

ORIGINAL ARTICLE

Reliability of Clinical Diagnosis of Oral and Maxillofacial Lesions Compared with Histopathological Diagnosis in a Tertiary Hospital in Southwest Nigeria: Implications in the Era of Medical Brain Drain

¹E. E. Aforka, ^{2,3}T. A. Akinniyi, ³I. E. Ugwu, ³A. I. Ayinuowo, ¹S. O. Adebayo-Edun, ⁴A. E. Ogunsanya, ⁵A. A. Adegbite

¹Department of Oral Medicine and Oral Pathology, Obafemi Awolowo University Teaching Hospitals Complex, Ile Ife, Nigeria.

²Department of Oral and Maxillofacial Surgery, Obafemi Awolowo University, Ile Ife, Osun State, Nigeria.

³Department of Oral and Maxillofacial Surgery, Obafemi Awolowo University Teaching Hospitals Complex, Ile Ife, Nigeria

⁴Department of Family Dentistry, University of Abuja Teaching Hospital, Gwagwalada, Abuja

⁵Dental center, Obafemi Awolowo University Teaching Hospitals Complex, Ile Ife, Osun State, Nigeria.

ABSTRACT

Background: Nigeria is experiencing an unprecedented medical brain drain, resulting in the loss of highly skilled clinicians. Consequently, many centres lack oral pathologists to provide accurate diagnoses for oral and maxillofacial lesions, which makes clinicians depend more on clinical assessment when managing patients. This study assessed the precision of clinical diagnosis compared with histopathological diagnosis of oral and maxillofacial lesions at Obafemi Awolowo University Teaching Hospitals Complex, Ile-Ife, Osun State, over nine years (2017–2025).

Methods: A comprehensive retrospective review of the archival biopsy service records from the Oral Pathology Unit, Department of Oral Medicine and Oral Pathology, was conducted for the period January 2017 to December 2025. Extracted data included sociodemographic characteristics such as patient age, sex, lesion site, clinical diagnosis, histologic diagnosis, and broad diagnostic category (e.g., benign, malignant, or reactive). SPSS was used to generate descriptive statistics, sociodemographic distributions, and concordance rates between clinical impressions and histopathological findings.

Results: A total of 451 cases were analyzed. Patients had a mean age of 38.1 years±20.3, with an age range of 3 months to 96 years. There was a slight female predominance, with 241 females and 209 males (female-to-male ratio: approximately 1.15:1) while the gender was not specified in one case. The mandible was the most common anatomical site of lesion presentation, and Ameloblastoma was the most frequently diagnosed pathology. Histologic Categorization: Benign lesions accounted for the largest diagnostic group, with 195 cases (43.5%), followed by malignant lesions in 114 cases (25.4%), reactive lesions in 93 cases (20.8%), cysts in 30 cases (6.7%), and developmental conditions in 16 cases (3.6%) while the three cases (0.7%) that were referred for further work-up were excluded from category-level comparisons. Exact clinical diagnoses corresponded with final histologic diagnoses in 53.66% of cases. In contrast, broader categorical concordance such as clinicians' ability to correctly predict whether a lesion was benign, malignant, reactive, or another category was higher at 77.7%.

Conclusion: Clinical evaluation was able to predict the broad category of oral and maxillofacial lesions with an accuracy of ~77%. However, specific diagnosis was less accurate and underscoring the indispensable role of histopathological diagnosis. Benign lesions were the most common, particularly mandibular ameloblastoma. To improve diagnostics and strengthen patient care, histopathology services must improve and healthcare professionals must be retained.

Keywords: Reliability, Clinical, Histopathological, Diagnosis, Brain-drain

Online Access



This is an open access journal, and articles are distributed under the terms of the Creative Commons Attribution-NonCommercial-ShareAlike 4.0 License, which allows others to remix, tweak, and build upon the work non-commercially, as long as appropriate credit is given and the new creations are licensed under the identical terms.

Corresponding author: Taofeek A. Akinniyi, Department of Oral and Maxillofacial Surgery, Obafemi Awolowo University/Obafemi Awolowo University Teaching Hospitals Complex, Ile Ife, Osun State, Nigeria.

doi: <https://doi.org/10.67250/va511h41>

Received: 24/7/2026 Revised: 5/8/2026 Accepted: 24/8/2026

INTRODUCTION

Oral and maxillofacial lesions span reactive, inflammatory, developmental, cystic, benign, and malignant conditions, each requiring different management. Accurate diagnosis is therefore essential, and histopathological examination remains the diagnostic gold standard beyond clinical assessment alone. While a single comprehensive national prevalence estimate for all oral and maxillofacial lesions in Nigeria remains undocumented due to fragmented regional reporting, multicentre epidemiological studies indicate these lesions—particularly odontogenic tumours—constitute a substantial and growing burden of maxillofacial surgical pathology nationwide.¹ In practice, treatment decisions often begin, and sometimes end, with clinical impression based on history, examination, and available imaging. Clinical diagnosis guides referral urgency, initial surgery, and patient counselling, but reported concordance with histopathology varies. For example, a Ghanaian series reported a concordance rate of 62.8%, while an earlier audit at OAUTHC covering the 2008–2017 period reported a clinico-pathologic concordance rate of just 54.6%.^{2,3} Thus, clinical judgement is valuable but imperfect, and pathology remains essential where clinical suspicion and histologic diagnosis diverge.

This reliability question is increasingly urgent in Nigeria amid worsening medical brain drain. The country's doctor-to-patient ratio is about 1:9,083, with roughly 16,000 Nigerian-trained doctors emigrated and about 55,000 licensed doctors serving more than 220 million people.^{4,5} The pathologist shortage is even sharper, with an estimated 105 practising pathologists for about 200 million people, approximately one per two million and emigration continues to widen this gap.⁶

Many secondary and peripheral Nigerian facilities therefore lack resident oral pathologists, requiring specimens to be referred to central laboratories such as the OAUTHC Oral Pathology Unit. Delays in histologic reporting may force surgeons to decide on resection extent, referral urgency, and adjuvant treatment mainly on clinical grounds. This makes it essential to determine how reliable clinical diagnosis is, especially across benign, malignant, reactive, cystic, and developmental categories.

Despite growing reliance on clinical judgement, contemporary Nigerian data comparing clinical and histopathological diagnoses for oral and maxillofacial lesions remain limited, especially category-specific sensitivity and positive predictive value during the recent

period of accelerated physician emigration. This study assessed clinical diagnostic reliability against histopathology for lesions seen at OAUTHC, Ile-Ife, from 2017 to 2025, described patient and diagnostic patterns, identified categories linked to disagreement, and considered implications for decision-making as oral pathology expertise becomes increasingly scarce.

