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Frequency and Radiographic Patterns of Benign Pathological Lesions of the Oral and Maxillofacial Region in Patients Reporting to Khyber College of Dentistry, Peshawar

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Abstract: **Background:** Oral and maxillofacial benign pathologic lesions form a heterogeneous category of disease that present with different signs and symptoms both clinically and radiologically. Although these lesions may not be considered malignant, their failure to be detected early may lead to serious problems. The frequency and radiologic features of such lesions in Pakistani patients are not yet fully known. **Objective:** To determine the frequency and radiographic patterns of benign pathological lesions of the oral and maxillofacial region in patients presenting to a tertiary care dental hospital in Peshawar. **Methods:** This cross-sectional study was carried out at the Khyber College of Dentistry during Feb 1, 2024, to July 1, 2024, after obtaining ethical clearance (Reference: 342/ERB/KCD). A total of 180 patients with biopsy-confirmed benign tumors were selected through non-probability consecutive sampling technique. The data were gathered on the basis of a structured questionnaire consisting of demographic profile, lesion characteristics, anatomical location, and radiographic features such as orthopantomogram and paranasal sinus radiographs or computed tomography wherever required. SPSS 22 was used for statistical analysis. Descriptive and inferential statistics were generated using the Chi-square test and independent sample t-test, respectively, with $p \leq 0.05$ being statistically significant. **Results:** Mean age of subjects was 37.34 ± 19.48 years with a preponderance of males (56.7%). Most prevalent lesions were odontogenic cysts (32.8%), other lesions (27.2%), reactive lesions (21.1%), and benign tumors (18.9%). Mandible was the most commonly affected anatomical region (70.0%). Radiologically, majority of the lesions were radiolucent (60.0%), unilocular (66.7%), and had well-defined borders (77.8%). Root resorption and cortical expansion occurred in 26.1% and 35.0% of the lesions, respectively. Incidence of involvement of inferior alveolar canal and maxillary sinus was 21.1% and 15.0%, respectively. There was no statistically significant correlation between the type of lesion and gender ($p = 0.283$) or anatomic region ($p = 0.430$). **Conclusion:** The odontogenic cysts are the most common types of benign lesions that occur in the oral cavity and jaw. They predominantly affect the mandible and have distinct radiographic appearances. Radiographic investigations have been shown to be essential in the diagnosis and treatment of the conditions.

Keywords: Mouth Diseases; Maxillofacial Abnormalities; Odontogenic Cysts; Jaw Diseases; Radiography; Diagnostic Imaging; Tomography, X-Ray Computed; Cross-Sectional Studies; Epidemiology; Prevalence

INTRODUCTION

Oral and maxillofacial pathological lesions are a variety of medical conditions affecting the hard and soft tissues of the face and neck. The pathological lesions involve developmental, inflammatory diseases, and benign and malignant tumors caused by various reasons and associated with the complex structure of the mouth. Being constantly exposed to mechanical, chemical, and biological irritations, the mouth is prone to the development of numerous diseases. Moreover, some lesions demonstrate similar symptoms and radiographic manifestations complicating the diagnostic process for the clinicians. Lesions such as cysts, reactive lesions, and benign neoplasms can be divided into odontogenic and non-odontogenic categories and do not metastasize. Despite being non-aggressive in nature, these pathological conditions might lead to severe clinical complications in case of untimely diagnosis including bone destruction, displacement of teeth, face asymmetry, and other health issues associated with functions performed by the maxillofacial region. Different types of lesions exhibit dissimilar biological behavior in terms of their histology and localization.
There are numerous variations in the epidemiology of benign oral and maxillofacial lesions among various geographical regions. For instance, according to previous research, there exist discrepancies between the prevalence and types of lesion subtypes depending on several factors including genetics, living and working environment, health care availability, and clinical practices. Reactive lesions and inflammatory conditions were found to be the most prevalent; however, certain types of odontogenic tumors including ameloblastomas have a predisposition to age groups and certain locations like the mandible. Nevertheless, these differences were not observed globally.

Radiographic analysis serves as a necessary tool during the diagnostic evaluation as it provides important information about the extent, internal structure, and relation to other anatomical structures of pathological lesions. Some of the key radiographic features that should be considered are the radiodensity of the lesion (radiolucent or radiopaque), the presence of a unilocular or multilocular structure, defined margins, cortical invasion, tooth resorption, and lesions extending to other structures such as the inferior alveolar canal and maxillary sinus. While the importance of using radiographs to establish differential diagnoses is well-known, there is a lack of sufficient research involving both epidemiological and radiographic characteristics.

It can be stated that in Pakistan, there is little evidence available related to the frequency and radiographic patterns of benign oral and maxillofacial lesions among the general population. Existing scientific studies mainly address the problem of histopathology of different lesion types without taking into account the radiographic manifestations. Such deficiency of epidemiologically and radiographically focused research might contribute to the inconsistency in diagnoses.

