Pattern of Oral and Maxillofacial Biopsy Results in a Teaching Hospital; An 11-year Retrospective Study

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Key words: ..

ABSTRACT

Background

Biopsy remains a cornerstone in diagnostic pathology, enabling definitive diagnosis, guiding treatment planning, and informing tumor classification. This study evaluated the distribution of histopathologically diagnosed lesions in the oral and maxillofacial region over an 11-year period.

Methods:

A retrospective review was conducted at the Department of Oral and Maxillofacial Surgery, Oral Pathology, and Molecular Biology, Lagos University Teaching Hospital, Nigeria. Biopsy records from January 2013 to December 2023 were analyzed. Ethical approval was obtained from the Health Research and Ethics Committee (HREC Approval No. ADM/DSCST/HREC/APP/5714).

Results:

A total of 756 biopsies were reviewed. Females accounted for 52.2% of cases. The highest frequency of tumors occurred in the fourth decade of life (20.8%). Odontogenic tumors were the most prevalent lesion group, with ameloblastoma being the most common histologic diagnosis, predominantly involving the mandible.

Conclusion

A broad spectrum of lesions affects the maxillofacial region. Biopsy remains indispensable for definitive diagnosis. Knowledge of lesion distribution patterns is vital for clinical decision-making among oral surgeons and pathologists.

INTRODUCTION

The oral and maxillofacial region is susceptible to a diverse range of lesions, spanning inflammatory, cystic, and neoplastic processes. These lesions vary in prevalence based on age, sex, and geographical region.[1] Accurate diagnosis is critical for appropriate management, and biopsy remains the gold standard.

The term "biopsy" is derived from the Greek words bios (life) and opsis (vision), reflecting its role in visualizing disease at the cellular level.[2–4] Biopsies are integral to surgical practice, providing tissue samples for histopathological evaluation which in turn guides diagnosis, treatment planning, and prognosis assessment.[2–5] They also serve as tools for monitoring disease progression or recurrence and carry significant medicolegal relevance. [4]

Indications for biopsy

- Lesions persisting beyond two weeks without an apparent cause. [3–6]
- Inflammatory lesions unresponsive to conventional therapy.
- Suspected premalignant or malignant lesions.
- Lesions associated with sensory disturbances such as pain, paresthesia, or anesthesia.
- Radiolucent or radiopaque osseous lesions. [3–6]

Contraindications:

- Poor general health status or systemic instability.
- Acute pyogenic j infections at the biopsy site.
- Normal anatomical structures or inflammatory lesions that resolve with local treatment.[3–7]

Classification of Biopsies

- Biopsies are classified based on the following criteria:
- Technique: Incisional, excisional, punch, or fine-needle aspiration. [8–9]
- Depth of lesion: Direct (superficial) or indirect (deep). [4]
- Purpose: Diagnostic or experimental. [4,10]

Oral and Maxillofacial Lesions

The World Health Organization (WHO) classifies oral and maxillofacial lesions according to their biological behavior—benign or malignant—with major

classification updates in 1992, 2005, 2017, and 2022.[11] These lesions encompass odontogenic cysts and tumors, fibro-osseous lesions, bone pathologies, and soft tissue neoplasms.[1] Several studies have highlighted regional differences in lesion prevalence. In some reports, odontogenic cysts are the most frequently encountered.[1] Others emphasize the predominance of inflammatory or reactive lesions.[12] Squamous cell carcinoma remains the most commonly diagnosed oral malignancy globally.[1] Despite the extensive body of literature, a lack of consensus persists regarding lesion distribution in different populations. This study aims to evaluate the histopathological patterns of oral and maxillofacial lesions diagnosed over an 11-year period at a tertiary institution in southwestern Nigeria.

METHODS

Ethics: Ethical approval for the study was obtained from the Health Research and Ethics Committee of LUTH (Approval No. ADM/DSCST/HREC/APP/5714). The study was conducted and reported in accordance with the Strengthening the Reporting of Observational Studies in Epidemiology (STROBE) guidelines and in adherence to the Declaration of Helsinki.

Design:

A retrospective, hospital-based study was conducted at the Department of Oral and Maxillofacial Surgery, Oral Pathology, and Molecular Biology, Lagos University Teaching Hospital (LUTH), Nigeria. Biopsy records from January 2013 to December 2023 were retrieved and reviewed.