Specifically, this study sought to answer the following research questions:

1. What is the demographic and anatomic distribution of oral and maxillofacial lesions in the study population?
2. What is the exact diagnostic concordance rate compared to the broad categorical concordance rate (e.g., distinguishing between benign, malignant, reactive, cystic, and developmental lesions)?
3. Which specific diagnostic categories exhibit the highest rates of clinico-pathologic disagreement, and how do these impact clinical decision-making?

MATERIALS AND METHODS

This was a retrospective, descriptive cross-sectional study of archival biopsy service records held by the Oral Pathology Unit, Department of Oral Medicine and Oral Pathology, Obafemi Awolowo University Teaching Hospitals Complex (OAUTHC), Ile-Ife, Osun State, Nigeria. OAUTHC is a tertiary referral centre that receives oral and maxillofacial biopsy specimens from within and other referring hospitals as well as dental facilities across Osun State and neighbouring states. The Oral Pathology Unit is one of a relatively small number of functioning histopathology services providing this level of diagnostic support in south-western Nigeria. All biopsy accession records and corresponding histopathology reports processed by the Unit over the nine-year period from January 1, 2017 to December 31, 2025 were reviewed. Data extraction was systematically carried out between January and March 2026 to ensure the inclusion of all finalized reports up to the end of the study period.

Every case with a completed histopathology report and a corresponding documented provisional clinical diagnosis on the biopsy request form was eligible for inclusion. Cases were excluded where the specimen was reported as inadequate for diagnosis, where the histology report was inconclusive or deferred pending additional work-up (for example, awaiting immunohistochemistry or a second opinion) without a final diagnosis being reached, or where

the clinical request form did not record a provisional clinical diagnosis or diagnostic category. Duplicate entries relating to a repeat biopsy of the same lesion in the same patient were cross-checked, and only the report corresponding to the definitive diagnosis was retained to avoid double-counting.

Although sample size calculation was not performed, a total population sampling technique was employed. A comprehensive enumeration of all available eligible cases over the nine-year period was utilized to maximize statistical power and ensure a fully representative audit of the institutional caseload.

For each eligible case, the following data were extracted from the accession register and the histopathology report: patient age at biopsy, sex, anatomic site of the lesion, the provisional clinical diagnosis and clinical diagnostic category recorded on the request form, and the final histopathological diagnosis. Both the clinical and the histologic diagnoses were independently mapped by the investigators to one of five-broad diagnostic categories such as benign neoplastic, malignant, reactive/inflammatory, cystic, or developmental using standard oral and maxillofacial pathology classification. Where a request form specified a differential rather than a single clinical diagnosis, the lead clinical impression (the diagnosis listed first, or the one most consistent with the documented category, where a category was separately indicated) was taken as the provisional clinical diagnosis for the purpose of comparison. A small number of cases ($n = 3$) for which the final report indicated referral for further specialist work-up without a definitive category being assigned were retained in the descriptive demographic and site analyses but excluded from the category-level concordance comparisons.

Data were extracted onto a structured proforma and entered into IBM SPSS 25 for analysis. Descriptive statistics were used to summarise sociodemographic characteristics, anatomic site distribution, and the frequency of individual histologic diagnoses. The association between age and histologic diagnostic category was assessed using one-way analysis of variance (ANOVA) and, given the right-skewed distribution of age, corroborated with the non-parametric Kruskal–Wallis test. Associations between categorical variables such as sex, anatomic site, and histologic category, and clinical versus histologic diagnostic category were assessed using the chi-square test of independence, with Cramer's V calculated as a measure of effect size where a significant association was found.

Concordance between the provisional clinical diagnosis and the final histologic diagnosis was assessed at two levels: exact diagnostic concordance, defined as the proportion of cases in which the specific clinical diagnosis matched the specific final histologic diagnosis; and categorical concordance, defined as the proportion of cases in which the broad clinical diagnostic category (benign, malignant, reactive, cystic, or developmental) matched the broad final histologic category. Category-level agreement beyond chance was further quantified using Cohen's kappa coefficient, interpreted according to conventional benchmarks (kappa 0.61–0.80 denoting substantial agreement). For each diagnostic category, sensitivity and positive predictive value of the clinical impression relative to the histologic diagnosis were calculated from a 5 x 5 confusion matrix cross-tabulating clinical against histologic category. A two-tailed p-value of less than 0.05 was considered statistically significant throughout.

RESULTS

Demographic and General Characteristics

A total of 451 histologically diagnosed orofacial lesions were retrieved and analysed over the nine-year study period (2017–2025). To clarify the case flow for subsequent analyses: age was unspecified in two cases, yielding a cohort of $N = 449$ for age-related statistics; furthermore, three cases were referred for further specialist work-up without a definitive histologic category being assigned, leaving a final cohort of $N = 448$ for the category-level concordance comparisons.

Age at presentation ranged from 3 months to 96 years. The age was not normally distributed (Shapiro–Wilk test, $p < 0.001$); the median age was 36.0 years (IQR 22–53). The age-frequency distribution was unimodal and right-skewed (Figure 1), with the highest concentration of cases in the third decade of life (21–30 years; $n = 95$, 21.2% of cases), followed by the fourth and fifth decades. Cases in patients younger than 10 years accounted for 5.1% ($n = 23$) of the series, while only 3.6% ($n = 16$) of patients were older than 80 years.

Sex distribution showed a slight female predominance, with 241 females (53.6%) and 209 males (46.4%) (one record had sex unspecified), giving a male-to-female ratio of approximately 0.87:1. The full demographic summary is presented in *Table 1*

Distribution of Diagnostic Categories

Based on the final histopathologic diagnosis (N=448), lesions were classified as benign neoplastic (n = 195, 43.5%), malignant (n = 114, 25.4%), reactive/inflammatory (n = 93, 20.8%), cystic (n = 30, 6.7%), and developmental (n = 16, 3.6%); three cases (0.7%) were referred for further work-up and were excluded from category-level comparisons. The corresponding provisional clinical impressions classified 39.5% (n = 178) of lesions as benign, 25.3% (n = 114) as malignant, 21.7% (n = 98) as reactive, 11.3% (n = 51) as cystic, and 2.2% (n = 10) as developmental (Figure 2).

The single most frequent specific histologic diagnosis was ameloblastoma (n = 79, 17.5%), followed by squamous cell carcinoma (n = 48, 10.6%) and pyogenic granuloma/lobular capillary haemangioma (n = 43, 9.5%); the ten leading diagnoses accounted for 58.2% of the entire series (Figure 3).

