Original Article :

Prevalence and pattern of mandibular third molar impaction: a 4-year retrospective study of cases seen at a tertiary hospital in Nigeria

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Abstract

Background and Aims:
This descriptive retrospective study aimed to determine the prevalence and patterns of mandibular third molar impaction treated between 2020 and 2023 at a tertiary hospital in Nigeria.

Methods:
Cases of mandibular third molar impaction in individuals aged 20 years and above who presented at the oral and maxillofacial clinic were reviewed. Data analysis was conducted using IBM SPSS version 23, with statistical significance set at a 5% level ($p < 0.05$).

Result:
The age distribution revealed that the majority of respondents (52.1%) were within the 20–30 age group, while the lowest frequency (0.7%) was observed in the 61–70 age group. Females exhibited a higher prevalence of impacted mandibular third molars (65.8%). Mesioangular (38.3%) and vertical (37.7%) impactions were identified as the most common patterns of mandibular third molar impactions.

Conclusion:
Mesioangular and vertical impactions were the most prevalent patterns observed. While no association was found between impaction patterns and gender, a significant relationship was noted between impaction patterns and age.

Keywords:
Impacted, mandibular, third molar, prevalence, pattern

INTRODUCTION:

Tooth impaction is defined as the failure of a tooth to fully erupt into its normal functional position within a specified time, often due to a lack of space in the dental arch or obstruction [1]. It has also been described as a condition where a tooth remains embedded in the alveolus, preventing further eruption [2]. Additionally, an impacted tooth may be partially or completely unerupted, positioned against another tooth, bone, or soft tissue, making further eruption unlikely. Such teeth are often classified according to their anatomical position[3].

Tooth eruption is a complex process that is not yet fully understood. It involves a series of physical and biological events synchronized with jaw growth[4], and influenced by both local and systemic factors[5]. However, disruptions in this process can lead to tooth impaction.

Although many impacted teeth show no symptoms, several complications may develop, including pericoronitis, odontogenic cysts or tumors, pain, swelling, bone loss, and resorption of the root of adjacent tooth/teeth[6]. Partial impactions can lead to the accumulation of food debris and cleaning difficulties, eventually resulting in the development of dental caries and its subsequent sequelae[7] . Furthermore, impaction of the anterior tooth/teeth will definitely compromise the esthetic appearance of affected individuals[6]. In addition to the above-mentioned complications, an impacted mandibular third molar may weaken the angle of the mandible and enhance its susceptibility to fractures[8].

The third molars are the most frequently impacted and congenitally missing teeth, with 90% of the population having third molars and 33% experiencing at least one impacted tooth[9]. Among all impacted teeth, mandibular third molars are the most common, accounting for 95% of cases followed by the canines, central incisors, and premolars.[6].

Several etiologic factors have been implicated in the aetiology of impacted mandibular third molars, including changes in the orientation or position of the erupting tooth, differential root growth between the mesial and distal roots, insufficient space in the mandible, and delayed maturation of third molars compared to jaw development[10]. Additional factors include unfavorable angulations, aberrant eruption paths, dense overlying tissues, and a late eruption sequence[11]. Mesiodistal tooth width, soft diets, hereditary influences, and insufficient eruption forces have also been implicated.

Various classifications of impacted third molars exist in the literature. Winter's

classification categorizes impactions based on the angle between the longitudinal axes of the second and third molars into vertical, horizontal, mesioangular, distoangular, inverted, and transverse impactions (buccoversion and linguoversion)[12.] Pell and Gregory's classification assesses third molars relative to the adjacent second molar and the ascending ramus, considering the portion of the tooth covered by the anterior border of the ramus (levels 1, 2, or 3) and the depth of impaction (classes A, B, C)[13]. Other notable systems include those by Killey and Kay, as well as the American Dental Association.

The prevalence of mandibular third molar impaction varies significantly among populations, ranging from 18% to 70%[14-18]. These differences are attributed to racial variations in facial growth, jaw size, and tooth size[19]. Impacted teeth may result in pathological conditions such as pericoronitis, cystic lesions, or other odontogenic pathology[20,21].

Although most studies report no gender predilection, some have noted a higher incidence of impaction among females compared to males[22-24.]

This study aims to determine the prevalence and patterns of mandibular third molar impaction cases seen at a tertiary hospital in Nigeria.

