

Incidence and Pattern of Impacted Lower Third Molars Using Cone-beam Computed Tomography: A Retrospective Study in Sulaimani, Kurdistan Region, Iraq



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ABSTRACT

Background: Impacted mandibular third molars are among the most common dental problems, with varying prevalence in different populations. This retrospective study assessed the incidence and pattern of impacted lower third molars using cone-beam computed tomography (CBCT) in relation to angulation, laterality, and demographic data. **Materials and Methods:** A retrospective study was performed by analyzing the CBCT images of patients who attended the Empire Dental Polyclinic in Sulaimani, Kurdistan Region, Iraq, between January 2022 and December 2024. Mandibular third molars were included if they were impacted, bordered peripherally, or completely by the mandible on at least one image. The affected teeth were coded using the angulation system developed by Winter (vertical, mesioangular, distoangular, and horizontal angulations). **Results:** In the sample, 36.2% of the patients had mandibular third-molar impaction. Bilateral impaction (19.7%) was more common than unilateral impaction (16.5%). The most common pattern was mesioangular impaction (46.8%), followed by vertical (25.2%), horizontal (18.7%), and distoangular (9.4%) patterns. The highest prevalence of impaction was found in the age group of 20–29 years, and it decreased with increasing age. The study population was 57.8% female, and they had a higher impaction rate than their male counterparts. **Conclusion:** This study found a moderate prevalence of mandibular third molar impaction in a young Iraqi population, with bilateral involvement and mesioangular angulation as the dominant patterns of impaction. These findings support early radiographic assessment in young adults and highlight the need for population-specific data to guide clinical practice.

Index Terms: Impacted Mandibular Third Molars, Cone Beam Computed Tomography, Mesioangular Impaction, Prevalence

1. INTRODUCTION

The term impaction is derived from the Latin word *impaction*, which refers to an organ or structure that is prevented from assuming its normal position due to an abnormal mechanical

condition [1]. Third molars, or wisdom teeth, often do not erupt correctly; thus, impaction occurs when the tooth does not erupt properly into the dental arch [2]. Mandibular third molar impaction is present in 9.5–68% of the population worldwide and is more common in the mandibular arches than in the maxillary arches [1]. The lack of sufficient arch space, the lateness of the time of eruption, and genetic predispositions are considered to be the factors that contribute to this phenomenon [3]. Impaction patterns are divided into angulation (vertical, mesioangular, and distoangular; horizontal), depth (Pell-Gregory classes A, B, and C), and ramus relationship (classes I, II, and III). Mesioangular and

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horizontal impactions are more common in the mandible, with vertical impactions being more common in the maxilla. Complications, such as pericoronitis [4], caries on adjacent second molars [5], root resorption [5], and inferior alveolar nerve (IAN) [6] injury, and the importance of a correct preoperative examination are emphasized [4]. Traditional two-dimensional imaging, such as panoramic radiographs orthopantomograms (OPGs), offers an overview but suffers from superimposition and distortion, thereby limiting precision in root morphology, canal proximity, and bone relationships [6]. Cone-beam computed tomography (CBCT) addresses these shortcomings by providing isotropic voxels to support multiplanar reconstructions, allowing visualization of the IAN canal position, root dilaceration, and adjacent tooth pathology [6]. Research indicates the high predictive ability of CBCT in terms of IAN exposure (sensitivity, 93%; specificity, 77%) compared to OPG (67.7% accuracy), which helps to focus on the risk of surgery [7]. It is also more reliable in the detection of distal caries and root resorption on second molars and is associated with a prevalence of up to 47.7% linked to impacted third molars [7]. Small fields-of-view (3.5×3.5 cm) with centers of interest on the second molar are optimized to reduce radiation but cover the third molar and mandibular canal [6]. The population of Sulaimani, which forms part of the homogeneous Kurdish population, is likely to reflect the trends of Erbil, which has had high impaction rates (65.7%) in the past [8]. Nevertheless, there is still a lack of epidemiological evidence on the prevalence and trend of affected lower third molars in certain groups. The Sulaimani area of Iraq is a separate geographic and ethnic community, with no available comprehensive data on patterns of impaction of third molar. Knowing the pattern of impaction that occurs in this population in particular and the prevalence of this type of dental impaction in this population(s) would be valuable information to clinical practitioners and would contribute to the overall body of knowledge on this common dental condition in diverse populations. Thus, the objective of this retrospective study was to assess the frequency and trend of affected lower third molars with the help of CBCT imaging among the population of Sulaimani, with special consideration given to the anatomical relationship and classification features of the affected teeth.