Association Between Age and Diagnostic Category

Median age varied considerably across histologic categories as shown in box-whisker plot in Figure 4. Malignant lesions presented at a markedly older median age (55.0 years) than benign (29.0 years), cystic (26.0 years), reactive (34.0 years), and developmental lesions (23.5 years), the latter unsurprisingly representing the youngest group. A Kruskal–Wallis test confirmed a statistically significant difference in age distribution across

Table 1: Demographic summary of the study population (N = 451)

Variable	n	%	Median (IQR)
Age, years (n = 449)	449	—	36.0 (22–52)
Sex – Female	241	53.6	—
Sex – Male	209	46.4	—
Sex unspecified	1	0.2	—
Total cases	451	100.0	—

the five diagnostic categories ($H = 76.21$, $df = 4$, $p < 0.001$). These results indicate that patient age is a clinically useful discriminator between malignant and non-malignant orofacial disease, with malignancy showing a propensity for the fifth to sixth decades of life while developmental lesions cluster in the first two decades.

Association Between Sex and Diagnostic Category

Cross-tabulation of sex against histologic category (Figure 5) revealed a statistically significant association ($\chi^2 = 26.97$, $df = 4$, $p < 0.001$; Cramér's $V = 0.25$, indicating a small-to-moderate effect). Malignant lesions were disproportionately represented among males, comprising 35.4% of all male diagnoses compared with 16.6% of female diagnoses (73 vs. 40 cases), whereas benign lesions were comparatively more frequent in females (48.5% vs. 37.9% of male diagnoses). Developmental lesions also showed a female preponderance (14 of 16 cases, 87.5%). No significant sex difference was apparent for reactive or cystic lesions.

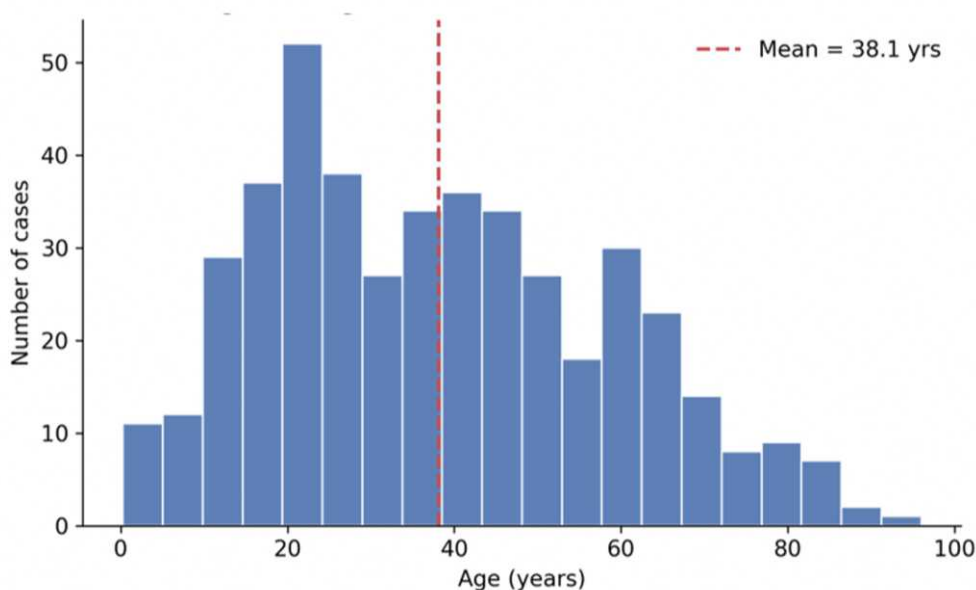


Figure 1: Age distribution of all orofacial lesions (N = 449). The dashed line denotes the overall mean age (38.1 years).

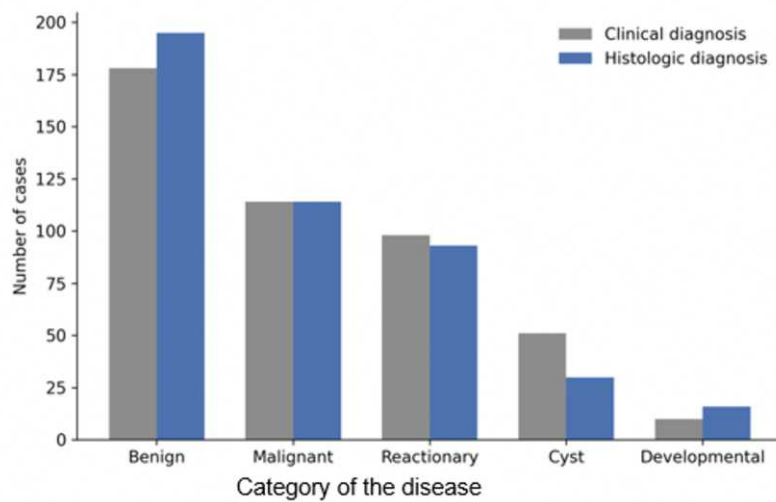


Figure 2: Distribution of diagnostic categories by clinical impression versus final histologic diagnosis

