

Prevalence and Difficulty Index Associated with the 3rd Mandibular Molar Impaction among Malaysian Ethnicities: A Clinico-Radiographic Study

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ABSTRACT

Background: The mandibular third molars (3Mms) are the most common impacted teeth in the human dentition and their prevalence ranges from 27-68.8% in various parts of the world. The assessment of surgical difficulty of 3Mms extraction helps in better formulation of treatment plan by minimizing postoperative complications.

Objectives: The aim of this retrospective study was to investigate the prevalence and pattern of 3Mm impaction in patients between 20-44-year-old among Malaysian's ethnicities attending Oral Health Center/ SEGi University, Faculty of dentistry.

Materials and Methods: This study reviewed 1249 orthopantomograms (OPGs) of subjects aged 20 to 44 years of three Malaysian ethnic groups. Of the study population 918 OPGs were considered for the study. Patient's details include

age, gender and ethnicity were extracted from the patient's clinical record and all details related to impaction were obtained from patient's panoramic radiograph that was individually examined by two investigators. The data collected was statistically analysed using SPSS 16.

Results: This study found that Chinese female recorded the highest number of patients with "very difficult" category of impacted mandibular third molars. The most common age group involved was 20-24 years, mesioangular impaction, deep occlusal level and no ramus space for impacted mandibular third molars (3ms) were the most common findings observed.

Conclusion: The present study suggests that predicting the level of difficulty preoperatively for impacted 3m surgery will help in formulating the better treatment plan, thereby minimizing the postoperative complication for the ultimate benefit of the patient.

Keywords: Ethnicity, Impaction, Mandible, Third molar

INTRODUCTION

Teeth are considered as impacted when they fail to erupt into its normal functioning position and will not eventually assume a normal arch relationship with the other teeth and tissues [1,2]. Among all the teeth, mandibular third molars (3Mms) are the most commonly impacted teeth. Various studies from different part of the world have reported about the frequency of impacted 3ms ranging from 27-76% [3-9].

Malays, Chinese and Indians are three major ethnicities in Malaysia. Indians are under the sub-group of Caucasoid called Indo-Dravidian (Indo-European) and all others belong to Mongoloid race. Individuals from different ethnical background have different facial form, facial growth, jaw and tooth size and it affects the pattern of impaction [10]. Assessment of the difficulty in third molar (3m) surgical removals is important factor in the treatment plan in order to reduce the chances of complications. Pederson has proposed difficulty index for impacted 3Mms based on angulation, level of depth and ramus relationship [11].

Limited information is available in the scientific literature regarding the prevalence of impacted 3ms in different ethnicities within the same geographical region and correlation of different aspects of impacted 3ms with the difficulty index. So we make an attempt to study the prevalence and pattern of 3Mms impaction in patients between 20-44-year-old among Malaysian's ethnicities according to the age, gender, ethnicity and type of impaction and correlation to difficulty index as proposed by Pederson.

The current study will help clinician to take extra measure in those cases where scores will be high in the difficulty index and thus will reduce the postoperative morbidity.

MATERIALS AND METHODS

This retrospective study involved 1249 panoramic radiographs of subjects aged 20 to 44 years represented by the three Malaysian

ethnicities (Malay, Chinese and Indian) attending the Oral Health Center/SEGi University, Faculty of dentistry, Malaysia. Of the study population 918 OPGs were considered for the study. Patient's details include age, gender and ethnicity were extracted from the patient's clinical record and all details related to impaction were obtained from patient's panoramic radiograph that was individually examined by two investigators. Patients without OPG and clinical data were excluded from the study. The ethical clearance was obtained from the university ethical committee.

The difficulty scores related to impacted 3Mm's were recorded based on difficulty index proposed by Pederson [10], which include the sum of spatial relationship, depth and ramus relationship with respected to impacted 3Mms. This was further correlated with the patient clinical factors (age, gender and ethnicity respectively).