Thus, the purpose of the current paper is to estimate the prevalence and radiographic patterns of benign lesions of the oral and maxillofacial region in the patient population of a tertiary dental clinic Khyber College of Dentistry.

MATERIALS AND METHODS

The study is a descriptive cross-sectional study that was conducted in the dental teaching hospital of Khyber College of Dentistry, Peshawar. This study has been carried out for determining the frequency and radiographic patterns of benign lesions of the oral and maxillofacial region in the selected population for a period of five months from February 1, 2024, to July 1, 2024. This study has been done in a way to ensure that it meets the recommendations of the STROBE statement.

Ethical approval was taken from the Ethical Review Board of Khyber College of Dentistry, Peshawar (Reference number: 342/ERB/KCD; date: January 23, 2024). All activities of this research have been done keeping in view the provisions of the Declaration of Helsinki. Informed written consent has been taken from the patients before the enrollment process in the study. Confidentiality has been ensured throughout the whole research process, and the data has been coded with the help of unique identification numbers.

A sample size has been calculated using the WHO sample size calculator based on a prevalence rate of 13.53%, confidence interval of 95%, and precision value of 5%. Accordingly, it has been found that the sample size needed for this study would be 180 patients. In this regard, a non-probability consecutive sampling technique has been used to recruit the patients till the completion of the desired sample size.

All the patients regardless of age and gender with benign pathological lesions in the oral and maxillofacial region have been included in this study. Complete records and radiographic imaging of all those cases have been considered in the study that met the inclusion criteria. Those patients who have already undergone any sort of treatment for the benign lesions have been excluded to avoid the possibility of confounding in radiographic presentations.

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In order to collect the data, the proforma for the study has been designed and validated by consulting experts. Data collection has been done by obtaining demographic and clinical information including the age of the patient and his/her gender, lesion location, and histopathological diagnosis. Besides this, the radiographic data have been collected from the patients' records including OPGs, PNS, and CT scans wherever available. In addition to this, the standard process has been adopted for data collection.

In this regard, the most important part of the study is the radiographic evaluation of benign lesions of oral and maxillofacial region. All lesions have been examined to find radiodensity (Radiolucent, Radiopaque or Mixed), locularity (Unilocular or Multilocular), well-defined or ill-defined margins, root resorption, cortical expansion, and involvement of the inferior alveolar canal and maxillary sinus. In this regard, all radiographs have been evaluated independently by two experienced oral and maxillofacial radiologists that did not know about the results of each other. The interobserver agreement has been calculated using the kappa coefficient.

Some precautions have been taken to minimize biases. First, the diagnostic and radiographic standards have been maintained in the case of all participants. Second, the inclusion and exclusion criteria have been properly applied so as to prevent any selection bias. Third, observer calibration sessions have been arranged before analyzing the radiographic data. Fourth, blinding of the radiologists has prevented the observer bias.

Data analysis has been done using SPSS 22. The statistical package was used to calculate descriptive statistics as well as inferential analysis. Continuous variables have been reported in the form of means ± standard deviation whereas categorical variables have been reported in the form of frequencies and percentages. The association of the variables has been tested with the chi-square test/Fisher's exact test and independent sample t-test where necessary. In this regard, stratification by age and gender has also been performed to control the possible confounders. For significance, the p-value has been kept less than or equal to 0.05.

RESULTS

The number of patients who participated in the current study was 180. The average age of the patients was 37.34 ± 19.48 years, with a minimum age of 5 years and maximum age of 70 years. Male patients formed the majority (56.7%) compared to female patients (43.3%), as depicted in Table 1.

TABLE 1: Demographic Characteristics

Variable	Value
Age (Mean ± SD)	**37.34 ± 19.48 years**
Age Range	5 – 70 years
Male	102 (56.7%)
Female	78 (43.3%)

Odontogenic cysts were found to be the most prevalent category of lesions, while other lesions, reactive lesions, and benign tumors comprised the second, third, and fourth categories, respectively. As far as anatomic distribution was concerned, the mandible was the most common site of affection, as compared to the maxilla (see Table 2).

TABLE 2: Distribution of Lesion Types and Anatomical Site

Variable	Category	Frequency (n=180)	Percentage (%)
Lesion Type	Odontogenic cyst	59	32.8
	Reactive lesion	38	21.1
	Benign tumor	34	18.9
	Other lesions	49	27.2
Site	Mandible	126	70.0
	Maxilla	54	30.0

Radiographically, it was found that most of the lesions had radiolucent features, but there was also a relatively smaller number of lesions with radiopaque and mixed-density features. Lesions with unilocular features were more common than lesions with multilocular features. Well-defined margins were common, while lesions with ill-defined margins were less common. Among the other radiographic features associated with the lesions, some lesions had features of cortical expansion and root resorption (Table 3).