Inclusion Criteria: All cases with complete demographic and histopathological data were included.

Exclusion Criteria: Cases with incomplete data or repeated recurrences with identical histopathologic diagnoses were excluded.

Data Collection:

The following variables were extracted: patient age, sex, nature of lesion (benign or malignant), anatomical site, and histologic diagnosis based on WHO classification.

Statistical Analysis:

Data were entered and analyzed using IBM SPSS Statistics version 25 (IBM Corp., Armonk, NY, USA). Descriptive statistics were presented as frequencies and percentages. Inferential analysis was performed using Chi-square or Fisher's exact test as appropriate. A p-value less than 0.05 was considered statistically significant.

RESULTS

A total of 756 biopsy results met the inclusion criteria and were recorded in this study (Figure 1).

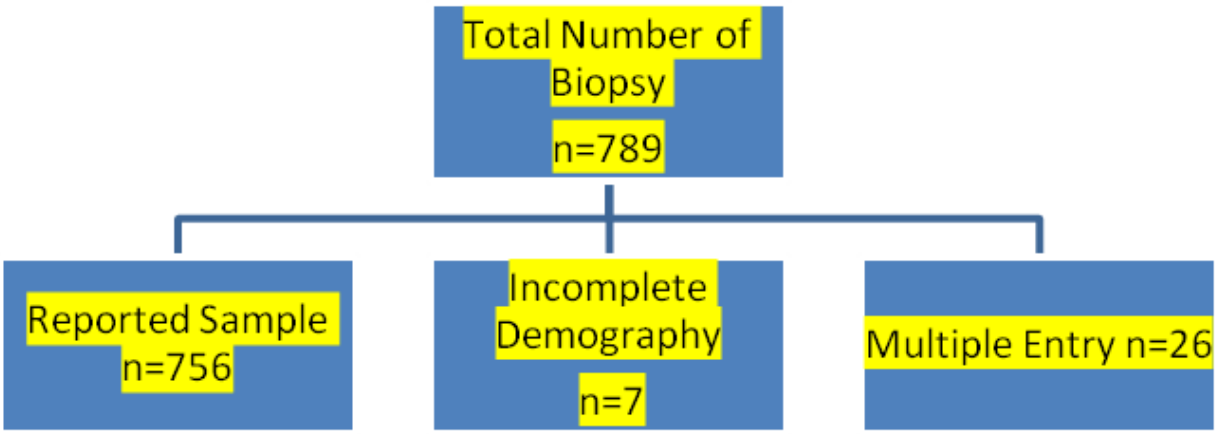

Figure 1: STROBE Flowchart of included samples

Demographics

The ages of patients ranged from 10 days to 97 years, with a mean age of 36.75 ± 18.59 years. Females accounted for a slight majority of cases (52.2%), yielding a male-to-female ratio of 1:1.1 (Table 1).

Age and Sex Distribution of Tumors

Tumors occurred most frequently in the third and fourth decades of life. Benign lesions were more prevalent than malignant ones, with an overall benign-to-malignant ratio of 1.8:1. However, this ratio declined with increasing age, as malignant lesions became significantly more common among older patients ($p = 0.001$). Additionally, the proportion of malignant lesions was significantly higher in males than in females ($p = 0.009$) (Table 1).

Table 1: Social Demographic distribution of lesions in the oral and maxillofacial region

Variable	Frequency	Percentage		X^2	P-value
Age group					
0-9	54	7.1			
10-19	94	12.4			
20-29	151	20.0			
30-39	157	20.8			
40-49	104	13.8			
50-59	94	12.4			
60-69	62	8.2			
70-79	28	3.7			
80-89	11	1.5			
90-99	1	0.1			
Total	756	100			
Sex					
Male	361	47.8			
Female	395	52.2			
		Nature of Tumor			
Age group	Benign	Malignant	Inflammatory/Reactive		
0-9	40	10	4		
10-19	72	15	7		
20-29	121	19	11	*1.000	0.001
30-39	106	48	3		
40-49	60	38	6		
50-59	43	47	4		
60-69	19	42	1		
70-79	3	24	1		
80-89	0	11	0		
90-99	0	1	0		
Sex					
Male	211	137	13	1.000	0.009
Female	253	118	24		

X^2= Chi square test *= Fisher's exact test

Site Predilection and Tumor Patterns

The mandible was the most frequently affected site, accounting for 50.4% of all lesions. Approximately one-third of the cases were located in the posterior mandible. Overall, more lesions were found in the mandible and maxilla than in any other region of the face. Bony lesions (65.9%) were more prevalent than soft tissue lesions (Table 2).