MATERIALS AND METHODS:

Study Design and Setting:

This study was conducted at the University of Medical Sciences Teaching Hospital (UNIMEDTHC), Ondo and Akure complexes. It employed a descriptive retrospective study design to determine the prevalence and pattern of mandibular third molar impaction. Ethical approval for the study was obtained from the Research and Ethical Committee of the University of Medical Sciences, Ondo (NHREC/TR/UNIMED-HREC-Ondo St/22/06/21).

Population and Participant recruitment:

The target population included individuals with comprehensive dental records related to impacted mandibular third molars. Medical records—including clinic record books, patient case files, and radiographs—of patients aged 20 years and above who presented with impacted mandibular third molars were retrieved for inclusion in the study.

Exclusion criteria:

Patients with incomplete data, including missing and inadequate radiographs or incomplete root formation of the impacted third molar (based on radiographic evaluation), were excluded from the study.

Data collection procedure:

Data extracted included patients' age, gender, impaction patterns, and their locations. Other variables such as the

presence or absence of caries on adjacent teeth, the presence of an operculum at presentation, diagnosis, and treatment provided were also recorded. A total of 170 recorded cases were retrieved—110 cases from the Akure complex and 60 cases from the Ondo complex. However, only 146 cases with adequate periapical radiographs were included in the analysis, as 24 cases were excluded due to absence or inadequacy of radiographs. (ref. Organogram below).

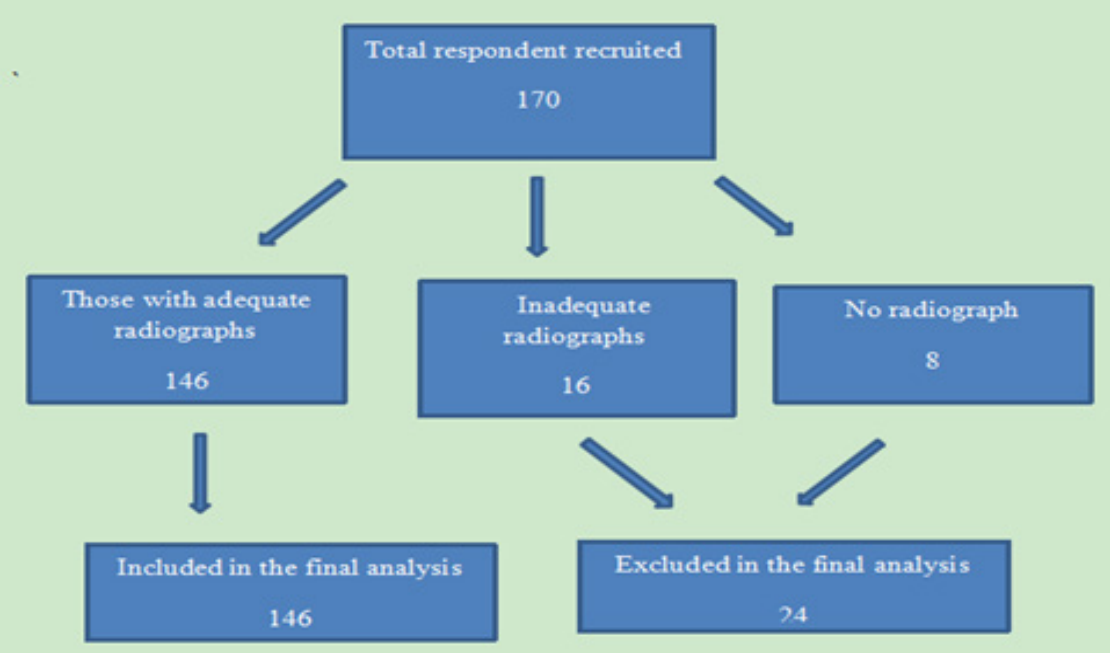


Figure 1: An organogram showing the exclusion of 24 cases based on absence or inadequacy of periapical radiographs.

The periapical radiographs were reviewed using a standard radiographic viewing source to confirm the type of impaction and assess associated pathologies, such as caries on adjacent teeth. All radiographs were evaluated twice by two calibrated examiners in a two-week interval. Interexaminer reproducibility was 91% and the intraexaminer reproducibility for the first and second examiner was 87.5% and 93%, respectively.