2. MATERIALS AND METHODS

2.1. Study Design and Ethical Approval

This retrospective cross-sectional study was conducted using CBCT images archived in the Radiology Department of the Empire Dental Polyclinic in Sulaimani, Kurdistan Region,

Iraq. The local ethics committee of the Institutional Review Board of Sulaimani Technical Institute approved this study (Approval No. 145), and a waiver of informed consent was granted due to the retrospective nature of the study. A single-center design was selected to eliminate inter-center hardware variability and ensure uniform scanning parameters across all the evaluated images.

2.2. Study Population and Sample Selection

The study population consisted of all consecutive archived patients who underwent CBCT imaging at the Radiology Department of Empire Dental Polyclinic between January 2022 and December 2024. In strict accordance with ALARA and SEDENTEXCT guidelines, CBCT imaging was not used as a routine screening tool [9], [10]. All included scans were prescribed based on specific clinical and 2D radiographic indications where 3D visualization was required for treatment planning, such as suspected proximity of the root apex to the IAN canal, root dilaceration, adjacent tooth resorption, or complex bone morphology.

The inclusion criteria were as follows: (1) Clear visualization of bony and dental structures reconstructed at a 0.2 mm isotropic voxel resolution and (2) complete CBCT images showing the entire mandible, including both third molar regions.

The exclusion criteria were as follows: (1) Presence of syndromic conditions affecting bone development; (2) history of orthodontic treatment affecting third molar position; (3) previous third molar extraction; (4) Scans exhibiting severe patient motion artifacts; (5) metallic scattering artifact from adjacent restorations obliterating the retromolar space or second molar root; and (6) incomplete field-of-view obscuring the third molar region.

2.3. Demographic and Clinical Data Collection

Demographic and radiographic information was obtained from the clinical records in the archives and CBCT images of eligible patients. The following variables were recorded: age, sex, chief complaint, status of 3rd molar, laterality (right, left, unilateral, or bilateral), and angulation pattern. For the demographic summary, age was grouped by 10-year interval (20–29, 30–39, 40–49 years). For the evaluation of age-specific trend, age was grouped by 5-year interval.

2.4. CBCT Image Acquisition and Analysis

CBCT images were obtained using a PreXion 3D CBCT system (PreXion Inc., Tokyo, Japan) with standardized scanning parameters: 90 kVp, 8 mA, 10-s scan time, and

0.2 mm voxel size. The patients were positioned seated upright with head stabilization, maintaining the Frankfurt horizontal plane parallel to the floor. The images were reconstructed in orthogonal planes (axial, coronal, and sagittal) with a slice thickness of 0.2 mm.

