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Impacted Mandibular Third Molar Prevalence and Patterns in a Nigerian Teaching Hospital: A 5-Year Retrospective Study

Opeyemi Adeola [1], Olawunmi Fatusi [2,*], Azuka Njokanma [1] and Adewale Adejobi [2]

[1] Department of Oral and Maxillofacial Surgery, Obafemi Awolowo University Teaching Hospitals Complex, Ile-Ife 220882, Nigeria; opeyemiesther6076@gmail.com (O.A.); ranjork@yahoo.co.uk (A.N.)
[2] Department of Oral and Maxillofacial Surgery, Obafemi Awolowo University, Ile-Ife 220882, Nigeria; aadejobi@oauife.edu.ng
* Correspondence: ofatusi@yahoo.com

Abstract: Mandibular third molars are the most commonly impacted teeth. The prevalence and pattern of impacted mandibular third molars in patients presenting to the Obafemi Awolowo University Teaching Hospitals Complex, a tertiary hospital in south-western Nigeria, are largely unknown. This retrospective study examined 469 patient records, extracting socio-demographic and clinical information for analysis. It also determined the prevalence and pattern of impacted mandibular third molars from January 2015 to December 2019. The positioning of impacted teeth was assessed via periapical radiographs utilizing Winter's classification. Data were subjected to analysis with IBM SPSS version 20, utilizing frequencies, percentages, and likelihood ratios, with statistical significance set at $p < 0.05$. The prevalence of impacted mandibular third molars within the study cohort was 2.51%, with a higher incidence observed in the 21–29 age group ($p < 0.001$). Mesioangular impaction was the most prevalent, with pericoronitis being the primary reason for extraction, and periodontal pockets being the most common associated pathology.

Keywords: impacted; mandibular; third molar; prevalence; pattern

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1. Introduction

Teeth play a crucial role in mastication and overall oral health. When teeth fail to erupt or develop in their expected functional location, they are classified as impacted [1,2]. The World Health Organization (WHO) defines an impacted tooth as one that does not erupt in its normal occlusion due to obstructions in its path, such as overlying bone, soft tissue, or another tooth [3]. Among all teeth, mandibular third molars exhibit the highest incidence of impaction [4–6]. Etiological factors contributing to third molar impaction include phylogenetic, Mendelian, and orthodontic theories [5]. The phylogenetic theory suggests that the reduction in human jaw size over time is an evolutionary adaptation, influenced by changes in diet and masticatory forces [7]. The Mendelian theory proposes that inherited discrepancies in jaw and tooth size can hinder the proper eruption of third molars [8]. Meanwhile, the orthodontic theory postulates that disruptions in the normal developmental growth of the jaw and teeth can lead to impaction, often caused by a lack of space in the dental arches [9].

The prevalence and patterns of mandibular third molar impaction exhibit geographical variability, with reported prevalence rates ranging from 1.9% to 68.6% [6,8,10,11]. These variations are influenced by specific geographic regions, with rural areas generally exhibiting lower prevalence. Different impaction patterns are observed based on the orientation of the impacted third molar relative to the second molar, including mesioangular (MA), distoangular (DA), vertical (V), and horizontal (H) impactions [12]. Studies in southern Nigeria have reported that mesioangular impaction is the most frequently encountered type [7,9]. Likewise, another study found that mesioangular impactions were the most prevalent, accounting for 68.2% of cases, while distoangular impactions were the least

common, representing only 5.7% of cases [10]. In contrast, studies by Dogan et al. and Polat et al. demonstrated a high incidence of third molar impaction in the vertical position, with a predominance of level C impaction (according to the Pell and Gregory classification) [13,14].