Impacted teeth were classified using Winter's classification system, which categorizes impaction into six types: mesioangular, horizontal, distoangular, vertical, inverted, and transverse. Winter's classification is the most commonly chosen method for the spatial evaluation of teeth included in the literature due to its simplicity of use. It does not require the use of additional measuring instruments, which influences its widespread use in clinical practice[48]. A diagram illustrating Winter's classification was referenced to guide this categorization[49].

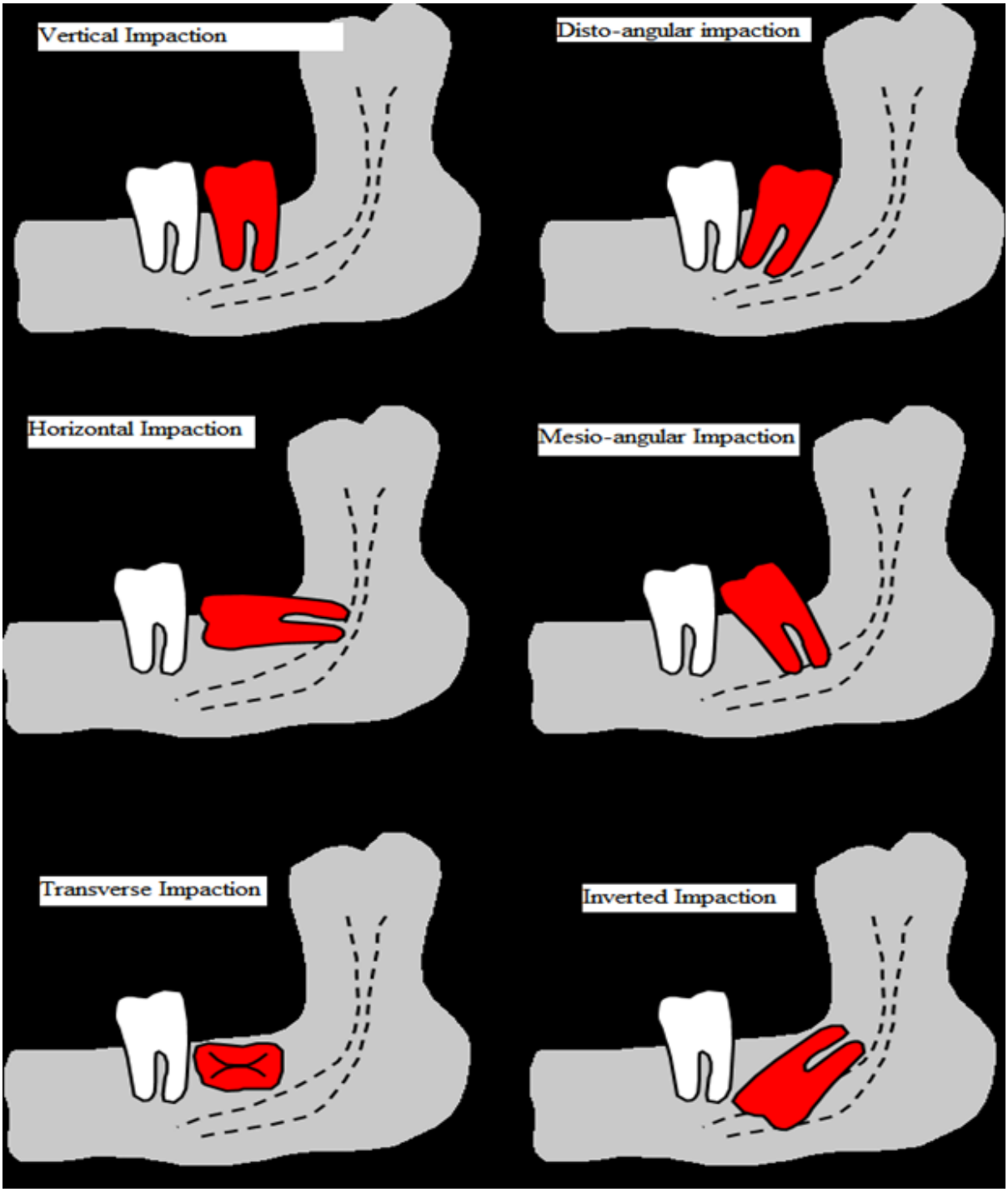


Figure 2: Winter's classification of impacted tooth

Figure 2: Winter's classification of impacted tooth extracted from Lee et. al. (2022). Automated Prediction of Extraction Difficulty and Inferior Alveolar Nerve Injury for Mandibular Third Molar Using a Deep Neural Network. Applied Sciences. 12. 475. 10.3390/app12010475 .

