to evaluate the prevalence and patterns of impacted maxillary third molars among patients reporting from June 2019 to March 2020. The approval for this university setting study was obtained from the institutional review board and it was covered by the ethical approval number; SDC/SIHEC/2020/DIASDATA/0619-0320.

Study population and sampling

Inclusion criteria for the study were patients at least 18 years of age, with complete root formation of third molars, and no history of third molar extraction. Patients with dental pathologies, malalignment in the occlusal plane and presence of congenital diseases or facial syndromes were excluded from this study. After assessment in the university patient data registry, case records of 65 patients who were diagnosed with impacted maxillary third molars and were eligible for the study were included in the study. Cross verification of data for errors was done with the help of an external examiner.

Data collection

Data regarding patients having impacted teeth were retrieved after analyzing 86000 case sheets. Radiographs and intraoral photographs of patients having impaction were reviewed. The following criteria were examined based on the dental records: age, sex, level of eruption and angulation pattern of impacted maxillary third molars. All the radiographs collected were assessed for the following parameters: number of the impacted maxillary third molars, angulation of the impaction and level of the impaction.

Maxillary third molar is considered impacted when it was not fully erupted into the normal functional location in the occlusal plane or the lowest portion of the impacted tooth was below the occlusal plane of the second molar. Winter's classification was used to determine the angulation pattern of the impacted maxillary third molars. The following classification system adopted were ; 0°-10°, vertical; 11°-79°, mesioangular or distoangular; 80°-100°, horizontal, and the remaining cases were classified as cases of inverted or buccolingual impaction.

The level of impaction was recorded using Pell and Gregory classification; Position A, the highest portion of the impacted tooth was on same level of above the occlusal plane / not buried in bone; Position B, the highest portion of the impacted tooth was below the occlusal plane but above the cervical line of second molar; Position C, the highest portion of the impacted tooth was below the cervical line of second molar / completely buried in bone. All the data collected were tabulated in MS Excel and incomplete data was eliminated.

Statistical Analysis

The collected data was validated, tabulated and analysed with Statistical Package for Social Sciences for Windows, version 23.0 (SPSS Inc., Chicago, IL, USA) and results were obtained. Categorical variables were expressed in frequency and percentage; and continuous variables in mean and standard deviation. Chi-square test was used to test associations between categorical variables. P value < 0.05 was considered statistically significant.

Results & Discussion

In our study, we evaluated the incidence of impacted maxillary third molars among the patients treated in our college and its association with gender and age groups. We observed that women had higher prevalence (58.5%) of impaction than men [Figure 1] and were seen mostly in the age group of 21-40 years. [Figure 2]. 64.6% and 35.4% of the total teeth were 18 and 28, respectively. [Figure 3]. Level C impaction had greater occurrence (61.5%) compared to other two levels of impaction. [Figure 4]. The most common angulation of impaction in maxilla was vertical (55.4%).

Figure 1. Bar chart shows Gender-wise Distribution of Impacted Maxillary Third Molars. X axis represents the distribution of gender and Y axis represents frequency of impaction. Females (58.46%) showed higher prevalence of maxillary third molar impaction compared to males (41.54%).

Figure 2. Bar chart shows Age-wise Distribution of Impacted Maxillary Third Molars. X axis represents the distribution of age groups and Y axis represents frequency of impaction. Impacted maxillary third molar was more prevalent among the age group of 21-40 years (67.69%) compared to 10-20 years (18.46%), 41-60 years (10.77%) and 61-80 years (3.08%).

Figure 3. Bar chart shows the Distribution of Impacted Maxillary Third Molars. X axis represents the distribution of age groups and Y axis represents frequency of impaction. Impacted maxillary third molar was more prevalent for 18 than 28 (FDI Notation) with the percentage of (64.62%) and (35.38%), respectively.

Figure 4. Bar chart shows the Distribution of Impacted Maxillary Third Molars Based on Pell and Gregory Classification. X axis represents the distribution of impaction based on Pell and Gregory classification and Y axis represents frequency of impaction. Red denotes Position A, orange denotes Position B and grey denotes Position C. There is higher prevalence of Position C (61.54%) than Position A (21.54%) and Position B (16.92%).

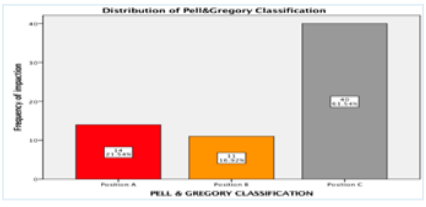


Figure 5. Bar chart shows the Distribution of Impacted Maxillary Third Molars Based on Winter's Classification. X axis represents the distribution of impaction based on Winter's classification and Y axis represents frequency of impaction. Blue denotes buccolingual, green denotes distoangular, beige denotes mesioangular and purple denotes vertical impaction. There is higher prevalence of vertical impaction (55.38%) than other angulations.