The mandibular third molar follows a diverse developmental timeline, with the initiation of development as early as 5 years and radiographic visibility occurring between 8 and 9 years of age [11,15]. Radiographic visibility of the M3 tooth germ typically occurs between 8 and 9 years of age. The absence of radiographic evidence of the third molar germ after 14–16 years may indicate agenesis, implying that the tooth may never develop. The calcification of the M3 cusp begins around 9 years, and the crown's orientation changes from forward and upward to a vertical alignment. Full root formation and eruption into the oral cavity typically occur between ages 17 to 21, but variations exist due to dietary and masticatory habits [16]. A study in rural Nigeria reported earlier average eruption ages—15 years in males and 13 years in females—attributed to dietary and masticatory habits [15]. Orthopantomography (OPG) and periapical radiographs are commonly used diagnostic tools to assess impacted mandibular third molars [17]. These tools provide information about their location, angulation, and relation to adjacent structures. Impacted third molars can remain asymptomatic or lead to pathologies such as pericoronitis, dental caries, periodontal issues, root resorption, odontogenic cysts, and tumours [18], and these pathologies are influenced by the eruption status, position, and angulation of the impacted tooth. Prophylactic extraction of asymptomatic third molars is a common practice in many regions, although clear criteria for such procedures are lacking [12]. This study aimed to assess the prevalence and pattern of impacted mandibular third molars and associated pathologies in a suburban population in Ile-Ife, Nigeria, contributing valuable data for future research in the southwest region of Nigeria.

2. Materials and Methods

This retrospective study involved 469 patients who had impacted mandibular third molars, seen at the Dental Centre, Obafemi Awolowo University Teaching Hospitals Complex, Ile-Ife, Nigeria, between January 2015 and December 2019. Ethical approval was obtained from the Health Research and Ethics Committee of the Institute of Public Health, Obafemi Awolowo University, with HREC number IPHOAU/12/1581.

Medical records of patients aged twenty years and above with clinical and radiographic diagnosis of impacted mandibular third molars were retrieved from the hospital registry. Relevant information was extracted from patient's records and documented in a study proforma. Retrieved data included patients' biodata (age, sex, marital status, ethnicity, educational level, and occupation), clinical findings (presence or absence of an operculum over the impacted tooth, impacted tooth and its location, presence or absence of caries on the adjacent tooth), and diagnosis. The periapical radiographs retrieved were reviewed with a standard radiographic viewing source to confirm the type of impaction and assess the presence or absence of pathologies associated with the impacted tooth. Impactions were classified according to Winter's classification system as follows: mesioangular, horizontal, distoangular, vertical, and inverted. The pattern of impaction was determined by assessing the angle formed between the lines intersecting the long axis of the second and third molar. The angle formed was used to interpret and determine the mesial or distal inclination to the second molar. The pattern of impaction was subsequently entered into the study proforma. Patients with incomplete data and incomplete root formation of the impacted third molar were excluded from the study.

Data analysis was carried out using IBM SPSS version 20. The prevalence of impacted mandibular third molar was determined using frequencies and percentages. The association between commonly found pathologies and impacted mandibular third molar subtypes/patterns, as well as the relationship between the associated pathologies and depth of impaction, were assessed using tables and likelihood ratios. The test of statistical significance was set at the 5% level or a p-value of <0.05.

3. Results

As shown in Table 1, 469 patients were diagnosed with impacted mandibular third molars out of the 18,720 patients seen at the Dental Centre within the study period. This revealed a prevalence of 2.51%. The distribution of patients by age showed that the majority (73.1%) were aged 20–29 years. Most of the patients were female (61.6%) and single (72.3%), and three-fifths (59.9%) were students. The distribution of patients' highest education level showed that a large proportion (45.8%) of them were undergraduate students.

Table 1. Prevalence of impacted mandibular third molar and patients' socio-demographic characteristics.

Prevalence of Impacted Mandibular Third Molar			**2.51%**
		N = 469	**%**
Age in years	20–29	343	73.1
	30–39	101	21.5
	40–49	16	3.4
	50–73	9	1.9
Sex	Male	180	38.4
	Female	289	61.6
Marital status	Single	339	72.3
	Married	129	27.5
	Widowed	1	0.2
Occupational level	Student	281	59.9
	Government employed	109	23.2
	Privately employed	79	16.8
Educational level	Not documented	124	26.4
	Undergraduate	215	45.8
	Graduate	91	19.4
	Postgraduate	39	8.3

Table 2 showed the pattern of impacted mandibular third molars among the patients. A little above half (51.2%) of the patients had a left-sided mandibular third molar impaction (tooth number 38). Mesioangular impaction (36.5%) was the most common type of impaction, followed by vertical impaction (31.4%). Distoangular impaction was recorded the least often, with 15.8%.