The red teeth are the mandibular third molars. The figure expressed six types of impacted mandibular third molar

according to winter's classification: vertical, mesioangular, horizontal, distoangular, transverse, and inverted [49].

The collected data were entered into a structured study proforma for analysis.

Data analysis:

Appropriate descriptive statistics (including mean, standard deviation, and frequency) were computed using the Statistical Package for Social Sciences software, version 23 (SPSS, Chicago, IL, USA). Relationships between variables were determined using Pearson's chi square with level of significance set at 0.05 to determine statistical significance.

RESULTS:

A total of 170 cases of patients with impacted mandibular third molars, who presented between January 2020 and December 2023, were reviewed. However, only 146 cases with complete information were included in the analysis, while 24 cases were excluded due to insufficient data.

Table 1: Socio-demographic Characteristics of Respondents:

AGE		
Age group	**Frequency (n = 146)**	**Percentage**
20 -30	76	52.1%
31 -40	45	30.8%
41 -50	20	13.7%
51 -60	4	2.7%
61 - 70	1	0.7%
GENDER		
Gender	**Frequency (n = 146)**	**Percentage**
Male	50	34.2%
Female	96	65.8%

Table 1 presents the socio-demographic characteristics of the respondents. The ages ranged from 20 to 66 years, with the highest percentage (52.1%) in the 20–30 age group, followed by 31–40 years (30.8%). The lowest percentage (0.7%) was observed in the 61–70 age group. The sample comprised 50 males (34.2%) and 96 females (65.8%).

Table 2: Distribution of types of impaction based on socio-demographic characteristics:

	TYPES OF IMPACTION			
	MESIOANGULAR	**DISTOANGULAR**	**HORIZONTAL**	**VERTICAL**
AGE GROUP				
20 -30	32 (57.1%)	12(80.0%)	10(950.0%)	22(40.0%)
31 -40	16(28.6%)	3(20.0%)	5(25.0%)	21(38.2%)
41 -50	8(14.3%)	0(0.0%)	4(20.0%)	8(14.5%)
51 -60	0(0.0%)	0(0.0%)	1(5.0%)	3(5.5%)
61 - 70	0(0.0%)	0(0.0%)	0(0.0%)	1(1.8%)
(*χ^2= 0.043; ***P*<0.05*)				
GENDER				
MALE	15(26.8%)	3(20.0%)	11(55.0%)	21(38.2%)
FEMALE	41(73.2%)	12(80.0%)	9(45.0%)	34(61.8%)
TOTAL	56(38.3%)	15(10.3%)	20(13.7%)	55(37.7%)
(χ^2= 0.467; ***P***>0.05)				

Table 2 presents the distribution of mandibular third molar impaction types (Mesioangular, Distoangular, Horizontal, and Vertical) by age group and gender. Mesioangular (38.3%) and Vertical (37.7%) impactions were the most common overall, with Mesioangular impactions particularly prevalent among females (73.2%). The highest frequency of all impaction types was observed in younger individuals (20–30 years), while impactions were rare in older age groups (51–70 years). A notable gender difference was also observed, with females (65.8%) showing a higher prevalence of impacted mandibular third molars compared to males.

Table 3: Distribution of adjacent tooth with caries based on age and types of impaction.

	ADJACENT TOOTH WITH CARIES	
	YES	**NO**
AGE GROUP		
20 -30	20(54.1%)	56(51.4%)
31 -40	14(37.8%)	31(28.4%)
41 -50	3(8.1%)	17(15.6%)
51 -60	0(0.0%)	4(3.7%)
61 - 70	0(0.0%)	1(0.9%)
TYPES OF IMPACTION		
MESIOANGULAR	28(75.7%)	28(25.7%)
DISTOANGULAR	0(0.0%)	15(13.8%)
HORIZONTAL	3(8.1%)	17(15.6%)
VERTICAL	6(16.2%)	49(45.0%)
TOTAL	37(25.3%)	109(74.7%)

Table 3 describes the occurrence of caries in teeth adjacent to impacted mandibular third molars, categorized by age group and type of impaction. A total of 37 individuals (25.3%) had adjacent tooth caries, while 109 individuals (74.7%) did not. Adjacent tooth caries were most common in younger age groups (20–30 years), followed by the 31–40 years group, and became progressively less frequent with increasing age. No caries were observed in individuals aged 51–70 years. Mesioangular impaction had the highest frequency of adjacent tooth caries, accounting for 75.7% of the cases. Vertical impaction was the second most frequent type associated with adjacent tooth caries (16.2%). Distoangular impactions showed no association with caries, while horizontal impactions were infrequently associated (8.1%).

