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Prevalence and Pattern of Distribution of Impacted Mandibular Third Molars on Digital Panoramic Radiograph among Central Kerala Population: A Cross Sectional Study

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Abstract
Aim: *The aim of this cross sectional study was to assess the prevalence and pattern of impacted mandibular third molars on digital panoramic radiographs.*
Methods: *In the study we reviewed 745 digital panoramic radiographs of patients treated in our institution from 2017 June to 2018 June. The radiographs were retrieved from the archives of Department of Radiology and were evaluated for the prevalence of impacted mandibular third molars, their pattern of distribution and associated pathological conditions. The study also evaluated presence of other impacted teeth as well as partially impacted mandibular third molars.*
Results: *From the total of 745 radiographs reviewed, a total of 293 impacted teeth were observed. Mandibular third molars (198) were the most commonly encountered impactions, followed by maxillary third molars (69), maxillary canines (11) and supernumerary teeth (15). 135 subjects (18.1%) presented with at least one impacted mandibular third molar. 105 (14.1%) subjects presented with impacted mandibular left third molar and 93(12.5%) presented with impacted mandibular right molar, 22 (3%) and 21(2.8%) subjects presented with partially impacted mandibular right and left molars respectively. The analysis of the pattern of the impacted mandibular teeth showed that majority were in the mesioangular (47%) position, followed by horizontal (32.32%), vertical (15.15%) and distoangular (5.56%) positions.*
Conclusion: *The study revealed that 18% cases showed impacted mandibular third molar, with mesioangular (47%) pattern was more frequent.*
Keywords: *Impacted mandibular third molar, Impaction, Mesioangular, Molar, Kerala.*

Introduction

Impaction is the cessation of eruption of a tooth caused by either a physical barrier or an ectopic positioning of the tooth[1]. Impacted tooth either fail to erupt completely or partially to its correct position in the dental arch and its eruption potential has lost. Mandibular third molars or wisdom teeth are considered to be the most frequently impacted teeth followed by the maxillary canines and second premolars. According to Quek *et al.* in 2003, third molar is the most frequently impacted tooth, with a frequency of occurrence generally reported to be from 16.7 to 73.82 %[2]. The causes of impaction includes insufficient skeletal growth, macrodontia, late maturation of the third molars, inhibition of growth by adjacent tooth, mucosa thickness over growing tooth, retained deciduous teeth or systemic conditions like cleidocranial dysplasia and Down's syndrome[3].

The complications associated with impacted tooth are incisor crowding, resorption of adjacent tooth roots, inflammatory processes (pericoronitis),

temporomandibular joint dysfunction and development of cysts or tumours associated with these impacted teeth[4]. Digital panoramic radiographs are widely used in the diagnosis of variations in impacted third molars. Assessment of type of impaction and pathologies associated with these impacted teeth facilitates the treatment plan and surgical intervention. Since there were no studies conducted in the Central Kerala population to determine the prevalence of impacted mandibular third molars the present study was an attempt to know the prevalence, pattern of distribution and associated pathoses of impacted mandibular third molars on digital panoramic radiographs.

Materials and Methods

The cross sectional study analyzed 745 digital panoramic radiographs of patients who presented to the outpatient clinic at Mar Baselios Dental College, Kothamangalam, Kerala between the time period 2107 June to 2018 June. Only patients above 21 years of age were selected for the study as third molar eruption usually completes at this age. The radiographs, taken for routine radiographic examination for various dental purposes were randomly retrieved from the archives of Department of Oral Medicine and Radiology. Patients with incomplete root formation or malformed roots mandibular third molar roots, absence of mandibular second molars were excluded from the study. Only good quality radiographs that had a clear reproduction of teeth without any superimposition were included in this study.

Digital panoramic radiographs obtained from those performed on the Orthophos XG 5 (Sirona) machine at 64 kVp, 8mA and an exposure time of 14.1 seconds in our Department of Oral Medicine and Radiology. A single examiner viewed the radiographs using SIDEXIS XG software, Version (Sirona Dental Systems GmbH, Bensheim, Germany). Impaction of any teeth, especially impacted mandibular third molars, pattern of distribution and pathoses seen on impacted mandibular second and third molars were assessed.

For this study, impaction and angulation of impaction were defined as follows. A tooth was considered impacted when the occlusal plane of the tooth was below the occlusal level of adjacent tooth and below the bone level. A tooth is defined as partially/semi-impacted when it is in the line of occlusion but partially erupted.