Table 2. Pattern of mandibular third molar impaction in the study.

	Frequency	**Percent**
Tooth Number		
38	240	51.2
48	229	48.8
Total	469	100
Type of impaction		
Mesioangular	171	36.5
Distoangular	74	15.8
Vertical	147	31.3
Horizontal	77	16.4
Total	469	100

Table 2. *Cont.*

	Frequency	Percent
Extraction indication		
Pericoronitis	452	96.4
Pulpitis	15	3.2
Dentoalveolar abscess	1	0.2
Prophylactic extraction	1	0.2
Total	469	100

The most common indication for the surgical extraction of impacted mandibular third molars was pericoronitis (96.4%), while pulpitis, dento-alveolar abscess, and prophylactic extraction accounted for 0.2% each.

Table 3 shows the prevalence of associated pathologies with each type of impaction. Periodontal pocket was the most commonly associated pathology, occurring in 83.8% of patients, while dental caries and periapical cysts were the least occurring pathologies, at 0.2% each.

Table 3. Association between types of tooth impaction and associated pathologies.

	Periodontal Pocket	Dental Caries	Periodontal Pocket + Dental Caries	Dental Caries + Periapical Cyst	Total
Type of Impaction	n (%)	n (%)	n (%)	n (%)	n (%)
Mesioangular	128 (74.9)	16 (9.4)	27 (15.8)	0 (0.0)	171 (100.0)
Distoangular	63 (85.1)	2 (2.7)	9 (12.2)	0 (0.0)	74 (100.0)
Vertical	135 (91.8)	0 (0.0)	11 (7.5)	1 (0.7)	147 (100.0)
Horizontal	67 (87.0)	3 (3.9)	7 (9.1)	0 (0.0)	77 (100.0)
Total	393 (83.8)	21 (4.5)	54 (11.5)	1 (0.2)	469 (100.0)

Note: This table illustrates the distribution of dental pathologies in relation to various types of tooth impaction. The likelihood ratio (31.20) and *p*-value (0.001) are used to assess the overall association between impaction types and the corresponding pathologies.

Among patients with mesioangular impaction, three-quarters (74.9%) had periodontal pocket only, about one-tenth (9.4%) had dental caries, and 15.8% had periodontal pocket and dental caries combined. In the group with distoangular impaction, the majority (85.1%) had periodontal pocket only, 2.7% had dental caries, and 12.2% had periodontal pocket and dental caries combined. Almost all patients with vertical impaction (91.8%) had pocket only, 7.5% had pocket plus dental caries, and 0.7% had dental caries only. Among patients with horizontal impaction, 87.0% had pocket only, 3.9% had dental caries, and 9.1% had pocket plus dental caries. There was a significant association between the associated pathologies and the impaction types (likelihood ratio = 31.20; $p = 0.001$).

4. Discussion

The prevalence and pattern of impacted mandibular third molars, as well as the associated pathologies, are a subject of concern in oral and maxillofacial surgery. This retrospective study aimed to shed light on these aspects within the context of a Nigerian teaching hospital.

The distribution of patients by age revealed that the majority (73.1%) of those with impacted mandibular third molars were aged 20–29 years. This finding aligns with previous

studies indicating that impaction of the third molar is most commonly observed in young adults [7,9,19,20]. The higher prevalence in this age group may be attributed to the fact that the third molars typically begin to erupt in late adolescence and early adulthood.

Most of the patients in our study were single (72.3%), and nearly three-fifths (59.9%) were students. This demographic profile may be indicative of the age group most commonly affected by third molar impaction. Additionally, the distribution of patients' highest education level revealed that a substantial proportion (45.8%) were undergraduate students. This suggests that this group may be more inclined to seek dental care and be evaluated for impacted third molars, potentially due to their access to healthcare services on a university campus.