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TABLE 3: Radiographic Characteristics of Lesions

Feature	Category	Frequency	Percentage (%)
Density	Radiolucent	108	60.0
	Radiopaque	41	22.8
	Mixed	31	17.2
Locularity	Unilocular	120	66.7
	Multilocular	60	33.3
Margins	Well-defined	140	77.8
	Ill-defined	40	22.2
Root Resorption	Present	47	26.1
Cortical Expansion	Present	63	35.0
IAC Involvement	Present	38	21.1
Sinus Involvement	Present	27	15.0

Statistical inference testing showed that there was no statistically significant relationship between gender and type of lesion ($p = 0.283$) as well as between type of lesion and anatomical site ($p = 0.430$). Furthermore, statistical analysis of the difference in age between the two genders yielded no statistically significant result ($p = 0.659$).

TABLE 4: Inferential Analysis

Variable Comparison	Test Used	p-value	Significance
Gender vs Lesion Type	Chi-square	0.283	Not Significant
Site vs Lesion Type	Chi-square	0.430	Not Significant
Age vs Gender	Independent t-test	0.659	Not Significant

DISCUSSION

This study was done to evaluate the incidence and radiographic characteristics of benign lesions of the mouth and face in the outpatient of tertiary care dental hospital in Peshawar. Findings indicate that odontogenic cysts are common among the inhabitants of this region; they have predilection for mandible and have radiographic characteristics as follows: radio-lucent appearance, uni-locularity, and well-defined margins.

On demographic basis, there is a clear male predominance and prevalence at the age of fourth decade, which shows similarity to other studies. As mentioned earlier, similar studies by Alhindi et al. and Agrawal et al. show similar trends. In addition, local studies by Farooq et al. and Waheed et al. revealed the same trends. Interestingly, there was no statistically significant correlation between gender and benign lesions, which signifies that biologically benign lesions lack sexual preference.

Odontogenic cysts were identified as the most prevalent benign lesion in this study, and this finding coincides with other literature reports both regional and international. The reason behind that could be that there are plenty of untreated oral infections in developing countries. Similarly, many researchers like Agrawal et al. and Alhindi et al. reported the same trend. Additionally, according to a study done by Farooq et al., there was high frequency of odontogenic lesions in the local population.

There was a preference for mandible as a common affected site as compared to other sites in face and jaw, which has a rationale in several aspects. For instance, there are many odontogenic tissues located in mandible, there is a high frequency of impacted teeth in mandible, and there is adequate space available for expansion of lesion without becoming symptomatic. The above observations have also been noticed in several other studies by researchers like Waheed et al. and Farooq et al.

Radiographic examination showed that the radiolucent appearance of the lesions was most common among all, which was attributed to the presence of bone resorption. These findings were supported by similar researches conducted previously. Predominance of unilocular appearance indicated a prevalence of lesser aggressive lesions, especially cysts, while multilocular appearances could signify more aggressive tumors such as ameloblastoma.

Well-defined margins found in most cases were considered important because they reflected slow growth rate of benign lesions and also helped distinguish benign lesions from malignant ones. Root resorption and cortical expansion seen in some cases were indications of the adverse effects of lesions, but their less commonness is an encouraging sign. Involvement of adjacent anatomical structures, especially inferior alveolar canal and maxillary sinus, was observed in a few cases.

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The results of the present study could have important implications on clinical practice in dentistry, and that is that radiographic evaluation is a key step in the detection of oral and maxillofacial diseases. Radiographs are an essential tool for diagnosing different lesions and can play a crucial role in identifying the lesions, planning treatment options, and preventing complications.

There was no statistically significant correlation between benign lesions and variables like gender and anatomical site, which was an expected finding in light of the heterogeneous nature of lesions. Several similar findings were reported in previous literature, indicating that despite the presence of some trends, they do not always achieve statistical significance.

The strength of this study includes the combined analysis of epidemiological and radiographic characteristics of lesions, application of standardized techniques of data collection, and focus on the third-level of healthcare provision. There are several limitations of the current study, like its monocentricity and cross-sectional design.

CONCLUSION

In conclusion, the present study demonstrates that odontogenic cysts constitute the most prevalent benign pathological lesions of the oral and maxillofacial region, with a marked predominance in the mandible. The majority of lesions exhibited characteristic radiographic features, including radiolucency, unilocular presentation, and well-defined margins, consistent with their benign biological behavior.

These findings underscore the critical role of radiographic evaluation in the early detection and accurate characterization of maxillofacial lesions. Recognition of specific radiographic patterns can significantly assist clinicians in establishing an accurate differential diagnosis and optimizing treatment planning.

Furthermore, the absence of statistically significant associations between lesion type and demographic or anatomical variables highlights the heterogeneous nature of these lesions and reinforces the importance of comprehensive clinical and radiographic assessment for individualized patient management.

Overall, this study provides valuable regional data from a tertiary care dental hospital in Peshawar and contributes to the existing body of literature by integrating epidemiological and radiographic perspectives. The findings emphasize the importance of early diagnosis, enhanced oral health awareness, and the appropriate use of imaging modalities in reducing disease burden and improving patient outcomes.

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