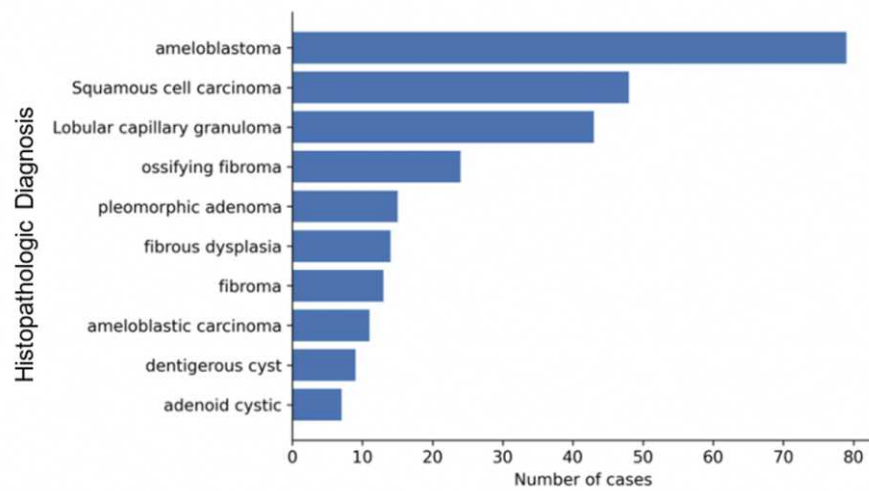


Figure 3: Ten most common histologic diagnoses in the study population

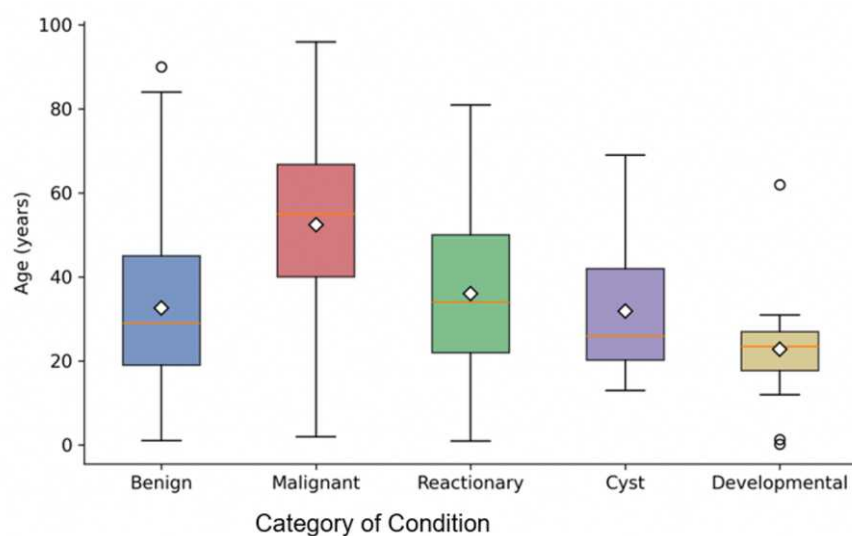


Figure 4: Box-and-whisker plot of age distribution by histologic diagnostic category. Diamonds indicate group means; the central line indicates the median

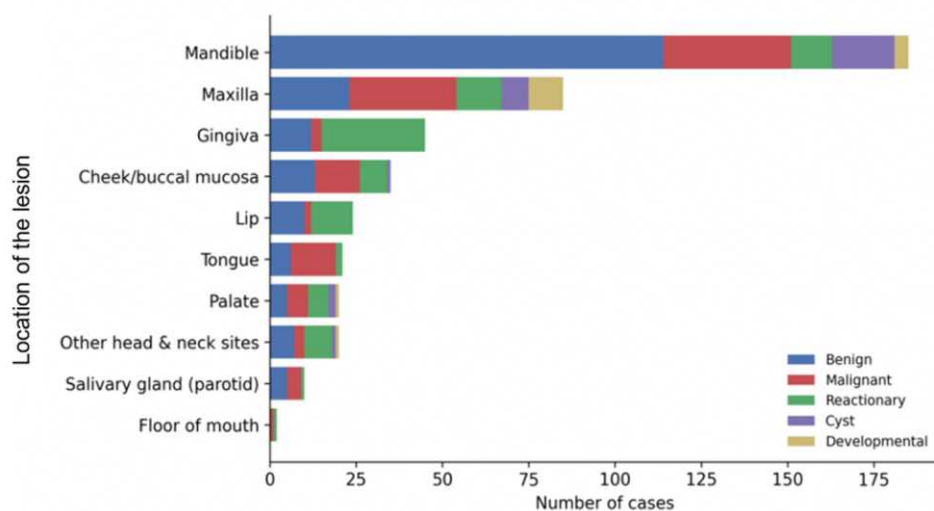


Figure 6: Stacked distribution of histologic diagnostic categories across anatomic sites ($\chi^2 = 172.41$, $df = 36$, $p < 0.001$)

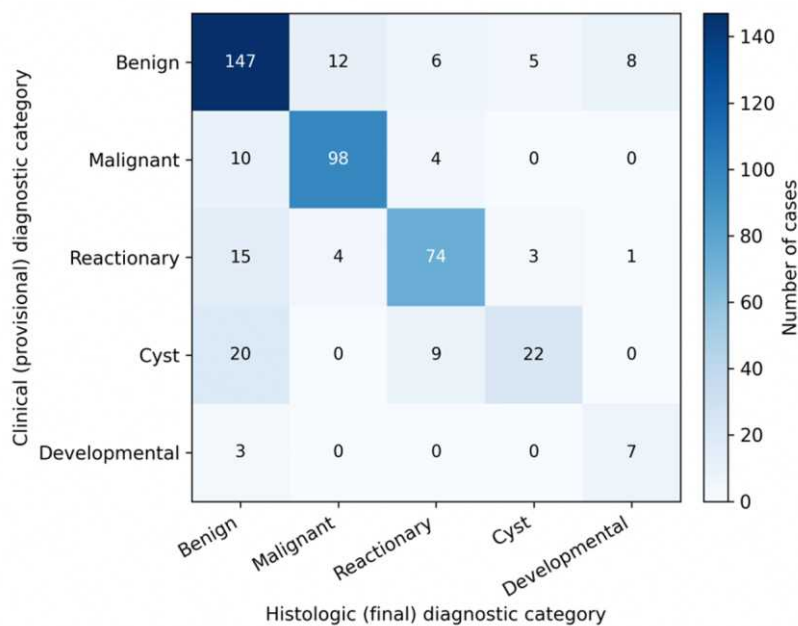


Figure 7: Confusion matrix illustrating concordance between the clinical (provisional) and histologic (final) diagnostic categories (Cohen's $\kappa = 0.686$; overall agreement = 77.7%; $\chi^2 = 773.20$, $df = 16$, $p < 0.001$).

Table 4: Sensitivity and positive predictive value (PPV) of the provisional clinical diagnosis for each histologic diagnostic category (overall concordance 77.7%; Cohen's $\kappa = 0.686$).