2.5. Measurement Calibration and Reliability

All CBCT scans were evaluated independently by two experienced oral and maxillofacial radiologists. Before image analysis, the examiners underwent a joint calibration session using 25 non-sample CBCT scans to standardize. Winter's classification criteria are based on the angle formed between the long axis of the impacted third molar and the long axis of the adjacent second molar. Vertical impaction: long axis of the third molar parallel to the long axis of the second molar ($+10^\circ$ to -10°). Mesioangular impaction: long axis angled mesially toward the second molar ($+11^\circ$ to $+79^\circ$). Distoangular impaction: long axis angled distally to the second molar (-11° to -79°). Horizontal impaction: long axis of third molar to the long axis of the second molar ($+80^\circ$ to $+100^\circ$). Other type of impaction ($+101^\circ$ to -80°) [8], [11]. The other type of impaction represents the circular angular range, encompassing distal-horizontal and inverted orientations. Intra-observer reliability was assessed by re-evaluating 10% of the sample ($n = 25$) after a 3-week interval. Cohen's kappa (κ) demonstrated strong inter-observer ($\kappa = 0.88$) and intra-observer ($\kappa = 0.91$) reliability. High-resolution representative CBCT reconstructions illustrating each impaction pattern are provided in Fig. 1.

2.6. Statistical Analysis

Data were analyzed using IBM Statistical Package for the Social Sciences Statistics for Windows version 26.0 (IBM

Corp., Armonk, NY, USA). Descriptive statistics were used to calculate frequencies, percentages, means, and standard deviations. The prevalence of impacted third molars was calculated at both the tooth (number of impacted teeth/total number of third molars $\times 100$) and patient levels (number of patients with at least one impacted third molar/total number of patients $\times 100$).

3. RESULTS

The study population predominantly consisted of young adults. Participants in the 30–39 age group represented the largest demographic (41.8%), followed by the 20–29 age group (39.8%). No participants were recorded in the age groups under 20 years or over 50 years. Regarding sex distribution, females accounted for 57.8% of the sample, while males accounted for 42.2% (Table 1). The patterns of impaction were classified according to angulation on both the right and left sides. Mesioangular impaction was the most common pattern, occurring in 46.8% of the cases. Vertical impaction occurred in 25.2%, horizontal impaction in 18.7%, and distoangular impaction was the least common at 9.4%. On the right side, mesioangular impaction occurred in 44.3% of cases, whereas on the left side, it occurred in 49.3% of the cases (Table 2). The overall prevalence of mandibular third molar impaction, whether right, left, or both, was 36.2%. Right-sided impaction (LR8) was observed in 28.1% of the population, and left-sided impaction (LL8) was observed in 27.7% of the population. Bilateral impaction was more frequent (19.7%) than unilateral impaction (16.5%). Most subjects (63.9%) presented with no impaction (Table 3). The prevalence of mandibular third molar impaction showed a steady decline with increasing age. The highest prevalence

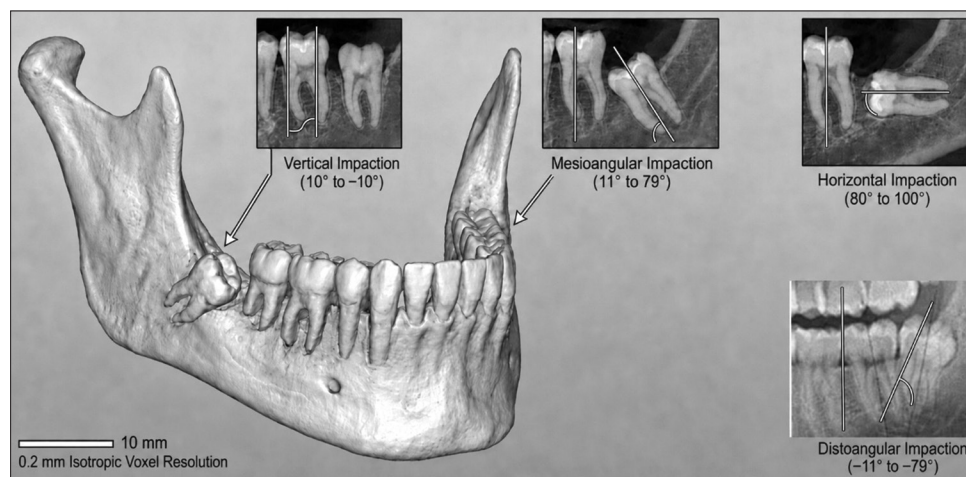


Fig. 1. Winter classification. Vertical ($+10^\circ$ to -10°), mesioangular ($+11^\circ$ to $+79^\circ$), horizontal ($+80^\circ$ to $+100^\circ$), distoangular (-11° to -79°) impactions.

of overall and bilateral impaction was observed in the 20–24 age group, with bilateral cases decreasing significantly in the 40–44 age group. Unilateral impaction showed a slight increase in prevalence between the 20, 24, and 30–34 age groups before declining in the older cohorts (Fig. 2).