Figure 6. Bar chart shows the association between Age and Pell & Gregory Classification. X axis represents the age groups and Y axis represents the frequency of impaction based on Pell & Gregory classification. Red denotes Position A, orange denotes Position B and grey denotes Position C. Chi square test was done and association was found to be statistically not significant between age groups and Pell & Gregory Classification. Chi-square test value - 9.421, p=0.151 (>0.05) and the results are statistically not significant. Impaction with Position A was seen more prevalent among 21-40 years (41.54%) compared to 10-20 years (13.85%) and 41-60 years (6.15%).

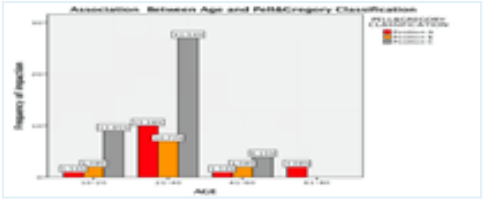


Figure 7. Bar chart depicting the association between Age and Winter's Classification. X axis represents the age groups and Y axis represents the frequency of impaction based on Winter's classification. Blue denotes buccolingual, green denotes distoangular, beige denotes mesioangular and purple denotes vertical impaction. Chi square test was done and association was found to be statistically not significant between age groups and Winter's Classification. Chi-square test value - 5.506, p=0.788 (>0.05) and the results are statistically not significant. There is an increase of vertical impaction among all age groups.

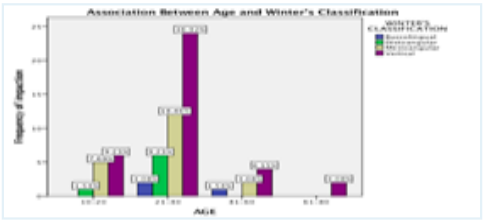


Figure 8. Bar chart depicting association between Gender and Pell & Gregory Classification. X axis represents the gender and Y axis represents the frequency of impaction based on Pell&Gregory classification. Red denotes Position A, orange denotes Position B and grey denotes Position C. Chi square test was done and association was found to be statistically not significant between gender and Pell & Gregory Classification. Chi-square test value - 2.926, p=0.232 (>0.05) and the results are statistically not significant. There is an increase of impaction with Position A among females (40%) compared to males (21.54%).

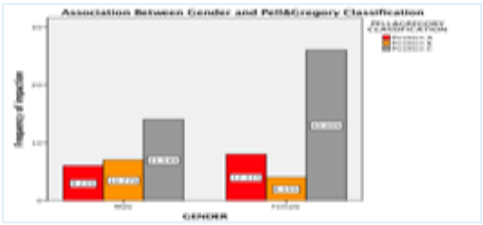


Figure 9. Bar chart depicting association between Gender and Winter's Classification. X axis represents the gender and Y axis represents the frequency of impaction based on Winter's classification. Blue denotes buccolingual, green denotes distoangular, beige denotes mesioangular and purple denotes vertical impaction. Chi square test was done and association was found to be statistically not significant between gender and Winter's Classification. Chi-square test value - 6.145, p=0.105 (>0.05) and the results are statistically not significant. There is higher prevalence of vertical impaction among females (30.77%) than males (24.62%).

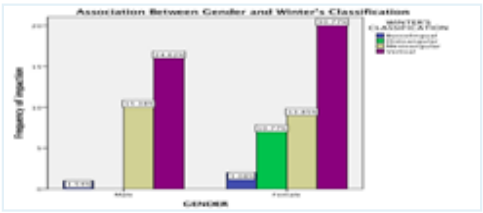


Figure 10. Bar chart depicting the association between Tooth Number and Pell & Gregory Classification. X axis represents the tooth number and Y axis represents the frequency of impaction based on Pell&Gregory classification. Red denotes Position A, orange denotes Position B and grey denotes Position C. Chi square test was done and association was found to be statistically not significant between tooth number and Pell & Gregory Classification. Chi-square test value - 1.337, p=0.512 (>0.05) and the results are statistically not significant. There is an increase of impactions with Position A,B and C in relation to 18.