A prevalence rate of 2.15% was found with patients aged between 20 and 73 years and with a minimum inclusion age of 20 years. A comparative multi-centre study reported a higher prevalence of 65.2% [21]. The wide margin in prevalence may be a result of their methodology. It has been reported that the age range with the highest prevalence of impacted mandibular third molar is between 25 and 35 years old [7,22,23]. The study by Braimah et al. [21] only included patients between 18 and 35 years old. This narrow age range is closely related to the age group with the highest prevalence of mandibular third molars, which could have affected their study results. However, our findings were about half of the prevalence reported in the study conducted in the Dental and Maxillofacial Surgery Clinic of the University of Calabar Teaching Hospital, Calabar, which showed a prevalence of 4.7%. Our prevalence is also much lower than the result of Odusanya and Abayomi [15], who showed a prevalence rate of 9.2%, and that of Olasoji and Odusanya [24], who reported a prevalence rate of 10.7% among the urban population of the southwest region of Nigeria. The reasons for these findings are speculative and may be a result of the diet of the study population. For example, high-fibre-containing food causes an increase in activity of the masticatory muscles when chewing, which in turn stimulates the development of the jaw bones through functional adaptation [15]. Adequate growth of the mandible with sufficient space to accommodate the third molar may reduce the prevalence of impaction commonly associated with the third mandibular molar [15]. However, Obiechina et al. [7] (2001) reported a slightly lower prevalence of 1.9% in their study. We postulate that the slightly higher prevalence in our study may be due to our study location being suburban as compared to the rural settlement in their study. The prevalence of mandibular third molars is higher in the urban areas than in the more conservative rural region. However, Ile-Ife is a suburb of Osogbo, being less densely populated and primarily residential, with fewer companies concentrated in the commercial areas.

In this study, impacted mandibular third molar occurred more commonly among patients in the 20–29 age group, which accounted for 73.1% of the study population. This is similar to the study by Obiechina et al. [7], which observed that patients in the 21–30 age group presented with the highest number of impactions. From this study, it is evident that impacted mandibular third molars decrease with a corresponding increase in the age of patients. This may be due to early tooth loss, which may create space and allow the eruption of the impacted tooth later in life. Additionally, in the ageing population, an impacted mandibular third molar may become visible due to periodontal bone loss and subsequent gingival recession [25]. There is a preponderance towards the female gender (61.6%) in our study. This can be attributed to females having better health-seeking behaviour than males. This assertion agrees with the study by Kramer et al. [26], which reported that men are slower to notice signs of a dental condition, causing them not to seek medical attention promptly. Similar studies have also found a higher female predilection [6,27]. Hassan [8] reported no gender predilection in their study on the prevalence of mandibular third molar impaction. Conversely, Ren [28] and Kumar [3] reported a high prevalence of impacted third molars associated with males (60%) compared to (40%) in females. Most of the patients in this study population were single, and a large proportion were also undergraduates, a reflection of the location of the dental centre. This finding is similar to the study by Venta et al. [29].

The mesioangular form of impaction was the most predominant pattern of impaction, with 171 patients (36.5%), and the distoangular pattern of impaction was the least, with 74 (15.8%). Some other Nigerian studies have also reported similar findings [9,21]. In contrast, Al-Dajani et al. [30] reported the vertical form of impaction as the most prevalent form of impaction among the Saudi population, and Almendros et al. [31] reported the same among the Swedish population. A Jordanian study found that vertical impaction was the most common type (61.4%), and mesioangular impaction only represented about 18.1% [32].

In this study, the most common indication for impacted mandibular third molar extraction was pericoronitis. Pericoronitis typically occurs due to the accumulation of food debris and bacteria beneath the operculum. The operculum is the flap of gum tissue that may partially cover an impacted tooth, leading to inflammation and subsequent infection. The high prevalence of pericoronitis as an indication for extraction underscores the clinical significance of managing impacted third molars, especially when associated with symptoms. The high proportion of pericoronitis observed in this study may be due to the high proportion of mesioangular (36.5%) and vertical impactions (31.3%), as supported by previous studies [9,33]. These studies noted that mesioangular and vertical impactions with partial mucosa coverage usually predispose patients to food accumulation and present as recurrent pericoronitis [9,33].