4. DISCUSSION

The current research indicated that bilateral impaction of the mandibular third molar was more prevalent than

unilateral impaction, and mesioangular impaction proved to be the dominant angulation pattern. These results imply that the impaction of the third molar is a significant oral-health problem in Sulaimani, Kurdistan Region, Iraq, and that the burden is concentrated in young adults, particularly those in their twenties and thirties. The pattern is clinically significant since the mesioangular and bilateral impactions are usually the most likely forms that may be subjected to radiographic attention and surgical consultation [5]–[7]. It is also remarkable that the age distribution of this study showed that impaction was more prevalent in the group of 20–24 years old, and then the prevalence of impaction among different groups decreases gradually with increasing age. This is in line with the biology of third molar eruption, as impaction is typically identified during or within the eruption window when root development is underway and when space constraints become apparent. Similar findings are shown by studies in Iran, Turkey, Saudi Arabia, and Yemen, which all indicate that 3rd molar impaction is concentrated during late adolescence and early adulthood, and older age groups often report lower prevalence due to previous extractions, interventions based on the manifestation of symptoms, or changes in radiographic ascertainment over time [5], [11]–[15]. It is also worth taking note of the female dominance in the current sample. A higher percentage of females has been reported in a number of epidemiologic studies, such as the Yemeni study and a recent global review, which indicated that women could be slightly more likely to have impaction of the third molar [12], [16], [17]. The possible reasons are smaller mandibular size, completion of skeletal growth earlier, and an increased use of health-care services by women, which can increase the probability that an affected tooth will be noted on a radiograph. Meanwhile, other studies in the region are not in agreement, as the Erbil cohort discovered that it is sex dominant, and that sex distribution might have relied on the population sampled and the referral pattern of the dental facility [8]. The overall prevalence in this case is less than that in some neighboring populations but similar to others, indicating the regional heterogeneity which is characteristic of the impaction of the third molar. In Karbala, the percentage of impacted third molars was 34.71%, which is similar to the 36.2% in the present study [18]. Conversely, Erbil had a higher prevalence of 65.7% [8], while a Yemeni's study reported a prevalence slightly above 38.8% of patients with at least one affected third molar [12]. Moderate-to-high prevalence has also been reported in studies in Iran and some Saudi cohorts, but other populations have much lower or higher prevalence depending on age structure, radiographic method, and inclusion criteria [5], [13]. Another applicable finding is the bilateral predominance in this study. Bilateral impaction has

TABLE 1: Demographic	
Age group	Number (%)
<20	0 (0.0)
20–29	99 (39.8)
30–39	104 (41.8)
40–49	46 (18.5)
50+	0 (0.0)
Female	144 (57.8)
Male	105 (42.2)

TABLE 2: Angulation patterns by side			
Pattern	Right side (%)	Left side (%)	Number (%)
Mesioangular	31 (44.3)	34 (49.3)	65 (46.8)
Vertical	16 (22.9)	19 (27.5)	35 (25.2)
Horizontal	15 (21.4)	11 (15.9)	26 (18.7)
Distoangular	8 (11.4)	5 (7.2)	13 (9.4)

TABLE 3: Overall prevalence and laterality	
Impaction status	Number (%)
Any mandibular 3 rd molar impaction (R and/or L)	90 (36.2)
Right mandibular 3 rd molar impaction (LR8)	70 (28.1)
Left mandibular 3 rd molar impaction (LL8)	69 (27.7)
Impaction side	
Unilateral impaction	41 (16.5)
Bilateral impaction	49 (19.7)
No impaction	159 (63.9)