Table 4: Prevalence of Operculum in age groups and types of impaction.

	PRESENCE OF OPERCULUM	
	YES	NO
AGE GROUP		
20 -30	73(60.3%)	3(12.0%)
31 -40	38(31.4%)	7(28.0%)
41 -50	10(8.3%)	10(40.0%)
51 -60	0(0.0%)	4(16.0%)
61 - 70	0(0.0%)	1(4.0%)
TYPES OF IMPACTION		
MESIOANGULAR	52(43.0%)	4(16.0%)
DISTOANGULAR	15(12.4%)	0(0.0%)
HORIZONTAL	19(15.7%)	1(4.0%)
VERTICAL	35(28.9%)	20(80.0%)
TOTAL	121(82.9%)	25(17.1%)

Table 4 shows the presence or absence of an operculum (a flap of gum tissue covering a partially erupted tooth), categorized by age group and type of impaction. A total of 121 individuals (82.9%) had an operculum, while 25 individuals (17.1%) did not. The presence of an operculum was strongly associated with younger age groups, particularly those aged 20–30 years (60.3%), and mesioangular impactions (43%). Distoangular impactions showed no association with the absence of an operculum, suggesting they are almost always accompanied by one. In contrast, vertical impactions were more frequently associated with the absence of an operculum (80.0%).

Table 5: Prevalence of Pericoronitis in age groups and types of impaction

	PRESENCE OF PERICORONITIS	
	YES	NO
AGE GROUP		
20 -30	76(55.1%)	0(0.0%)
31 -40	43(31.2%)	2(25.0%)
41 -50	15(10.9%)	5(62.5%)
51 -60	3(2.2%)	11(2.5%)
61 - 70	1(0.7%)	0(0.0%)
TYPES OF IMPACTION		
MESIOANGULAR	55(39.9%)	1(12.5%)
DISTOANGULAR	15(10.9%)	0(0.0%)
HORIZONTAL	19(13.8%)	1(12.5%)
VERTICAL	49(35.5%)	6(75.0%)
TOTAL	138(94.5%)	8(5.5%)

Table 5 examines the prevalence of pericoronitis (inflammation around a partially erupted tooth) in relation to age group and type of impaction, categorized by the presence or absence of the condition. A total of 138 individuals (94.5%) had pericoronitis, while 8 individuals (5.5%) did not. The prevalence of pericoronitis decreases with age, being most common in younger individuals, particularly those aged 20–30 years (55.1%), followed by those aged 31–40 years (31.2%). Mesioangular impactions were most strongly associated with pericoronitis (39.9%), followed by vertical impactions (35.5%). Distoangular and horizontal impactions also contributed to pericoronitis but at lower frequencies (10.9% and 13.8%, respectively).

Table 6: Treatment options based on age groups and types of impaction.

	TREATMENT OPTIONS	
	DISIMPACTION	**OPERCULECTOMY**
AGE GROUP		
20 -30	70(51.1%)	6(66.7%)
31 -40	42(30.7%)	3(33.3%)
41 -50	20(14.6%)	0(0.0%)
51 -60	4(2.9%)	0(0.0%)
61 - 70	1(0.7%)	0(0.0%)
TYPES OF IMPACTION		
MESIOANGULAR	56(40.9%)	0(0.0%)
DISTOANGULAR	15(10.9%)	0(0.0%)
HORIZONTAL	20(14.6%)	0(0.0%)
VERTICAL	46(33.6%)	9(100.0%)
TOTAL	137(93.8%)	9(6.2%)

Table 6 provides insights into the treatment options for impacted third molars—disimpaction and operculectomy—categorized by age group and type of impaction. A total of 137 cases (93.8%) were treated with disimpaction, while 9 cases (6.2%) underwent operculectomy. Disimpaction is the primary treatment for impacted third molars, particularly in younger age groups, accounting for 51.1% of treatments in patients aged 20–30 years, and for 40.9% of mesioangular impactions. Operculectomy is a less common procedure, performed only for vertical impactions and primarily in individuals aged 20–30 years. The choice of treatment is influenced by both the patient's age and the type of impaction, with disimpaction (93.8%) being the most widely used approach.