A statistically significant predilection for mandibular involvement was observed (p = 0.001). Benign tumors predominated over malignant tumors in both the maxilla and mandible. Conversely, malignant lesions were more frequently encountered in the minor salivary glands compared to benign lesions. The observed differences in lesion pattern and anatomical distribution were statistically significant (p = 0.001) (Table 3).

Table 2: Prevalence of maxillofacial tumors

Variable	Frequency	Percentage
Site/Landmark		
Face/Neck	81	10.7
Upper jaw	246	32.5
Lower jaw	381	50.4
Lip	19	2.5
Tongue	19	2.5
Others	10	1.3
Location		
Anterior maxilla	107	14.2
Posterior maxilla	90	11.9
Anterior posterior maxilla	17	2.3
Anterior mandible	87	11.5
Posterior mandible	246	32.5
Anterior posterior mandible	44	5.8
Salivary gland	96	12.7
Tongue	19	2.5
Lip	19	2.5
Others	31	4.1
Tissue type		
Soft tissue	258	34.1
Hard tissue	498	65.9
Anatomical structures involved		
Maxilla	214	28.3
Mandible	377	49.9
Major salivary gland	55	7.3
Minor salivary gland	41	5.4
Tongue	19	2.5
Lip	19	2.5
Others	31	4.1
Nature of tumor		
Benign	464	61.4
Malignant	255	33.7
Inflammatory/Reactive	37	4.9

Table 3: Site distribution and pattern of maxillofacial lesions

Variable	Nature of tumor				
Site	Benign	Malignant	Inflammatory/Reactive	X^2	P
Maxilla	132	95	19		
mandible	266	101	14	*0.083	0.001
Tongue	7	12	0		
Lip	15	4	2		
Others	44	43	2		
Location					
Anterior maxilla	71	23	13		
Posterior maxilla	38	45	7		
Anterior posterior maxilla	10	7	0		
Anterior mandible	61	18	8		
Posterior mandible	168	72	6	*0.250	0.001
Anterior posterior mandible	37	7	0		
Salivary gland	41	55	0		
Minor	12	29	0		
Major	29	26	0		
Tongue	7	12	0		
Lip	15	4	2		
Others	16	12	1		

X^2= Chi square test *= Fisher's exact test

Tumor Types

Odontogenic tumors were the most frequently recorded lesions. Ameloblastoma emerged as the most common odontogenic tumor and the most prevalent tumor overall in the maxillofacial region, with a predilection for the posterior mandible. Among salivary gland tumors, pleomorphic adenoma was the most common benign lesion, while adenoid cystic carcinoma was the most frequent malignant salivary gland tumor identified in this study (Table 4).

Table 4: Pattern of maxillofacial tumors in different locations

Location	Specific tumor									
	AA	OT	FO	Cyst	Car	Sar	Haem	Others	X^2	P
Anterior maxilla	10	12	23	18	19	3	3	19		
Posterior maxilla	7	8	18	5	34	8	0	10		
Anterior posterior maxilla	3	0	5	3	5	0	0	1		
Anterior mandible	29	6	19	9	6	8	0	10		
Posterior mandible	114	15	22	14	48	22	1	10	*1.000	0.001
Anterior posterior mandible	25	3	7	1	5	3	0	0		
Others								69		

Salivary gland	Ranula	Pleomorphic adenoma	Adenoid-cystic Car	Mucoepidermoid Car	SCC	Others
	13	5	31	24	14	9