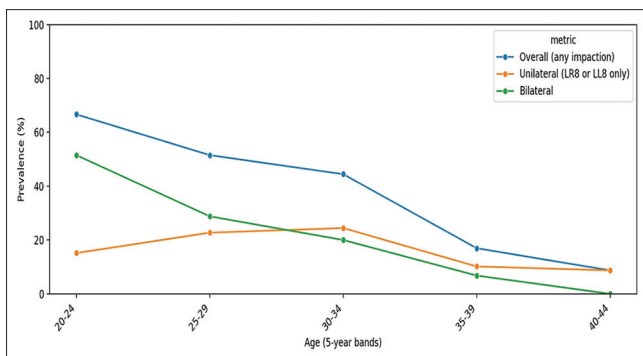


Fig. 2. Mandibular 3rd molar impaction prevalence by 5-year age band.

been reported to be common in various panoramic studies such as the review study reported that bilateral impaction was more frequent than unilateral impaction [16]. This pattern indicates that both sides of the mandible are influenced by local anatomical factors such as minimal retromolar space, symmetric jaw development and inherited craniofacial dimensions [11], [12]. The fact that, in the current sample, the right and left prevalence are near-symmetric also supports the notion that impaction is motivated by generalized developmental constraints, rather than random side-specific variation. In the current study, mesioangular impaction was the most common angulation, with vertical, horizontal, and distoangular angulations coming next. It is among the most replicable findings that are found in the literature, particularly in the mandibular impaction studies in Iran, Karbala, Nepal, and many Saudi cohorts [5], [13], [15], [18]–[20]. Mesioangular impaction is commonly understood as the consequence of the lack of the retromolar space and the inclination of the third molar to incline toward the second molar when the eruption is inhibited [11], [15]. This arrangement is clinically significant as it is often related to food impaction, distal caries in the second molar, and inability to spontaneously erupt. The vertical impaction was reported as the most common pattern in a recent study of adults, with some Turkish and Saudi series finding vertical or horizontal patterns to dominate various samples and classification systems [5], [11]. Such discrepancies are probably due to the differences in ethnicity, jaw size, age composition, and the kind of radiograph employed. They can also be a reflection of the selection of patients who have already been referred to imaging and, therefore, will be more likely to have a complex or symptomatic case. The decrease in impaction seen with age in the current study could be due to practical and epidemiological reasons. The unerupted or partially erupted third molars are more likely to be found in younger adults, as they may still be erupting or have not fully developed, while some in the older age groups may be late erupting but have been extracted or may not be seen in the archival records. Hence, it is important to consider that the lower prevalence in older age groups might be associated with the natural history of eruption failure, sampling bias, and previous treatment [11], [13], [18], [21]. Clinically, the most common mesioangular and bilateral impactions imply that the focus should be put on screening young adults, particularly in the second and third decades of their lives, while sex-related patterns should be interpreted according to the population-specific findings because some studies report female predominance whereas others report higher prevalence in males [13], [15]–[18], [21]. Mesioangular impactions tend to weaken the distal part of the second

molar and also may cause periodontal defects or caries if the impaction is not addressed [13], [17]. Bilateral cases cannot be considered incidental radiographic findings, due to the ability to create a greater cumulative surgical burden and the need to be carefully planned to be treated [22].

Investigations in Iraq, Saudi Arabia, Yemen, Iran, and Turkey have revealed a wide range of differences in prevalence; however, it is clear that the mandibular third molar is the most affected tooth, with the most common pattern of angulation being mesioangular or vertical [5], [8], [11], [13], [14], [20], [21]. This implies that there are regional variations but that there is also a shared epidemiologic profile that can guide clinicians in anticipating common types of impaction in patients in the Middle East. In the case of oral surgeons and general dentists, this favors a lower radiographic review threshold and individualized counseling when young adults present with symptoms or signs of third molar impaction or limited eruption space.