DISCUSSION:

The age distribution of respondents in this study shows that the majority were within the third and fourth decades of life, with the lowest frequency observed in the seventh decade. This finding is consistent with previous reports in the literature[25]. This trend may be explained by the timing of third molar eruption, which typically occurs during the early years of these decades and coincides with the cessation of puberty. At this stage, growth stops, and space for the eruption of third molars may become insufficient, leading to partial eruption or complete impaction of these teeth, accompanied by associated symptoms[17].

This age-related prevalence aligns with the natural history of third molar development and impaction. Third molars typically erupt between the ages of 16 and 25[26] , but complications such as impaction often become symptomatic and clinically significant during the late twenties and thirties[27] . This high prevalence in the 20-40 age group is consistent with other studies, which suggest that the peak age for third molar complications falls within this range[27]. The lower prevalence in older age groups may be attributed to the fact that many individuals in these groups may have undergone surgical extraction of problematic third molars, or the teeth may be asymptomatic and therefore remain untreated.

Understanding this age distribution is crucial for planning public health interventions and clinical management strategies. Dental practitioners should prioritize early screening and intervention for younger adults to prevent complications. Educational campaigns focused on the importance of early dental visits and the potential issues related to third molars can also be beneficial.

The gender distribution revealed a higher prevalence of impacted mandibular third molars among females compared to males, which aligns with findings from studies conducted in Nigeria[28, 29, 30] and globally [16,23,31]. Several factors contribute to this disparity, such as the earlier cessation of physical growth in women, which results in a smaller jaw size compared to men [16, 17, 31]. Additionally, third molar eruption in women typically occurs after the completion of jaw growth, unlike in men, whose third molars erupt during jaw development, providing more space for eruption [17, 30, 31] . Anatomical differences between males and females, with females generally having smaller jaw sizes, may lead to a higher likelihood of impaction due to limited space [32]. Moreover, females may be more proactive in seeking dental care due to their lower pain tolerance and

threshold, which could explain the higher reported cases of impaction [33].

However, some studies show no gender predilection for mandibular third molar impaction [15, 34]. For example, Stanley et al. reported a 2:1 male-preponderance in their study [35], while other studies did not find any significant difference in impaction patterns between male and female genders [15, 34, 36]. The variations in these findings highlight the need for further research to better understand the underlying reasons for gender disparities in third molar impactions. Recognizing these sociodemographic characteristics can help in developing targeted public health interventions and resource allocation in dental practices. Tailoring educational campaigns and preventive strategies to specific age and gender groups may enhance the effectiveness of dental health programs.

The study identified mesioangular impactions as the most common pattern of mandibular third molar impactions, which is consistent with studies conducted in Nigeria[13,18] and trends reported in dental literature from various locations around the world[16,17,23,25,31,37]. Mesioangular impactions occur when the tooth is angled towards the anterior part of the jaw, while vertical impactions occur when the tooth is correctly aligned but fails to erupt fully [37] . Horizontal (10.0%) and distoangular (8.2%) impactions were less common, consistent with findings from a nearby geographic location[38]. Horizontal impactions occur when the tooth lies on its side along the horizontal anteroposterior axis of the jaw and can be particularly challenging to manage due to their orientation. Distoangular impactions, where the tooth is tilted backward, are difficult to extract and are often associated with a higher risk of complications.

The distribution of impaction types has significant clinical implications. Mesioangular and vertical impactions are generally more straightforward to treat with surgical extraction, while distoangular and horizontal impactions may require more complex surgical techniques. We also identified cases of caries associated with adjacent teeth, which is almost exclusively linked to mesioangular impaction. This finding is in agreement with the study by Altan et al. [39]. The angulation of the impacted molar and its close proximity to the cervico-coronal region of the distal aspect of the second molar creates a stagnant area for food debris and bacterial colonization. Therefore, early screening and detection of impacted third molars is crucial to prevent caries on the second molar when the third molar is impacted. Regular dental check-ups and early radiographic

evaluations can help in the early detection and management of potential impactions, thus preventing severe complications.