Location	General name of tumor											
	Cyst	FO	OT	Car	Sar	Vascular	Reactive	SG	Lymphoma	Others	X^2	p
Anterior maxilla	18	23	22	19	3	10	2	-	-	10		
Posterior maxilla	5	18	15	34	8	5	2	-	-	3		
Anterior posterior maxilla	3	5	3	5	0	0	0	-	-	1		
Anterior mandible	9	19	35	6	8	7	1	-	-	2		
Posterior mandible	14	22	129	48	22	7	2	-	-	2	*1.000	0.001
Anterior posterior mandible	1	7	28	5	3	0	0	-	-	0		
Others locations								96	4	65		

X^2 = chi square test * = Fisher's exact test . AA=Ameloblastoma, OT=Odontogenic tumor, FO=Fibro-osseous Lesion, Car=Carcinoma, Sar=Sarcoma, Haem=Haemangioma, SCC=Squamous Cell Carcinoma, SG=Salivary Gland Lesion

DISCUSSION

Findings:

Lesions originating from both soft and hard tissues affect the oral and maxillofacial region. The prevalence and pattern of these lesions vary with age, sex as well as location. This study reported the pattern and distribution of these lesions in the oral and maxillofacial region and 756 requests were recorded in this study. This was higher than a similar study conducted both in Nigeria where 167 requests were recorded and that conducted in Gambia where 158 requests were recorded.[13] On the contrary, findings in our study were lower than that reported in Saudi Arabia and Brazil where 3,150 and 13,522 requests were made respectively.[14]

The age of occurrence of the various tumors was recorded. The mean age of subjects in this study was 36.75±18.59. Tekkesin et al. reported similar mean age in their study.[11] Vhriterhire and Ogbeifun also found a comparable age in their study conducted in Makurdi, North-central, Nigeria.[13] The peak age of maxillofacial lesions was the fourth decade of life in this study. This is in agreement with other studies that recorded peak incidence of maxillofacial lesions in this decade.[5,15] Adebayo et al. in their study conducted in Nigeria also reported the third and fourth decades as the peak age for the occurrence of maxillofacial tumors.[16] Kalantari and Samani in their study conducted in southeast Iran also reported the fourth decade as the peak incidence.[17]

Malignant lesions were predominant in the fourth decade in this study; this differs from other studies conducted in Nigeria, which reported malignant lesions being predominant in the fifth and sixth decades of life.[13] The greater prevalence of tumors in the third and fourth decade may be related to the active development of diverse pathologic lesions of embryonic tissues present in the jaw during this period of life.[5] However, the reasons for malignant lesions occurring earlier in our study than previous Nigerian studies are unclear and warrant further research.

Sex predilection of tumors also showed a varied pattern. The male-to-female ratio in this study is approximately 1:1.1. This is similar to a study conducted by Gbolahan et al. who reported a male-to-female ratio of 1:1.1[5] Vhriterhire and Ogbeifun also reported a male-to-female ratio of 1:1.6.[13] Contrary to this study, other studies have reported more male predominance.[16] The reason for more female predominance observed in this study may be due to better health-seeking behaviour amongst the female sex.[18] Although there were more females than males in this study, when the sexes were compared in terms of the nature of the tumor, the prevalence of malignant lesions was higher in males than females. Similarly, Odukoya, in his analysis of odontogenic tumors in the maxillofacial region, reported a slightly higher incidence of malignant odontogenic tumors among males than females.[15] Other studies have also reported malignant lesions to be more common in males.[5,13] This finding may be due to higher involvement of males in risky social habits like cigarette smoking and consumption of alcohol, both of which are strongly linked to the development of cancers.[5,19] Overall, benign tumors were commoner than malignant tumors in this study. This is similar to a study conducted in Nigeria[5] and other parts of the world,[20] where benign tumors commonly affect the maxillofacial region.