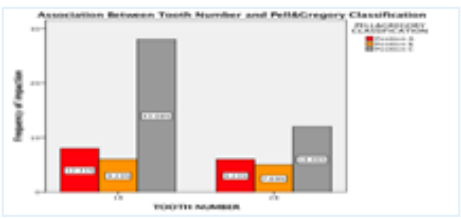
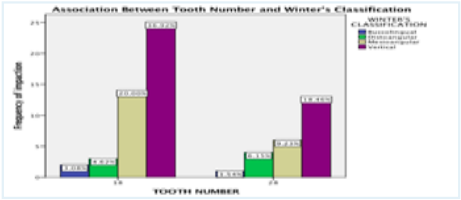


Figure 11. Bar chart showing the association between Tooth Number and Winter's Classification. X axis represents the gender and Y axis represents the frequency of impaction based on Winter's classification. Blue denotes buccolingual, green denotes distoangular, beige denotes mesioangular and purple denotes vertical impaction. Chi square test was done and association was found to be statistically not significant between tooth number and Winter's Classification. Chi-square test value - 1.642, p=0.650 (>0.05) and the results are statistically not significant. There is a higher prevalence of vertical (36.92%) and mesioangular (20%) impactions in relation to 18 than 28 (18.46% and 9.23%, respectively).



[Figure 5]. No statistically significant association was found between angulation and level of impaction with respect to age and gender.

The prevalence of maxillary third molar impaction found from this study was lower, in corroborating with a study by Reddy et al done in Indians (27%). However, the current studies by Quek et al and Hassan et al reported higher frequencies done in Singaporean Chinese (68.6%) and Saudi Arabians (40.5%), respectively. Hassan stated that the most common number of impactions per patient was one and Quek found that two was the highest frequency number of impacted third molars per patient. Conversely, the findings of Ma'aita et al reported that Jordanian patients had impaction of all four third molars. Different racial populations nationwide can influence these variations of consensus[1].

In our study, females had a higher proportion of impaction compared to males. This is consistent with previous study that stated higher frequency of the impaction was observed in women. Similarly, Heshemipour et al reported that females were more frequently observed in the association of impacted maxillary third molars [3]. These findings are in accordance with the results of previous studies [16, 21, 25]. The significant difference between gender can be attributed to the rate of growth and development of mandibles. There is evidence of females having less incremental growth and reduced time taken for mandibles to fully grow than males. Third molars begin to erupt when growth in females stops, whereas, the growth of the jaws still continues in males, considering more space created for the eruption of third molars [24].

In our study, more than half of the patients were in the range of 21 to 40 years old. It was observed that the prevalence of impacted maxillary third molars declines with the increasing age. In recent study, results showed younger subjects had more prevalence of rate of impaction [5]. This is correlated with the findings of Hashemipour et al in which half of the patients were in the third decade of their lives [3]. Besides, Garcia and Chauncey [13, 5, 42, 48] and Reddy reported high prevalence of impacted third molars among the young-aged population. However, there is also previous literature showing increased prevalence of impaction in older patients, above 40 years. Lack of awareness among these patients may have delayed the treatment of impaction [3].

Radiological examination revealed vertical impaction was the first common in this study (55.4%). This is in accordance with many other studies where the frequency of vertical impaction ranged from 14.1%-49.6% [5, 15]. According to a study of Saudi population, vertical angulation was the most frequent angulation seen in both maxillary and mandibular arch. In the maxilla, 44.1% of the study population had vertical angulation of impacted third molars followed by 37.1% distoangular impaction [5]. Reddy et al also found that the most common angulation of impaction in maxilla was vertical [(Reddy KVG, no date)]. However, Kruger et al reported that mesioangular impaction was the most common angulation impaction in the maxillary arch [23]. Some opposing studies revealed mesioangular impaction as the commonest [1]. The possible reason for different findings can be related to the fact of various methods used to classify angulation of impaction in each study. As it is solely based on visual impression, the reliable comparison of reported impaction was challenging.

The C level (61.5%) was the commonest level of impaction in our study. In line with the current study, Bayoumi et al and Alfadil at al observed that the C level impactions were the most commonly seen maxillary third molars impaction. Quek et al also reported the highest proportion of the C level impactions in maxilla than in the mandible, which was statistically significant [3, 28]. Contrary to this, the most common levels of impaction in their studies were B level [15] and A level [1]. There was no statistical significant association in the angulation pattern of third molar impaction between males and females in our study. This is supported with some investigations done by Sandhu and Kaur, Montelius, Topkara A and Hattab et al., [49]. However, some other prevalence studies reported a significantly greater frequency of third molar impaction [3]. Differences of the findings were possibly due to the limited data availability, ethnic variations, genetic hereditary and jaw-tooth size. Our institution is passionate about high quality evidence based research and has excelled in various fields [34, 40, 52, 11, 38, 47, 51, 7, 27, 43, 44]. We hope this study adds to this rich legacy.

As the current study was hospital-based, it may lack randomization which is the limitation of the study. Further studies should be conducted to evaluate the possible etiologies behind the prevalence of impaction in other regions of Tamil Nadu.

Conclusion

Within the limits of this Study it can be concluded that, there is high prevalence of gingivitis among pediatric patients, however, there is no significant association between age, gender and severity of gingivitis.

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