However, Prajapati et al. [34], in their study, recorded dental caries (especially of the adjacent tooth) and its sequelae as the most common indication for mandibular third molar extraction (63.2%), followed by recurrent pericoronitis (26.3%) and periodontitis (9.2%).

The presence of periodontal pockets was observed as the most common pathology associated with impacted mandibular third molars. This may be due to the high prevalence of pericoronitis (46.8%) among the study population. Pericoronitis is associated with periodontal pockets and subsequent food packing. Mesioangular impaction, the most common presentation in this study, has also been observed to present with an increased frequency of pockets on the distal surface of the mandibular second molar [35]. In this study, a periodontal pocket was reported in three-quarters (74.9%) of all mesioangular impactions. A contrasting study from Chu et al. [36] reported the prevalence rate of periodontal disease as 8.8% in Chinese populations in Hong Kong, while Stanley et al. [33] reported 4.5% as the prevalence of periodontal disease in sub-Saharan African populations.

In this study, the combination of dental caries and periapical cyst was the least occurring pathology, accounting for 0.2% of associated pathologies. While these pathologies were relatively rare in our study population, it is essential to address them promptly to prevent further complications.

Mesioangular impaction had the highest frequency of associated pathology in this study. This is because the angulation between the mesioangularly impacted mandibular third molar and the second mandibular molar creates stagnation areas that encourage plaque accumulation and food packing, ultimately encouraging the development of periodontal disease. Likewise, food stagnation may also result in dental caries development either on the occlusal surface of the impacted tooth or on the distal surface of the adjacent tooth.

Our study found significant associations between the impaction types and the presence of pathologies. These findings suggest that the specific type of impaction may play a role in the development of related pathologies. For instance, dental caries was predominantly associated with mesioangular impaction, whereas periodontal pockets were commonly associated with vertical and mesioangular impactions. Similar results were reported by Braimah et al. [21]. Understanding these associations can help clinicians anticipate and manage associated pathologies more effectively.

4.1. Limitations of the Study

The study utilized a retrospective design and a convenience sampling method. The study was also conducted at a single Nigerian teaching hospital. These limitations may limit the generalizability of the findings.

4.2. Implications

This study offers valuable insights into the prevalence and pattern of impacted mandibular third molars in a Nigerian population. This information holds significant potential for the benefit of the oral and maxillofacial surgeons, dentists, and healthcare practitioners responsible for managing impacted third molars. A good understanding of the prevalence, pattern, and associated pathological conditions can enhance patient care and the planning of treatments. This research also adds to the existing knowledge base concerning third molar impaction, particularly in the Nigerian context. It can function as an educational resource for academic institutions, dental schools, and researchers with an interest in oral health and dental pathology.

The findings of this investigation can establish a solid groundwork for subsequent research in the field. Researchers can utilize this study as a benchmark for designing more extensive, inclusive studies that encompass a wider array of factors and demographics. Furthermore, the results of this research can have an impact on healthcare policies related to oral health in Nigeria, such as directives for the management of impacted third molars. This study has the potential to contribute to the creation of clinical guidelines for dealing with impacted mandibular third molars in Nigeria, which would assist clinicians in making evidence-based decisions in their practice.

5. Conclusions

The prevalence of impacted mandibular third molars in our study was 2.15% over a 5-year period. Mesioangular impaction was the most prevalent type, followed by vertical, horizontal, and distoangular impactions. Although most patients presented with toothache diagnosed as pericoronitis, the presence of a periodontal pocket was the most frequently associated pathology and was more common in vertical impaction. The retrospective and convenient sample design employed in data acquisition may not allow for the generalization of our findings. While a larger population-based epidemiology study on the prevalence and pattern of mandibular impacted molar is recommended, the results of this study could be used as baseline data for future studies.

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Informed Consent Statement: Patient consent was waived because it was a retrospective study.

Data Availability Statement: All the data for the study are presented in the manuscript.

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