The inclination of impacted mandibular third molar was evaluated by measuring the angulation between the longer axis of impacted mandibular third molar and the adjacent second molar tooth using **Winter's Classification** (Fig:1) as follows:

1) Vertical impaction: 10° to -10°;
2) Mesioangular impaction: 11° to 79°;
3) Distoangular impaction: -11° to -79°;
4) Horizontal impaction: 80° to 100°;
5) Others: 111° to -80°;
6) Bucco-lingual impaction.

The classification of uncommon angulations such as 'Mesio-inverted,' Disto-inverted and Disto-Horizontal' was combined and designated as 'others'.

Pathologies associated with impacted teeth included:

1) Carious lesions of impacted mandibular third molar and mandibular second molar;
2) Root resorption of the adjacent tooth:
3) Bone loss adjacent to the impacted tooth
4) An increase in the pericoronal space of the dental follicle of more than 3 mm around the impacted tooth.

Descriptive data analysiswere done by using SPSS software 16.0.0.0.

Results

Of the 745 digital panoramic radiographs, 390 (52.3%) were males and 355 (47.7%) were females (Fig :2). 369 were in the age group of 20-29, 155 in 30-39 ,103 in 40-49, 87 in 50-59, 24 in 60-69 and 7 in 70-79 age groups respectively (Table 1) with an overall mean age of 34.20 ± 12.82 years.

Amongst the total of 745 patients, 135 (18.1%) presented with at least one impacted mandibular third molar, out of which 105 (14.1%) presented with impacted mandibular left third molar and 93(12.5%) presented with impacted mandibular right molar. Of the 745 patients, 63 cases presented with bilateral and 72 cases with unilateral impacted mandibular third molar tooth. 22 (3%) and 21(2.8%) presented with partially impacted mandibular right and left molars respectively (Fig: 3).

93 patients in the age group of 20-29 presented with at least one impacted mandibular third molar, out of which 76 presented with impacted mandibular left third molar and 69 presented with impacted mandibular right molar. As the age progresses the chance of impaction of mandibular third molar reduced (Table 2).

The relationship of impaction of mandibular third molar and gender were assessed using chi-square test. Table 3 shows the comparison of presence of at least one impacted mandibular third molar and gender and there was a statistically significant difference between males and females. While comparing presence of impacted mandibular right and left third molars with gender showed no statistically significant difference between them.

In the 745 patients a total of 293(39.33%) impacted teeth were noticed. Mandibular third molars (198 (26.6%)) were the most commonly encountered, followed by maxillary third molars (69 (9.3%)), maxillary canines (11(1.5%)) and supernumerary (15(2%)) (Fig: 4).

73 cases presented with any one of the third molars (either 18/28/38/48) impacted, 60 cases with 2 impacted third molars, 10 cases with 3 impacted third molars and 11 cases with all the 4 third molars impacted.

Fig 5 shows the analysis of the pattern of the impacted mandibular teeth. The results showed that majority were in the mesioangular (47%) position, followed by horizontal (32.32%), vertical (15.15%) and distoangular (5.56%) positions.

The most prevalent pathologic condition caused by impacted teeth was carious lesions of adjacent tooth (8 (1%)), followed by increased follicular space