Diagnostic category	Sensitivity (%) (95% CI)	PPV (%) (95% CI)	n (histologic)	n (clinical)
Malignant	86.0 (78.0–90.7)	87.5 (80.4–92.5)	114	112
Benign	75.4 (68.9–80.9)	82.6 (76.3–87.5)	195	178
Reactive	79.6 (70.3–86.5)	76.3 (66.1–83.0)	93	97
Cyst	73.3 (55.6–85.8)	43.1 (30.5–56.7)	30	51
Developmental	43.8 (23.1–66.8)	70.0 (39.7–89.2)	16	10

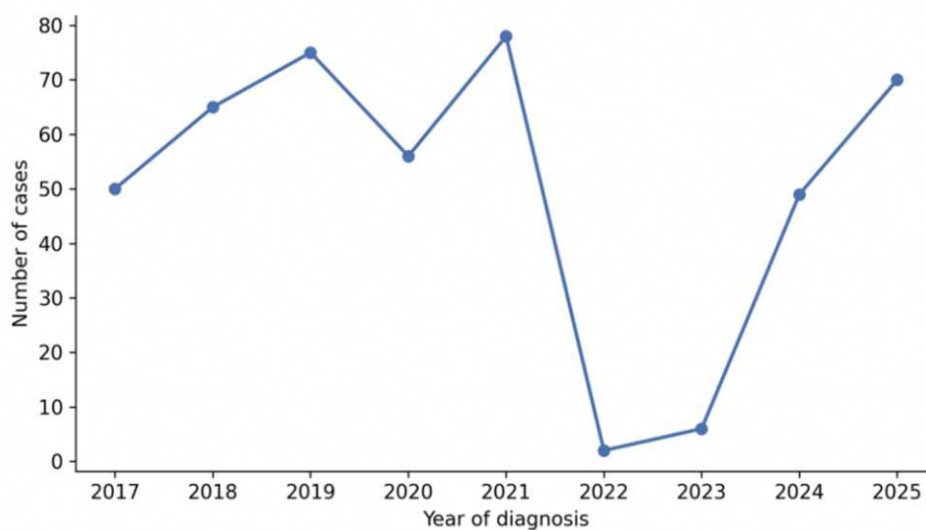


Figure 8: Annual case volume of histologically diagnosed orofacial lesions, 2017–2025. The x-axis denotes the year of diagnosis, and the y-axis represents the total number of cases.

Note: The marked decline in case volume observed between 2022 and 2023 is attributed to reduced specimen submission and data capture caused by unavailability of a resident Oral Pathologist

Anatomic Site Distribution and Its Association with Diagnostic Category

The mandible was the most frequently affected site overall ($n = 187$, 41.6%), followed by the maxilla ($n = 85$, 18.9%), gingiva ($n = 45$, 10.0%), cheek/buccal mucosa ($n = 36$, 8.0%), lip ($n = 24$, 5.3%), tongue ($n = 21$, 4.7%), palate ($n = 20$, 4.4%), other head-and-neck sites ($n = 20$, 4.4%), parotid gland ($n = 10$, 2.2%), and floor of mouth ($n = 2$, 0.4%); one case had no site recorded. The distribution of histologic category differed significantly by anatomic site ($\chi^2 = 172.41$, $df = 36$, $p < 0.001$; Cramér's $V = 0.31$), reflecting genuine site-specific disease tropism

rather than chance association (Figure 6). Notably, the mandible accounted for the majority of cystic (18/30, 60%) and benign (114/195, 58%) lesions, consistent with the predominance of odontogenic lesions such as ameloblastoma at this site, whereas the tongue and cheek showed a disproportionately high share of malignant disease (13/21 tongue cases, 62%, and 13/36 cheek cases, 36%, were malignant). Because several site $\times$ category cells contained small expected counts (minimum expected count 0.07), this chi-square result should be interpreted with appropriate caution and is presented as exploratory rather than confirmatory.

Concordance Between Clinical and Histologic Diagnostic Categories

Of the 448 cases with both a clinical and a histologic

diagnostic category recorded, the provisional clinical impression matched the final histologic category in 348 cases, giving an overall diagnostic concordance of 77.7%. Agreement beyond chance was substantial, as reflected by a Cohen's kappa coefficient of 0.686 (95% reference range for 'substantial agreement': κ 0.61–0.80). The association between clinical and histologic categories was highly significant ($\chi^2 = 773.20$, $df = 16$, $p < 0.001$; Cramér's $V = 0.66$, a large effect), confirming that the clinical impression was a strong predictor of the eventual histologic category (Figure 7).

As detailed in the confusion matrix (Figure 7), specific diagnostic pathways showed distinct patterns of agreement and misclassification. Of the 195 histologically confirmed benign lesions, 147 were correctly diagnosed clinically, while 10 were clinically suspected as malignant, 15 as reactive, 20 as cystic, and 3 as developmental. For the 114 histologically malignant lesions, 98 were accurately predicted, with 12 mistaken for benign and 4 for reactive lesions. Among the 93 reactive lesions, 74 were correctly categorized, whereas 6 were clinically thought to be benign, 4 malignant, 9 cystic, and 1 developmental. Of the 30 true cystic lesions, 22 were correctly identified, 5 were misdiagnosed as benign, and 3 as reactive. Finally, for the 16 developmental anomalies, 7 were accurately diagnosed clinically, with 8 misclassified as benign and 1 as reactive.

Diagnostic accuracy varied by category (Table 4). Clinical diagnosis performed best for malignant lesions, with a

sensitivity of 86.0% and a positive predictive value (PPV) of 87.5%, followed by benign lesions (sensitivity 75.4%, PPV 82.6%) and reactive lesions (sensitivity 79.6%, PPV 76.3%). Performance was weakest for cystic lesions, which had a high sensitivity (73.3%) but a low PPV of only 43.1% which reflects a frequent clinical over-diagnosis of cysts that proved, on histology, to be benign neoplasms or reactive lesions (20 and 9 cases, respectively; *Figure 7*). Developmental lesions showed the lowest sensitivity (43.8%), indicating that fewer than half of histologically confirmed developmental anomalies were correctly suspected clinically, although the PPV for this category remained moderately high (70.0%).

Temporal Trend in Case Volume

A trend analysis of the cases seen in different years showed that the annual number of histologically diagnosed lesions ranged from 2 cases in 2022 to 78 cases in 2021 (*Figure 8*). Case numbers were relatively stable between 2017 and 2021 (range 50–78 cases/year) before a marked decline in 2022–2023 (2 and 6 cases, respectively), most plausibly reflecting a period of reduced specimen submission/laboratory data capture as a result of unavailability of resident oral pathologist rather than a true reduction in disease incidence; case volume subsequently recovered to pre-decline levels in 2024–2025 (49 and 70 cases, respectively). Because of this gap, year-stratified comparisons should be interpreted with caution.