Pericoronitis was the primary reason for clinic visits in this study, with a female predominance, which is consistent with findings in the literature [40,41]. Yamalık et al.[42] also found a tendency for pericoronitis in female patients, although other symptoms did not show gender predominance. However, our findings contrast with those of Almendros-Marqués et al.[43] and Akarslan et al.[44], who did not find gender disparities in all complaints and pathologies.

Extraction was the main treatment option for most impacted mandibular third molars, although operculectomy was sufficient in some carefully selected cases. The predominant treatment modality for impacted third molars was surgical extraction, particularly for mesioangular and vertical impactions, consistent with the study by Gbotolorun et al. [36]. This is in line with standard clinical practices, where surgical extraction is often preferred to prevent complications such as infections, damage to adjacent teeth, cysts, and tumors.

Radiographic analysis plays a crucial role in diagnosing the type and severity of impactions. In this study, radiographs were unsuitable for interpretation in 16 cases, and in 8 cases, radiographs were not taken, with the majority of these patients not being planned for treatment. This highlights the importance of high-quality imaging and proper diagnostic protocols to ensure accurate assessment and treatment planning [45]. Inadequate radiographic data can lead to misdiagnosis or inappropriate treatment strategies, potentially worsening patient outcomes. Therefore, investing in advanced imaging technologies and training is essential to improving diagnostic accuracy and treatment outcomes.

The lack of significant gender differences in overall impaction patterns suggests that while some variations exist, the type of impaction is not strongly influenced by gender. This finding is important for clinical practice, as it indicates that treatment approaches should be standardized and not overly modified based on a patient's gender[46] .

The significant differences in impaction patterns based on age suggest that younger individuals may benefit from preventive dental screenings. Such screenings can identify potential impactions before they become symptomatic, thereby reducing the need for invasive treatments later in life.

The age-related distribution of impaction patterns highlights the importance of tailoring dental health strategies for different age groups:

- **Adolescents and Young Adults (16-25):** Focus on preventive screenings

and early interventions to manage impactions before they cause significant problems.

- **Adults (26-50):** Provide timely treatments for symptomatic impactions, with an emphasis on the common mesioangular and vertical impactions in this age group.
- **Older Adults (51-75):** Monitor for potential complications in previously treated cases and manage asymptomatic impactions conservatively unless they cause issues.

Understanding age-related trends in impaction patterns can guide dental practitioners in developing age-specific treatment protocols and preventive measures, ensuring that patients receive the most appropriate care based on their age and the likelihood of impaction-related complications.

RECOMMENDATION:

The findings of this study highlight several areas for future research to enhance our understanding of mandibular third molar impactions and improve clinical management strategies. Further research is needed to explore the genetic and environmental factors contributing to the development and impaction of third molars. Understanding these factors can help identify individuals at higher risk and facilitate the development of targeted preventive strategies[47]. Longitudinal studies tracking the development and impaction of third molars over time can provide valuable insights into their natural history and the effectiveness of various treatment approaches. Such studies can help determine the optimal timing for interventions and preventive measures. Investigating the impact of technological advances, such as 3D imaging and computer-aided surgical planning, on the diagnosis and management of impacted third molars can offer valuable insights into improving clinical outcomes. These technologies have the potential to enhance diagnostic accuracy and precision in surgical interventions[32,45]. Additionally, research focused on patient-centered outcomes, including pain management, quality of life, and long-term satisfaction with different treatment modalities, can provide a more comprehensive understanding of the impact of third molar impactions and their treatment on patients' lives.

LIMITATIONS:

The challenges encountered in this study were primarily related to the inability to retrieve certain medical records, as they were either not properly maintained or had been transferred to another department. Additionally, some records contained incomplete clinical information or were radiographically inadequate, leading to

their exclusion from the study. These issues highlight the need for improved record-keeping practices, including the adoption of digital or computer-enhanced systems, which would make the study more inclusive and provide more accurate and comprehensive data and information.

CONCLUSION:

In conclusion, Mesioangular and vertical impactions were the most common. No gender association was found with impaction patterns however a relationship between impaction patterns and age was observed which was statistically significant. Individuals who did not have a radiograph taken were not planned for appropriate treatment which highlights the importance of proper radiographic record-keeping and interpretation in treatment planning.

Accurate and comprehensive

diagnostic protocols are essential for effective treatment planning, including the use of high-quality radiographs to ensure clarity and interpretability, which are crucial for accurate diagnosis and treatment planning.

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