STATISTICAL ANALYSIS

Data collected was entered into a spreadsheet (Excel 2010; Microsoft, US) and analysed subsequently using SPSS version 16.0. The prevalence and pattern of impacted third molars in relation to age, gender, ethnicity and type of impaction were assessed and displayed by frequency and percentage. p-value was assessed through Pearson Chi-square test and FISHER exact test.

RESULTS

Out of 1249 panoramic view, 918 (73.5%) were considered for the study showing 1812 impacted 3Mm (fully or partially impacted), along with complete patient's data. The difference between the sexes regarding the impacted 3Mm was found to be significant, women had more impacted molar i.e., 81.3% (n=746) than men 18.7% (n=172). The prevalence of impacted 3Mm was highest in the Chinese patients 63.4% (n=582) as compared to Malay 28.1% (n=258) and Indian patients 8.5% (n=78) in this study. The most frequent age group was 20-24 years showing 66% (n=606) of 3Mm

impaction, whereas least frequent impaction i.e., 1.5% (n=14) was observed in 40-44 years age group [Table/Fig-1].

Based on the spatial relationship, 56% (1015) 3Mms showed mesioangular (MA) impaction, followed by 25% (n=453) 3Mms showing horizontal impaction, 13% (n=236) were vertically impacted and only 6% (n=108) were distoangular (DA) impacted [Table/Fig-1]. Result was significantly different as p-value was 0.023. Based on the depth index, 60.1% (n=1089) 3Mm were at the deep occlusal level, 30.3% (n=549) of 3Mm were at the medium occlusal level and 9.6% (n=174) of 3Mm were at the high occlusal level. Based on the ramus relationship or space available, 63% (n=1141) of 3Mm's had no space, 34.2% (n=620) of 3Mm's had reduced space and only 2.8% (n=51) of 3Mm's had sufficient space [Table/Fig-1].

The level of difficulty encountered during extraction of impacted 3Mms was categorized into very difficult, moderately difficult and slightly difficult category and the numbers of cases falling under each category were 69% (n=632), 25% (n=232) and 6% (n=54) respectively. Further very difficult cases were highest in all the ethnic groups [Table/Fig-2]. To maintain the reader's interest and to avoid ambiguity in the current study we will be discussing only the very difficult cases from here.

For the Malay ethnicity for very difficult cases, we found female scored higher prevalence of 76.2% (n=128) for impacted 3Mm's in 20-24-year-old [Table/Fig-3-5]. Horizontal impaction was the highest among this ethnicity accounting for 46.4% (n=153) [Table/Fig-3,6]. Among the depth index, most of the impacted 3Mm's were at deep occlusal level and p-value was found to be significant 84.5% (n=279) [Table/Fig-3,7]. An 81% (n=267) of the impacted 3Mm's had no space with ramus [Table/Fig-3,8].

Among Chinese ethnics again female had higher prevalence of 83.9% (n=334) for very difficult cases [Table/Fig-4,9]. Age range was significantly high (74.9% (n=582) for 20-24-year-old with

No.	Factors*		Prevalence	p-value
1.	Gender	Male	172 (18.7%)	.026
		Female	746 (81.3%)	
2.	Ethnicity	Malay	258 (28.1%)	.991
		Chinese	582 (63.4%)	
		Indian	78 (8.5%)	
3.	Age Range	20-24	606 (66%)	.931
		25-29	232 (25.3%)	
		30-34	40 (4.4%)	
		35-39	26 (2.8%)	
		40-44	14 (1.5%)	
4.	Spatial	Mesioangular	1015 (56%)	.023
		Horizontal/transverse	453 (25%)	
		Vertical	236 (13%)	
		Distoangular	108 (6%)	
5.	Depth	High occlusal level	174 (9.6%)	.372
		Medium occlusal level	549 (30.3%)	
		Deep occlusal level	1089 (60.1%)	
6.	Ramus	Sufficient space	51 (2.8%)	.105
		Reduced space	620 (34.2%)	
		No space	1141 (63%)	