DISCUSSION

This study assessed the reliability of clinical diagnosis against histopathological diagnosis for oral and maxillofacial lesions at OAUTHC over nine years, in the specific context of a health system in which the pathology workforce is contracting under sustained emigration pressure. The headline finding is that clinical and histologic diagnostic categories agreed substantially, with an overall concordance of 77.7% and a Cohen's kappa of 0.686, indicating agreement well beyond chance. This confirms that, in this environment, an experienced clinician's categorical impression for benign, malignant, reactive, cystic, or developmental is, on the whole, a dependable triage tool. At the same time, exact clinical diagnoses matched the specific final histologic diagnosis in only 53.66% of cases, a considerably more modest figure that reaffirms histopathology as the irreplaceable gold standard for definitive, lesion-specific diagnosis: clinicians can usually tell what broad kind of disease they are dealing

with, but precise typing, on which detailed management often depends, still requires the microscope. This is in keeping with an Iranian study by Farzinna et al.⁷ who reported an acceptable accuracy of the clinician initial impression in the diagnosis of orofacial pathology, and also with Soyele et al.² from one of the study centers suggesting that diagnostic precision based solely on clinical evaluation has plateaued despite advances in clinical training.

Furthermore, the findings from our study are broadly comparable to findings from other settings. Hernandez-Rivera and Oti reported a concordance rate of 47.8% and 62.8%, respectively.^{3,8} These findings should be interpreted with caution because the definition of concordance differ substantially across these studies. While Oti³ simply reported a clinical-histopathological concordance, Hernandez-Rivera et al.⁸ reported absolute concordance of 47.8% using SNOMED-CT codes, increasing to 52.1% when synonyms were considered, and relative concordance of 76.2% when diagnoses were grouped by pathogenic clusters. However, the Cohen's kappa of 0.68 reported by Hernandez-Rivera et al.⁸ closely approximates the 0.686 observed for categorical agreement in the present study. A recent 20-year study from Thailand reported an overall clinicopathological concordance of 69.34% across 1,148 cases.⁹ Similarly, a 2025 study of oral soft-tissue lesions from Iran reported a concordance rate of 65.3%, with substantial variation according to lesion type and anatomical site.¹⁰ A large multicentre Brazilian study published in 2026 reported an overall agreement of 67.8%, although the kappa was lower (0.23), and agreement varied markedly across diagnostic groups.¹¹ Collectively, these studies indicate that clinical-histopathological agreement is highly dependent on case mix, diagnostic granularity, and lesion category, and that broad categorical agreement should not be interpreted as equivalent to exact diagnostic accuracy.

The higher categorical agreement in the present study may nevertheless have considerable practical value. A clinician's ability to recognize a lesion as potentially malignant or otherwise requiring urgent investigation can influence referral priority, biopsy planning, and interim management while definitive histology is awaited. However, categorical agreement should not be interpreted as evidence that histopathology can be safely omitted. Several lesions within the same broad category have markedly different biological behaviour, recurrence risks, treatment requirements, and prognoses. Thus, identifying a lesion as 'benign,' for example, does not establish whether

it is an ameloblastoma, odontogenic keratocyst, fibro-osseous lesion, or another entity. The same principle applies to malignant lesions, for which histological subtype, grade, depth of invasion, margin status, and other pathological parameters may have direct therapeutic implications.

The strongest area of clinical performance was in the recognition of malignancy, with a sensitivity of 86.0% and a positive predictive value (PPV) of 87.5%, which is the best of any diagnostic category in this series. The relatively high sensitivity may partly reflect the fact that oral malignancies, particularly squamous cell carcinoma, can exhibit recognizable clinical warning features such as non-healing ulceration, induration, fixation to underlying tissue, and regional lymphadenopathy, which are actively taught as red flags, and it plausibly explains why clinicians in this setting are so adept at flagging suspicious lesions even before histologic confirmation is available.^{12,13} In the present series, malignant lesions occurred at a higher median age than benign lesions (median age 55.0 years, roughly two decades older than the benign group) and were disproportionately represented among males, while the tongue and cheek were important sites of malignant disease. From a health-systems perspective, this is a reassuring finding as it is precisely where the clinical stakes of a missed or delayed diagnosis are highest that clinical judgement performed most reliably, supporting continued, confident use of clinical acumen for the rapid, resource-light triage of suspected oral malignancy while biopsy results are awaited. Nevertheless, the 14% of malignant lesions that were not clinically categorized as malignant should not be overlooked. Twelve malignant lesions were clinically considered benign and four were considered reactive. Such misclassification is clinically important because a malignant lesion initially regarded as benign or reactive may experience delay in biopsy, referral, staging, or definitive treatment.

Benign lesions constituted the largest single diagnostic group (43.5%), and mandibular ameloblastoma was the single most frequent diagnosis overall (17.5%), consistent with the well-documented predominance of ameloblastoma particularly in Nigeria.

^{1,14,15} A large Nigerian multicentre series similarly identified a peak incidence in the third decade of life and overwhelming mandibular predilection for odontogenic tumours, mirroring the age and site distribution observed in the current study. This consistency across independently sampled Nigerian cohorts strengthens confidence that the pattern reflects genuine population-level disease biology

rather than a single-centre artefact.¹ The comparatively solid 82.6% positive predictive value for a clinical impression of “benign” likely reflects the fact that many odontogenic tumours, ameloblastoma foremost among them, present with a fairly classical clinical and radiological picture of a slow-growing, painless, expansile swelling of the mandible, often with a multilocular radiolucency on imaging that experienced clinicians in a referral setting learn to recognise reliably even without histologic confirmation.¹

The most striking diagnostic weakness in the present study was the clinical classification of cystic lesions. Although sensitivity was 73.3%, the PPV was only 43.1%, indicating substantial clinical overdiagnosis of cystic lesions as many clinically diagnosed cysts proved on histology to be benign neoplasms or reactive lesions instead. This is not surprising given that cystic and early neoplastic jaw lesions frequently share an overlapping clinical and radiographic appearance. A well-circumscribed, expansile, sometimes multilocular radiolucency can herald a simple dentigerous cyst, an odontogenic keratocyst, or an early ameloblastoma with near-equal plausibility on clinical grounds alone.^{16,17} The diagnostic uncertainty is particularly relevant where treatment decisions differ substantially. A lesion assumed to be a simple cyst may receive conservative treatment when the actual diagnosis requires a different surgical approach or closer follow-up

Developmental lesions showed the inverse problem: a sensitivity of only 43.8%, meaning fewer than half of histologically confirmed developmental lesions were suspected before biopsy, likely reflecting their frequently subtle, asymptomatic, or incidental presentation and their tendency to mimic other lesion types clinically. The clinical danger in both scenarios is real. A presumed simple cyst that is actually a locally aggressive neoplasm risks under-treatment if managed by enucleation alone rather than the wider margins its true nature would demand, while a missed developmental lesion risks either unnecessary intervention or delayed appropriate care. These categories, more than any other, illustrate why clinical impression cannot substitute for histologic confirmation before definitive surgical management is finalised.