First limitation. This study consisted of a pre-selected patient population referred to a dental radiology center for specialized 3D imaging and not an unselected general community sample. This hospital-based sampling method may have led to selection bias and overestimated the prevalence of third molar impaction in the general population. Second, while CBCT provides comprehensive 3D anatomical details, this investigation focused primarily on Winter's angulation patterns and demographic distributions. Detailed 3D parameters, such as Pell and Gregory depth/ramus classification and precise neurovascular relationship to the IAN canal—, were not systematically quantified in this primary analysis and should be explored in future prospective studies.

5. CONCLUSION

This study found a moderate prevalence of mandibular third molar impaction in a young Iraqi population, with bilateral involvement and mesioangular angulation being the dominant patterns of impaction. These findings support the need for early radiographic assessment in young adults and highlight the need for population-specific data to guide clinical practice.

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REFERENCES

- [1] D. Passi, G. Singh, S. Dutta, D. Srivastava, L. Chandra, S. Mishra, A. Srivastava and M. Dubey. "Study of pattern and prevalence of mandibular impacted third molar among Delhi-national capital region population with newer proposed classification of mandibular impacted third molar: A retrospective study". *National Journal of Maxillofacial Surgery*, vol. 10, no. 1, pp. 59-67, 2019.
- [2] M. J. Lakhani, W. Kadri, H. Mehdi, H. Sukhia, A. Bano and S. Yaqoob. "Anterior arch crowding--a possible predictor for mandibular third molar impaction". *Journal of Ayub Medical College Abbottabad*, vol. 23, no. 1, pp. 63-65, 2011.
- [3] H. M. Mahdey, S. Arora and M. Wei. "Prevalence and difficulty index associated with the 3(rd) mandibular molar impaction among Malaysian ethnicities: A clinico-radiographic study". *Journal of Clinical and Diagnostic Research for Doctors*, vol. 9, no. 9, pp. Zc65-Zc68, 2015.
- [4] M. Rieder, B. Remschmidt, C. Gsaxner, J. Gaessler, M. Payer, W. Zemmann and J. Wallner. "Augmented reality-guided extraction of fully impacted lower third molars based on maxillofacial CBCT Scans". *Bioengineering (Basel)*, vol. 11, no. 6, p. 625, 2024.
- [5] A. A. Madfa, A. F. Alshammari, B. B. Alshammari, T. M. Alenezi, E. A. Aledaili, S. S. Bhagwath, K. A. Alkurdi and A. Al-Haddad. "Prevalence and patterns of impacted third molars and their association with distal caries incidence in adjacent second molars: A CBCT-based study in a Saudi subpopulation". *BMC Oral Health*, vol. 25, no. 1, p. 1869, 2025.
- [6] A. M. Ilo, M. Ekholm, E. Pakbaznejad Esmaeili and J. Waltimo-Sirén. "Minimum size and positioning of imaging field for CBCT-scans of impacted lower third molars: A retrospective study". *BMC Oral Health*, vol. 21, no. 1, p. 670, 2021.
- [7] Y. Y. Leung, K. F. Hung, D. T. Li and A. W. Yeung. "Application of cone beam computed tomography in risk assessment of lower third molar surgery". *Diagnostics (Basel)*, vol. 13, no. 5, p. 919, 2023.
- [8] L. M. Fatah, A. F. Alzubadee, R. F. Khalid, A. Samad and R. Al-Kamali. "Prevalence and patterns of upper and lower third molar impaction: A radiographic retrospective study based on a population in Erbil, Iraq". *Erbil Dental Journal (EDJ)*, vol. 8, no. 1, pp. 93-101, 2025.