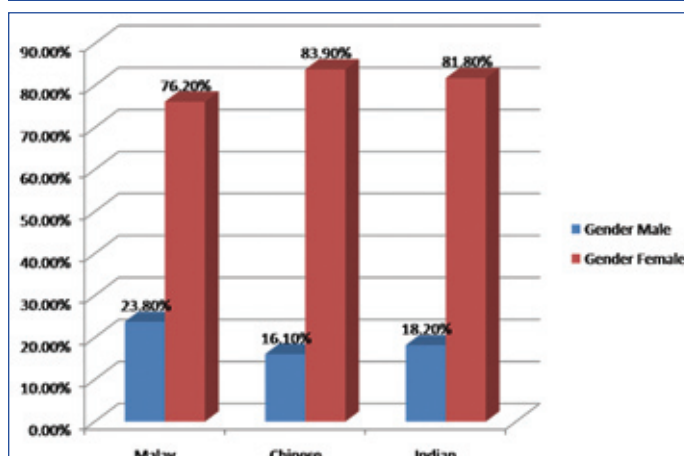
[Table/Fig-1]: Showing the demography and prevalence of mandibular impacted third molar
* total number of participant in the study= 918, Total number of impacted mandibular third molars = 1812

Ethnic groups	V.D.	M.D.	S.D.	Total
Malay	168(65%)	82(32%)	8(3%)	258
Chinese	398(68%)	140(24%)	44(8%)	582
Indian	66(85%)	10(13%)	2(2%)	78
Total	632(69%)	232(25%)	54(6%)	918

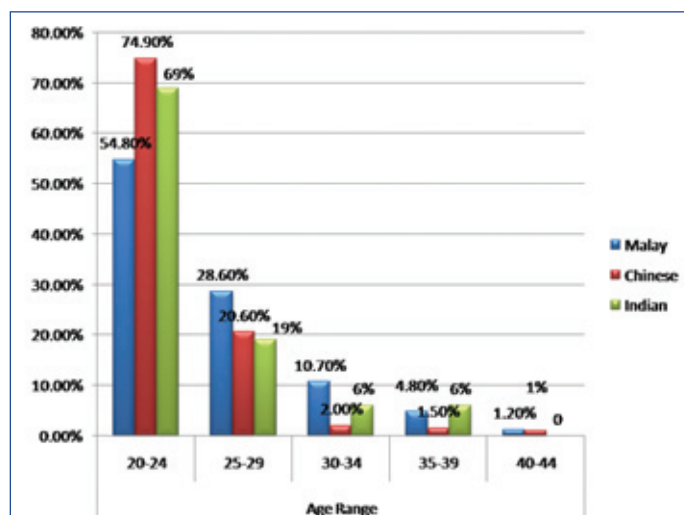
[Table/Fig-2]: Showing the difficulty index distribution among Malaysian ethnicities-V. D= very difficult cases, M.D=moderate difficult cases, S.D=slightly difficult cases

		Very Difficult cases	
		Percentage	Significance
Gender	Male	40(23.8%)	.486
	Female	128 (76.2%)	
Age Range	20-24	181 (54.8%)	.491
	25-29	94(28.6%)	
	30-34	35(10.7%)	
	35-39	16(4.8%)	
	40-44	4 (1.2%)	
Spatial	Mesioangular	102 (31.0%)	.001
	Horizontal/transverse	153 (46.4%)	
	Vertical	43 (13.1%)	
	Distoangular	32 (9.5%)	
Depth	High occlusal level	8 (2.4%)	.000
	Medium occlusal level	43 (13.1%)	
	Deep occlusal level	279 (84.5%)	
Ramus	Sufficient space	8 (2.4%)	.001
	Reduced space	55 (16.7%)	
	No space	267 (81.0%)	