The demographic findings provide additional context for the observed diagnostic patterns. The cohort demonstrated a slight female predominance, while malignant lesions were more common among males. Malignant lesions also occurred at a considerably older median age than benign, cystic, reactive, and developmental lesions. The significant association between age and diagnostic category is

clinically plausible and may assist in risk stratification, although age alone is insufficient for diagnosis. Similarly, the significant association between anatomic site and diagnostic category reflects the biological predilection of particular lesions for particular sites. The strong mandibular representation of benign and cystic lesions is compatible with the predominance of odontogenic pathology, whereas the higher proportion of malignant lesions involving the tongue and cheek emphasizes the importance of careful examination of these sites.¹⁸

The findings should also be interpreted in relation to the Nigerian health-system context. The ability of clinicians to provide an initial diagnostic category becomes particularly important when access to specialist pathology is limited. However, this should be viewed as a measure of the resilience of frontline clinical assessment rather than as a substitute for pathology. Nigeria in particular is facing a health workforce crisis. Nigeria's doctor-to-patient ratio has recently been reported at approximately one doctor to 9,083 patients, with about 16,000 Nigerian-trained doctors having emigrated. The pathology workforce is even more severely affected, with an estimated ratio of only one pathologist per two million people nationally.⁶ The danger is that prolonged delays in histopathological reporting may gradually shift clinical practice from 'clinical diagnosis followed by confirmation' toward 'clinical diagnosis as a substitute for confirmation'. This may also force surgeons to either postpone critical interventions or proceed blindly based on clinical impression alone, increasing the risk of over- or under-treatment. Furthermore, the exodus of senior academics heavily compromises the training and mentorship of junior colleagues, threatening the future pipeline of oral pathologists.

The marked reduction in biopsy case volume during 2022–2023 provides an important illustration of this vulnerability. The study recorded only two cases in 2022 and six in 2023, followed by recovery to 49 and 70 cases in 2024 and 2025, respectively. The pattern is more consistent with disruption in specimen submission and specialist pathologist service availability than with a true abrupt reduction in the incidence of oral and maxillofacial disease. However, because the study was retrospective and did not directly measure staffing levels, referral volumes, or service turnaround times for every year, this interpretation should remain cautious. The temporal pattern nevertheless illustrates how dependent diagnostic surveillance and institutional pathology databases are on the availability of specialist personnel.

The implications extend beyond individual diagnostic accuracy to health-system capacity. A shortage of oral and maxillofacial pathologists can increase workload on remaining specialists, delay reporting, reduce opportunities for subspecialist consultation, and weaken training and mentorship for junior practitioners. In a setting where specialist workforce attrition is occurring alongside increasing clinical demand, improving diagnostic systems should therefore involve both human-resource retention and technological support. Telepathology represents one potentially useful strategy. Orah and Rotimi⁶ highlighted the critical shortage of pathology services in Africa and described telepathology as a means of extending specialist diagnostic expertise through digital slide transmission for consultation, education, and quality assurance. For institutions in resource-limited settings, appropriately implemented telepathology could facilitate remote second opinions, subspecialty consultation, and continuity of diagnostic services during periods of specialist shortage. Importantly, telepathology should be considered an adjunct to, rather than a replacement for, investment in local pathology infrastructure and workforce development, appropriately implemented telepathology could facilitate remote second opinions, subspecialty consultation, and continuity of diagnostic services during periods of specialist shortage. Importantly, telepathology should be considered an adjunct to, rather than a replacement for investment in local pathology infrastructure and workforce development.

The study also has implications for clinical training and clinicopathological communication. The persistence of exact diagnostic discordance despite relatively strong categorical agreement suggests that continuing professional development should emphasize lesions that commonly mimic one another clinically and radiographically. Particular attention should be directed toward lesions clinically labelled as cystic, developmental lesions, and lesions with atypical features. Standardized biopsy request forms containing lesion duration, anatomical site, size, symptoms, radiographic findings, provisional diagnosis, differential diagnoses, and relevant clinical history may also improve communication between clinicians and pathologists. A 2024 study from Nepal found that the completeness of clinical information on biopsy forms was significantly associated with clinicopathological concordance and with histopathology reporting time.¹⁹ Strengthening communication between clinicians and pathologists is therefore likely to improve

diagnostic quality without requiring major technological investment.

Recent evidence also suggests that provider-related factors may influence diagnostic agreement. In a five-year retrospective study from Saudi Arabia, Sindi and Aljohani²⁰ reported an overall clinical-histopathological concordance of 44.1% and found that concordant diagnoses were associated with clinician rank and specialty, although years of experience were not significantly associated with agreement. The present study could not assess these factors because clinician seniority, specialty, and diagnostic experience were not consistently recorded. This limitation is important because the observed diagnostic performance should not be generalized to all clinicians or assumed to represent an intrinsic accuracy level independent of training and practice setting.⁶

This study has its limitations that warrant consideration. It is a retrospective, single-centre analysis, and although OAUTHC is a major tertiary referral centre serving a wide catchment area, its findings may be subject to selection bias, as the cohort only includes patients who successfully navigated the referral system to access tertiary care, potentially omitting early-stage or community-level lesions. Additionally, there is a notable temporal gap in the data, with a marked dip in case volume observed in 2022–2023. This reduction reflects a period of reduced specimen submission, laboratory data capture and near complete collapse of the oral pathology biopsy services due to critical lack of available resident oral pathologist. Consequently, year-stratified comparisons across this interval should be interpreted with caution. Another critical limitation is the lack of longitudinal follow-up and treatment outcome data; because we evaluated diagnostic concordance at the point of initial biopsy, the study cannot quantify the exact clinical harm, surgical morbidity, or survival impact resulting from cases that were misclassified clinically. Crucially, there was a lack of sampling of the experience level of the clinicians that submitted the cases; the seniority, specialty training, and specific diagnostic expertise of the referring clinicians were not captured in the biopsy request forms, which is a variable that plausibly has a significant influence on the baseline clinical diagnostic accuracy. Finally, as with any retrospective chart-based study, misclassification arising from incomplete documentation cannot be entirely excluded.

Despite these limitations, the study has important strengths. It represents a relatively large institutional series of 451 cases covering nine years and evaluates diagnostic

agreement at both the exact and categorical levels. The use of Cohen's kappa provides an estimate of agreement beyond chance, while category-specific sensitivity and PPV demonstrate that diagnostic performance is not uniform across lesion types. The inclusion of the recent period of marked pathology-service disruption also provides a useful health-system perspective that is rarely incorporated into clinicopathological concordance studies.