(3(0.4%)). Carious lesion on impacted mandibular third molars were noted in 0.7% of cases.
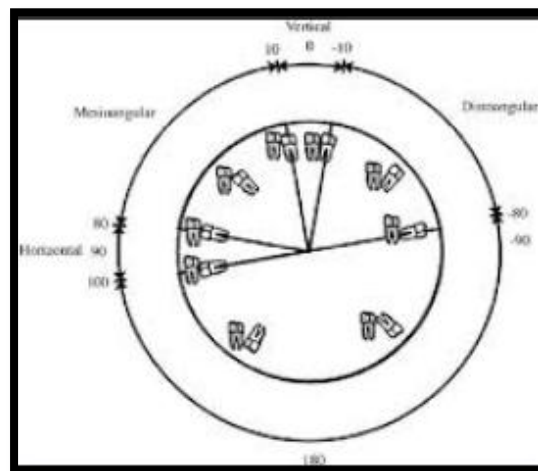
Fig 1: Winter's classification
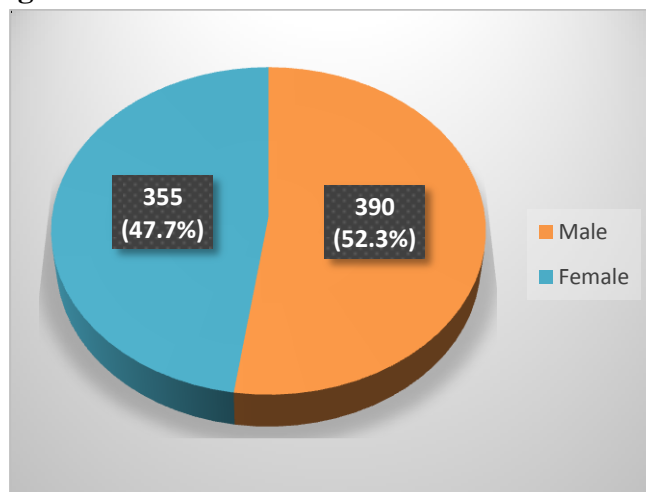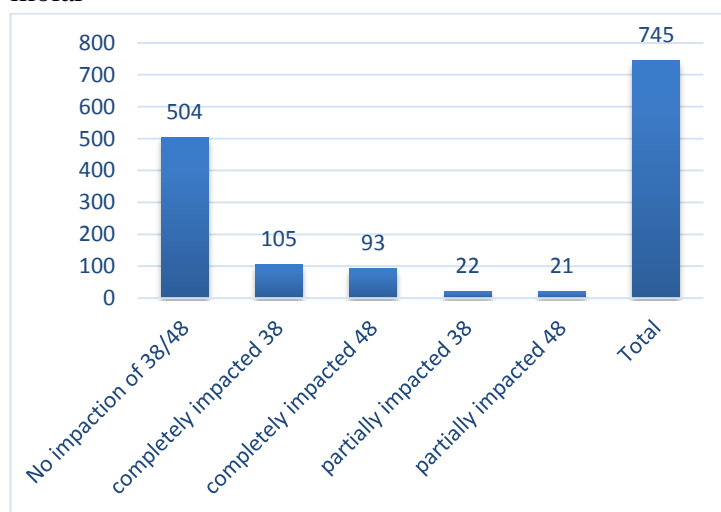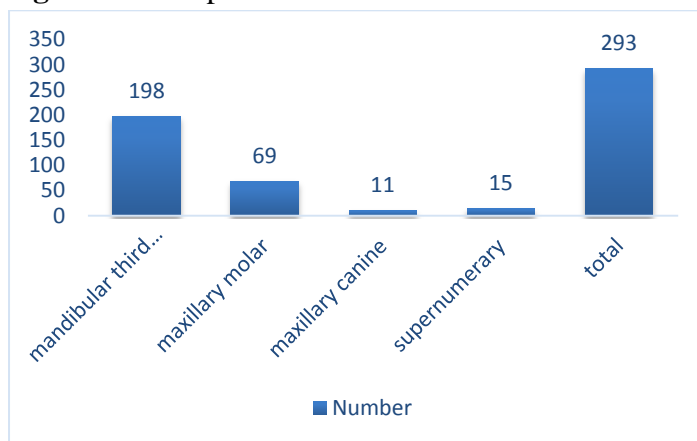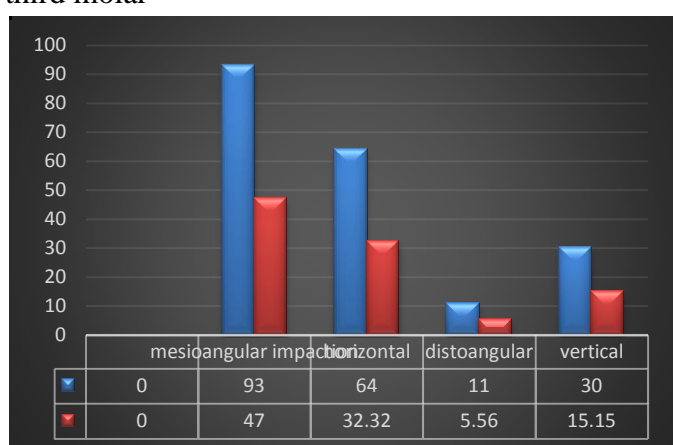

Fig 2: Gender distribution

Figure 3: Frequency of impacted mandibular third molar

Fig 4: Other impacted teeth

Fig 5: Pattern of distribution of impacted mandibular third molar

Table 1: Age group distribution

Age group	Frequency	Percent
20-29	369	49.5
30-39	155	20.8
40-49	103	13.8
50-59	87	11.7
60-69	24	3.2
70-79	7	0.9
Total	745	100

Table 2: Distribution of impacted mandibular third molars among different age groups

Age group	Presence of either impaction of 38/48	Presence of impaction of 38	Presence of impaction of 48
20-29	93	76	69
30-39	26	16	13
40-49	6	6	5
50-59	5	4	4
60-69	3	1	2
70-79	2	2	0
Total	135	105	93

Table 3: Comparison of presence of at least one impacted mandibular third molar and gender

	Male	Female	Total	P value
Presence of either impaction of 38/48	82	53	135	**0.019**
Presence of impaction of 38	62	43	105	0.084
Presence of impaction of 48	56	37	93	0.065

Discussion

Impaction is the cessation of eruption of tooth. Mandibular third molars are the most commonly impacted tooth. Panoramic radiographs are very useful in evaluating impaction, as they appear to have quite good cost- information ratio[5].