We also noted the site predilection of tumors. The mandible is more commonly involved in maxillofacial tumors in this study than any other part of the head and neck region. When compared to other parts of the mandible and other parts of the maxillofacial region, the posterior mandible was the most commonly affected by tumors. This is in agreement with other studies conducted in China and Turkey where more tumor involvement was reported in the mandible.[21,22] Hosgor et al. reported that the posterior mandible was more commonly affected.[1] Contrary to this study, it was reported that the maxilla and mandibular gingivae were more commonly involved.[14] There was more tumor involvement in the major salivary gland than the minor salivary gland in this study; however, malignant lesions affect the minor salivary gland more than the major salivary gland. In addition, the most frequent benign tumor is pleomorphic adenoma while the most frequent malignant tumor is adenoid-cystic carcinoma. A similar study conducted in Nigeria reported that salivary glands were more affected by malignant tumors.[5]

With respect to the types of tumors recorded, ameloblastoma remains the commonest. The maxillofacial region is affected by a diverse group of lesions, of which odontogenic tumors quite often affect the jawbones. In this study, odontogenic tumors were the most frequently encountered benign tumors affecting the maxillofacial region. Ameloblastoma was the most frequent odontogenic tumor seen in the current study. When ameloblastoma thus affects the maxillofacial region, the posterior mandible was the most frequently affected location. Other studies have reported odontogenic tumors as the most frequent benign tumor. Odukoya in his study conducted in Nigeria reported ameloblastoma as the most common odontogenic tumor and the posterior mandible was the most frequently affected location.[15] On the contrary, Akinosi et al. reported the anterior mandible as the most commonly affected location.[23] Other studies

conducted in Nigeria have equally reported ameloblastoma as the most common odontogenic tumor.[16,24] Adebayo et al. reported the most favored location of ameloblastoma as the anterior-posterior mandible.[16]

It has been reported that in the majority of the cases, odontogenic tumors were the most common benign tumor with ameloblastoma accounting for the majority of the cases among Africans and Asians while odontoma among caucasians.[5] Contrary to this study, Hosgor et al. reported odontogenic cysts as the most common tumor.[1] Tekkesin et al. in their study among the Turkish population reported radicular cysts as the most frequently encountered tumor.[11] Malignant versus benign tumors were recorded, with malignant tumors accounting for 33.7% of tumors affecting the maxillofacial region, and carcinomas were the most frequently encountered malignant tumors. Similarly, other studies conducted in other parts of the world and Nigeria have reported squamous cell carcinoma as the most common malignant tumor.[1,5] Contrary to this study, Leigh et al. in their study conducted in Gambia reported squamous cell carcinoma as the most frequently overall diagnosed lesion with odontogenic tumors making up a small fraction (3.8%) of the total requests.[14] The reason for their findings may be due to the relatively small number of Oral Pathology Specialists.[14] Knowledge of the pattern as well as the distribution of maxillofacial lesions not only helps in clinical practice but also serves as epidemiological data in oral and maxillofacial surgery as well as oral pathology.

Implications:

Malignant lesions were predominant in the fourth decade, being earlier than previous Nigerian studies. This warrants greater vigilance and increased health awareness campaigns to encourage early detection and treatment.

Trade-offs (Limitations):

This study was a single-centre retrospective study with a small sample size; hence, the results may not be fully representative of the entire Nigerian population.

Take-home (Conclusion):

The maxillofacial region is comprised mainly of the maxilla and mandible in terms of bony mass, and these structures are widely affected by varieties of tumors. The exact tumor affecting each unit can be specifically diagnosed through a biopsy, which eventually enables the surgeon and pathologist to determine the pattern and prevalence of tumors with respect to age, sex, anatomical and geographic locations.

Expectations for Future Research:

Is there really an earlier incidence of malignant tumors as seen in our study? This warrants urgent further studies!

Recommendation:

There is a need for large multi-centre studies across the six geopolitical zones in Nigeria.

Conflicts of interest:

The authors declare no conflicts of interest in this study

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Pre-designed Form: Pattern of Oral and Maxillofacial Biopsy Results in a Teaching Hospital; An 11-year Retrospective Study

SECTION 1

DEMOGRAPHIC DISTRIBUTION

1. AGE: ……
2. SEX: a) Male b) Female

SECTION 2

3. Side of tumor (a) right (b) left
4. Site of tumor (a) maxilla (b) mandible (c) tongue (d) lip (e) others
5. Location (a) anterior maxilla (b) posterior maxilla (c) anterior mandible (d) posterior mandible (e) anterior posterior maxilla (f) anterior posterior mandible (g) others
6. Type of tissue (a) bony (b) soft tissue
7. Organ involved
8. Specific name of tumor
9. General name of tumor
10. Type of tumor (a) benign (b) malignant (c) inflammatory/reactive (d) others