Overall, the findings indicate that clinical assessment remains a valuable first-line diagnostic and triage tool for oral and maxillofacial lesions, particularly for identifying lesions that are broadly likely to be malignant. However, the substantially lower exact diagnostic concordance demonstrates that clinical judgement has important limitations when precise histopathological classification is required. The low PPV for clinically diagnosed cystic lesions and low sensitivity for developmental lesions further illustrate categories in which reliance on clinical impression alone may be unsafe. Histopathological examination should therefore remain an essential component of definitive diagnosis, particularly before irreversible treatment is undertaken.

In the context of Nigeria's ongoing health workforce constraints, improving diagnostic reliability requires a dual strategy: strengthening clinical diagnostic skills while simultaneously protecting access to specialist histopathology. Retention and training of oral and general pathologists, improved clinicopathological communication, routine diagnostic audits, and appropriately implemented telepathology networks may collectively strengthen diagnostic resilience. The central implication of this study is therefore not that clinicians should assume greater responsibility for definitive diagnosis in the absence of pathologists, but that clinical expertise should be used effectively for early recognition and triage while health systems invest in maintaining the histopathological services required for diagnostic confirmation and patient safety.

REFERENCES

1. Okoh DS, Akinshipo AO, Butali A, Omitola OG, Sigbeku OF, Soyele OO, et al. Descriptive Epidemiology of Odontogenic Tumors in Nigeria: An African Oral Pathology Research Consortium Multicenter Study. *Niger J Clin Pract.* 2020; 23(12): 1695–1701.
2. Soyele OO, Aborisade A, Adesina OM, Olatunji A, Adedigba M, Ladeji AM, et al. Concordance between clinical and histopathologic diagnosis and an audit of oral histopathology service at a Nigerian tertiary hospital. *Pan*

Afr Med J. 2019; 34: 100.

3. Oti AA, Donkor P, Obiri-Yeboah S, Yelibora M. Concordance between Clinical and Histopathological Diagnoses at Komfo Anokye Teaching Hospital Oral and Maxillofacial Unit. *Surg Sci.* 2013; 4(3): 210–212.
4. One doctor attends to 9,083 Nigerians, NARD laments. Healthwise [Internet]. Cited 2026 Jul 19. Available from: <https://healthwise.punchng.com/one-doctor-attends-to-9083-nigerians-nard-laments/>
5. Olatunji G, Aderinto N, Kokori E, Abraham IC. Nigeria's new policy: solution for the health-care workforce crisis? *Lancet.* 2024; 404(10460): 1303–1304.
6. Orah N, Rotimi O. Telepathology in Low Resource African Settings. *Front Public Health.* 2019; 7: 264.
7. Farzinnia G, Sasannia M, Torabi S, Rezazadeh F, Ranjbaran A, Azad A. Correlation between Clinical and Histopathological Diagnoses in Oral Cavity Lesions: A 12-Year Retrospective Study. *Int J Dent.* 2022; 2022: 1016495.
8. Hernandez-Rivera P, Mirimoghaddam M, Lai H, Parashar P. Diagnostic Concordance Between Clinical and Histopathologic Diagnoses of Oral Mucosal Lesions: A Retrospective Study. *Cureus.* 2025; 17(11): e98026.
9. Teerawong C, Chulaksanadecha T, Anansila T, Krasaetanont P, Intapa C, Chompunud Na Ayudhya C. Concordance Between Clinical and Histopathological Diagnoses of Oral and Maxillofacial Lesions in Thailand: A 20-Year Retrospective Study. *J Clin Exp Dent.* 2025; 17(8): e834–e839.
10. Shamloo N, Afzali Z, Rezaeianjam M, Khanlari Goodarzi M. Evaluating the Harmony Between Clinical Observations and Pathological Findings in Oral Soft Tissue Lesions: A Two-Decade Retrospective Study of Diagnostic Consistency. *J Maxillofac Oral Surg.* 2025; 24(1): 24–29.
11. Faria CAB, da Silva WR, Cavalcanti JF da S, de Sousa SS, Arantes DAC, Colares DF, et al. Agreement between clinical and histopathological diagnoses of oral-maxillofacial lesions: a multicenter study. *Oral Surg Oral Med Oral Pathol Oral Radiol.* 2026; 141(6): 832–840.
12. Khan S, Alamgir MM, Bukhari U, Farrukh MS, Qurat-Ul-Ain, Shafiq A. Clinico-pathological features of oral squamous cell carcinoma and oral potentially malignant disorders: A comparative study from a tertiary care hospital of Karachi. *J Pak Med Assoc.* 2025; 75(3): 443–446.
13. Sufiawati I, Piliang A, Yusuf AA, Agustina H, Azhar Y, Idris A, et al. Clinicopathological Characteristics of Oral Squamous Cell Carcinoma at the Central Referral and Teaching Hospital in West Java, Indonesia. *Cancer Manag Res.* 2024; 16: 1053–1062.
14. Bassey GO, Osunde OD, Anyanechi CE. Maxillofacial tumors and tumor-like lesions in a Nigerian teaching hospital: an eleven year retrospective analysis. *Afr Health Sci.* 2014; 14(1): 56–63.
15. Aregbesola B, Soyele O, Effiom O, Gbotolorun O, Taiwo O, Amole I. Odontogenic tumours in Nigeria: A multicentre study of 582 cases and review of the literature. *Med Oral Patol Oral Cir Bucal.* 2018; 23(6): e761–e766.
16. Wang LL, Olmo H. Odontogenic Cysts. In: *StatPearls* [Internet]. Treasure Island (FL): StatPearls Publishing; 2022.
17. Müller S. Developmental Odontogenic Lesions Associated with the Crown of an Impacted Tooth: A Guide to the Distinct Histologic Features Required for Classification. *Head Neck Pathol.* 2021; 15(1): 107–112.
18. Ajayi OF, Ladeinde AL, Adeyemo WL, Ogunlewe MO. Odontogenic tumors in Nigerian children and adolescents—a retrospective study of 92 cases. *World J Surg Oncol.* 2004; 2(1): 39.
19. Keshwar S, Jain N, Raut T, Singh V, Shrestha A. A Retrospective Analysis of Concordance Between Clinical and Histopathologic Diagnoses and Completeness of Oral Biopsy Forms at a Tertiary Dental Hospital in Eastern Nepal. *Int J Dent.* 2024; 2024: 2528353.
20. Sindi A, Aljohani K. Agreement Between Clinical and Histopathological Diagnoses of Oral and Maxillofacial Lesions and Influencing Factors: A Five-Year Retrospective Study. *Clin Cosmet Investig Dent.* 2024; 16: 273–282.