[Table/Fig-3]: Showing distribution of very difficult cases in Ethnic Malays



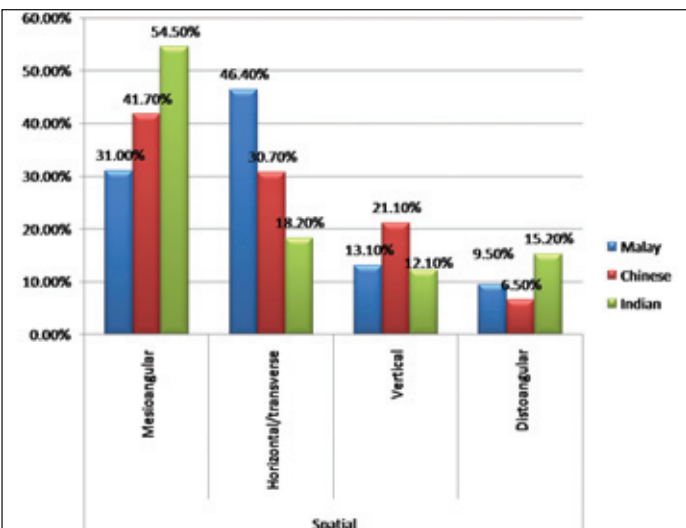
[Table/Fig-4]: Illustrating the demography among Malaysian ethnicities



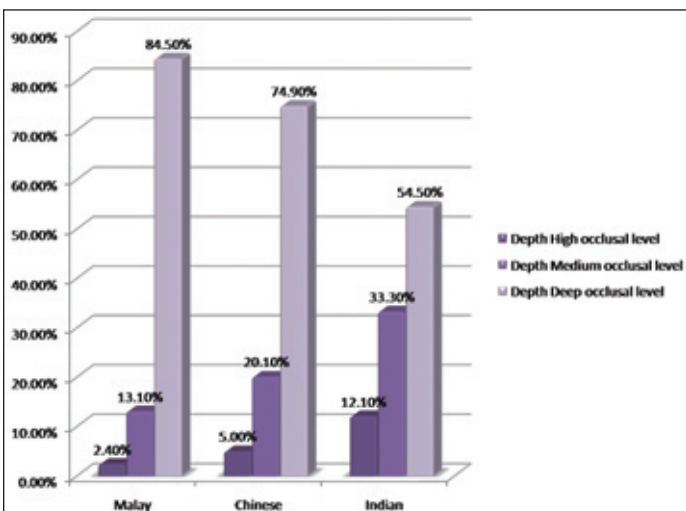
[Table/Fig-5]: Illustrating the difficulty index distribution among age ranges

p-value 0.044 [Table/Fig-5,9]. MA impaction scored highest 41.7% (n=324), p=0.001 [Table/Fig-6,9]. For the depth level, deep occlusal was significant with p=.001 74.9% (n=582) [Table/Fig-7,9]. Most of very difficult cases were where no space with ramus was found significantly in 78.9% (n= 613), p=0.001 [Table/Fig-8,9].

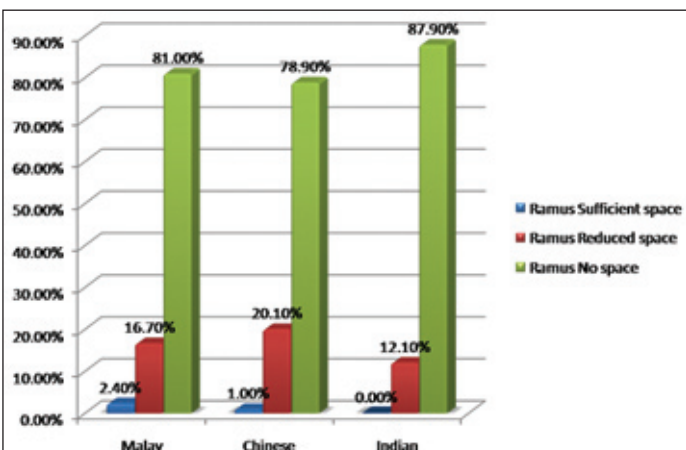
The Indian ethnic group also showed that female scored higher prevalence of 81.8%(n=54) for very difficult impacted 3Mms in age group of 20-24 years old [Table/Fig-4,5,10]. MA impaction was highest 54.5% (n=76) [Table/Fig-6,10]. For the depth level,