- [9] European Commission. Directorate-General. "Cone Beam CT for Dental and Maxillofacial Radiology -Evidence-Based Guidelines." Publications Office European Commission, 2012.
- [10] R. G. M. M. Rehani, S. Bartling, G. C. Sharp, R. Pauwels, T. Berris and J. M. Boone. "Radiological protection in cone beam computed tomography (CBCT)". *Annals of the ICRP*, vol. 44, no. 1, pp. 7-127, 2015.
- [11] S. Yilmaz, M. Z. Adisen, M. Misirliloglu and S. Yorubulut. "Assessment of third molar impaction pattern and associated clinical symptoms in a central Anatolian Turkish population". *Medical Principles and Practice*, vol. 25, no. 2, pp. 169-75, 2016.
- [12] Y. Alhadi, H. A. Al-Shamahy, A. Aldilami, M. Al-Hamzy and K. J. Al-Haddad. "Prevalence and pattern of third molar impaction in sample of Yemeni adults". *On J Dent Oral Health*, vol. 1, no. 5, pp. 1-4, 2019.
- [13] M. A. Hashemipour, M. Tahmasbi-Arashlow and F. Fahimi-Hanzaee. "Incidence of impacted mandibular and maxillary third molars: A radiographic study in a Southeast Iran population". *Med Oral Patol Oral Cir Bucal*, vol. 18, no. 1, pp. e140-e145, 2013.
- [14] K. A. Kheder, H. A. Barzanji and S. H. Ali. "Comparison of prevalence and angulation of impacted third molar among Erbil population with that of Iraq neighboring countries: A descriptive retrospective study". *Erbil Dental Journal (EDJ)*, vol. 1, no. 1, pp. 10-16, 2018.
- [15] N. Sharma Lamichhane, B. Sigdel, S. Lamichhane, R. Tripathi, U. Koirala, and D. P. Bajgain. "Mandibular third molar impaction among patients visiting outpatient dental department of a tertiary care centre". *Journal of Nepal Medical Association*, vol. 61, no. 266, pp. 769-774, 2023.
- [16] S. M. Al-Anqudi, S. Al-Sudairy, A. Al-Hosni and A. Al-Maniri. "Prevalence and pattern of third molar impaction: A retrospective study of radiographs in Oman". *Sultan Qaboos University Medical Journal*, vol. 14, no. 3, pp. e388-e392, 2014.
- [17] A. C. Pinto, H. Francisco, D. Marques, J. N. R. Martins and J. Caramês. "Worldwide prevalence and demographic predictors of impacted third molars-systematic review with meta-analysis". *Journal of Clinical Medicine*, vol. 13, no. 24, p. 7533, 2024.
- [18] R. B. Shaari, M. A. Awang Nawi, A. K. Khaleel and A. S. AlRifai. "Prevalence and pattern of third molars impaction: A retrospective radiographic study". *Journal of Advanced Pharmaceutical Technology and Research*, vol. 14, no. 1, pp. 46-50, 2023.
- [19] A. K. Demyati. "Patterns of mandibular third molar impaction and its relationship with distal caries in the adjacent mandibular second molars: A retrospective study". *Saudi Dental Journal*, vol. 36, no. 12, pp. 1544-1548, 2024.
- [20] K. B. Syed, F. S. Alshahrani, W. S. Alabsi, Z. A. Alqahtani, M. S. Hameed, A. B. Mustafa and T. Alam. "Prevalence of distal caries in mandibular second molar due to impacted third molar". *J Clin Diagn Res*, vol. 11, no. 3, pp. ZC28-ZC30, 2017.
- [21] M. N. Alhajj, A. G. Amran, S. Alhaidary, A. N. Amran, A. A. Al-Sosowa, E. A. Abdulghani and E. Halboub. "Prevalence and pattern of third molars impaction in a large Yemeni sample: A retrospective study". *Scientific Reports*, vol. 14, no. 1, p. 22642.
- [22] A. Shumar. "Prevalence of impacted third molars and its associated pathologies among population in Sanaa city- Yemen". *International Arab Journal of Dentistry (IAJD)*, vol. 11, no. 2, p. 7, 2020.