Schersten et al. suggested that 20 to 25 years is the most suitable age for studying the frequency of third molars and its impaction. The reason for this is to avoid overestimation of third molars agenesis as a result of unnoticed early extraction in older group. Further, many impacted third molars can change their position and erupt after the age of 18 to 20 years[6].

We observed that there was significant difference between the 20 to 29 age group and the 30 to 39 age group. The 20-29 age group had the highest prevalence of impaction, but it decrease in the 30-39 age group. This result agrees with Gunduz et al[7] who conducted their research on Turkish patients, and El-Khatheeb et al.[8] who conducted their study on Saudi population. Jung and Cho also found that older patients had fewer third molars[9]. Supporting our results, a similar study was carried out among Saudi population in the Asir region and they concluded that the highest incidence of tooth impaction was found in the age group of 20-25 years[10].

Our results showed that there was a statistically significant sex differences in the prevalence of mandibular third molar impaction. This differs from the observation made by Dachi and Howell[11], Al-Delaimi[12], but is in agreement with the observation made by Hellman[13] and Schersten et al[6]. Our results showed that males with more number of impacted mandibular third molars when compared to females.

Our study showed that 1.48% patients presented with all the 4 impacted third molars, 1.34% with 3 impacted third molars. 8.05% have 2 impacted third molars, and 9.8% have only one impacted third molar. These results agree with Fardi et al who detected at least one impacted tooth in 170 (13.7%) of Greek patients[14]. Our study found that the impacted mandibular third molars were the most prevalent impacted teeth and this was in accordance with Othman et al[15] and El-Khatheeb et al[8]. The second most prevalent impacted tooth was the maxillary third molar (13.4%) followed by the maxillary (1.7%) and mandibular canines (0.6%). This was in agreement with Al-Faleh who stated that the most frequently involved teeth in descending order were the mandibular and maxillary third molar, the maxillary canines, the mandibular and maxillary second premolar, and maxillary central incisors, among Pakistani patients[16]. There was a similar distribution of teeth impaction among a Brazilian subpopulation and among Tanzanian patients. This impaction distribution in our study was in disagreement with previous study in North Greek population, where the most frequent impacted teeth were maxillary canine followed by mandibular second premolar, and the least frequent were the third molars[14].

Shahbaz et al. stated that bilateral impactions are more common than unilateral[5], but our results were not in consistent with this. Our results showed that both unilateral and bilateral impactions were almost equal in number.

The prevalence of maxillary third molar impaction in the current study was 9.3%, which was consistent with the study done by Reddy and Prasad[17] (10%) on an urban population in South India and lesser compared to study done by Al-Anqudi (15%) in Oman[18].

The impaction of the canine is worthy of attention because the canine has an essential role in occlusal stability and esthetics. In our study, the prevalence of canine impaction was 1.5%, which was lower than the prevalence, 4% reported by Al Feeli in Kuwaiti population[19].

Radiological examination of the panoramic radiographs revealed that mesioangular impaction was the most common type of angulation (47%). This is in agreement with studies conducted by Al-Anqudi et al[18], Shahbaz et al[5]. However, the current study's results differ from studies published by Reddy et al[17]. Which found that vertical impaction was the most common type of third molar impaction.

Pathological changes associated with impacted third molars were found in 2.1% in the current study, which was lower than the 10% reported by Polat et al[20]. in a Turkish population and 14% reported by Al-Anqudi et al[18] in Oman population. The prevalence of dental caries in impacted lower third molars was 0.7% in the current study, which was lower than those reported by Polat et al[20]. (5%) in a Turkish population, Al-Anqudiin Oman population (4%) and those reported in Kenyan (46%)[18].

3. Conclusion

The prevalence and pattern of impacted mandibular third molars on digital panoramic radiograph among central Kerala population were almost similar to other racial populations. The incidence of impaction decreases with age and the prevalence of impaction was more common in the age group of 20-29 years. Prevalence of impacted mandibular third molar found to be 18.1% with mesioangular pattern was most common followed by horizontal and vertical pattern. Although the percentage of associated pathosis was considerably low, it is essential to carry out regular oral examinations to preserve asymptomatic impacted teeth in good health. To our knowledge no previous study was done for Kerala population and this will serve as data base for future references. Unfortunately, the etiology of teeth impaction has never been investigated in Kerala population. Future studies are needed to evaluate the etiology of teeth impaction in Kerala.

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