[Table/Fig-6]: Illustrating the difficulty index distribution among spatial index



[Table/Fig-7]: Illustrating the difficulty index distribution according to tooth impaction level



[Table/Fig-8]: Illustrating the difficulty index distribution according to impacted distance from ramus

		Very Difficult cases	
		Percentage	Significance
Gender	Male	64 (16.1%)	.264
	Female	334 (83.9%)	
Age Range	20-24	582 (74.9%)	.044
	25-29	160 (20.6%)	
	30-34	16 (2.0%)	
	35-39	12(1.5%)	
	40-44	7 (1%)	
Spatial	Mesioangular	324 (41.7%)	.001
	Horizontal/transverse	238 (30.7%)	
	Vertical	164 (21.1%)	
	Distoangular	51 (6.5%)	
Depth	High occlusal level	39 (5.0%)	.001
	Medium occlusal level	156 (20.1%)	
	Deep occlusal level	582 (74.9%)	
Ramus	Sufficient space	8 (1.0%)	.001
	Reduced space	156 (20.1%)	
	No space	613 (78.9%)	

[Table/Fig-9]: Showing distribution of very difficult cases in Ethnic Chinese

		Very Difficult cases	
		Percentage	Significance
Gender	Male	12 (18.2%)	.525
	Female	54 (81.8%)	
Age Range	20-24	96(69%)	.875
	25-29	27(19%)	
	30-34	8(6%)	
	35-39	8(6%)	
	40-44	-	
Spatial	Mesioangular	76 (54.5%)	.618
	Horizontal/transverse	25 (18.2)	
	Vertical	17 (12.1%)	
	Distoangular	21 (15.2%)	
Depth	High occlusal level	17 (12.1%)	.074
	Medium occlusal level	46 (33.3%)	
	Deep occlusal level	76 (54.5%)	
Ramus	Sufficient space	0 (.0%)	.006
	Reduced space	17 (12.1%)	
	No space	122 (87.9%)	

[Table/Fig-10]: Showing distribution of very difficult cases in Ethnic Indians

3Mms in Malaysian ethnicity. This was found to be 63.4% in Chinese followed by 28.1% in Malays and 8.5% in Malay Indians. The score of difficulty level for impacted 3Mm surgery was highest in Chinese group (83.9%). Prevalence rate of impacted 3ms from other studies are 67.6% by Kannepady et al., in Malaysians [7], Quek et al., reported a frequency of 68.6% in Singaporean Chinese [8] and Sandhu and Kaur have mentioned 76% prevalence rate among Indians in their study [9]. Al-Anqudi et al., Hassan, Hattab et al., and Reddy et al., have documented lower frequencies in studies done on Omanis (54.3%), Saudi Arabians (40.5%), Jordanians (47.4%) and Indians (27%), respectively [3-6]. This variation could be due to different criteria's (their study includes both impacted maxillary and mandibular third molar), sample size and statistical methods used.

However, when comparison was done among the various ethnic groups, the current study findings were similar to the findings of Kannepady et al., showing higher frequency of impacted 3Mm in Chinese [7]. This can be explained on the notion put forward by Keng and Foong who opined that Chinese have tooth-jaw size discrepancy and tapered arch form with wider inter-molar width which less favourably disposes to resorption of ramus [14]. So this leads to inadequate space for eruption of 3Ms eventually more chances of their impaction. We also agree with this fact.

deep occlusal was highest 54.5% (n=76) and difficult index were significant where no space with ramus was observed in 87.9% (n=122) impacted 3Mm'sp=0.006 [Table/Fig-7,8,10].

DISCUSSION

A 3Mm's are the most commonly impacted teeth in the oral cavity followed by maxillary third molar, maxillary canine and mandibular canine [12]. Surgical extraction of these impacted 3Mm is one of the most common oral-surgical procedures and is often associated with a varying degree of difficulty that can be related of pre-operative factors. Preoperative assessment of the difficulty of the 3Mm surgery is the most important factor that should be considered [13]. The present study showed the overall prevalence of 73.5% of impacted

Our study showed significantly higher frequency of impacted 3Ms in females (81.3%) in all the ethnic groups. This is in accordance with the studies of Kanneppady et al., Quek et al., Hashemipour et al., Hugoson and Kugelberg, Ma'a'ita and Alwrikat, and Kim et al., [7,8,15-18]. This could be explained as jaw growth ceases in females when 3Ms began to erupt whereas in men the jaw growth continues during the third molar eruption and thus provides more space for the tooth [8]. However, study from Saudi region revealed 3ms impactions were more prevalent in males [19]. Abu Alhaija et al., and Breik and Grubor had reported no sex predilection in 3Mms impaction [20,21]. The difficulty index score was highest for females in all the three ethnic groups.

The age range of the participants in the study was 20-44 years and the most frequent (66%) age group for impaction was 20-24 years in all the three ethnicities. This was in agreement with the study of Bokhari Syed et al., and Abu Alhaija et al., [19,20]. The difficulty index score was highest for 20-24 years of age group.

The most common spatial relationship observed was MA impaction in this study. However, in Malay ethnic group horizontal impaction was more common as compare to other two ethnic groups where MA impaction was mostly observed. Others have also reported that MA inclination was the most common for impacted 3Mms in their studies [5-8]. This can be explained on the basis of proportion of the root development, underdevelopment of the mesial root may lead to MA impaction, and overdevelopment of the mesial root may lead to DA impaction. Normal rotations of 3Ms were expected to occur from horizontal to MA and from MA to vertical. Failure of rotation from MA to vertical position is very common and may result in more MA impactions [8]. However, Reddy et al., reported vertical impaction to be the most common (50.0%) in the mandible [3].

The level of impaction is very important as it gives the idea of the depth and position of impacted tooth. This aids in proper pre-surgical planning and in very difficult cases the dentist would be cautious and already prepared to face the challenge if any. This study showed that 60% of the 3Mms were observed at the level C i.e., deepest level and highest score for level C among all ethnic groups were observed for impacted 3Mms in Malay (84.5%). Whereas studies of Quek et al., showed level B and Al-Anqudi et al., showed level A position of impacted 3ms respectively [6,8].

Another important variable to foresee eruption of 3Mms is the mesiodistal space between the distal surface of 2nd molar and anterior ramus of the mandible. This study showed that 63% of the impacted 3Mms had no space. This has been reported that if mesiodistal space is as large as the mesiodistal width of the crown, the probability of its eruption is approximately 70%. Lack of space seems to be a major cause of abortive eruption; however, eruption cannot be guaranteed, despite adequate space available in the jaw [22,23].

LIMITATION

We studied only the impacted 3Mms and only patients attending our institution health centre so more similar studies have to be carried out in other parts of Malaysia to substantiate our present findings.

CONCLUSION

The difficulty index (Pederson index) score was highest in Chinese ethnic group and even the operating surgeon felt that 3Mm surgery was more challenging in Chinese patients and took more operating time as compare to other two ethnic groups. Thus by predicting the difficulty index preoperatively for impacted 3m's surgery it can prepare the dentist for the complications he/she is going to encounter at the time of the surgery, thereby avoiding or minimizing the postoperative complication for the ultimate benefit of the patient.

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