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# Maxillary cysts diagnosed at a Brazilian Reference Center for Oral Injuries: a retrospective study

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**Aim:** determine the prevalence of cysts associated with maxillary bones, analyzing variables related to their occurrence. **Methods:** a cross-sectional study was carried out with secondary data from biopsy records and conclusive anatomopathological reports of cysts diagnosed at the Reference Center for Oral Lesions of the State University of Feira de Santana in the period 2006-2017. The information collected was analyzed using the software Statistical Package for the Social Sciences (SPSS) version 21.0; the chi-square statistical test was used, and the Likelihood-ratio test was applied, with a significance level of p≤ 0.05. **Results:** Of the 290 records with a conclusive histopathological diagnosis for some intraosseous lesion, 138 (47,58%) were definitive for cysts. The radicular/residual cyst was the most frequent (47.8%) and most of the lesions were located in the posterior region of the mandible (39.9%). The age group's statistical analysis showed a statistically significant difference in the different types of the cyst (p=0.000), however, when associating sex with histopathological diagnosis (p=0.222) and anatomical location with histopathological diagnosis (p=0.568), there was no statistically significant difference. **Conclusions:** The radicular/residual cysts group had the highest frequency among all lesions. Cysts were more commonly diagnosed in women, in the fourth decade of life and the most prevalent anatomical site was the posterior region of the mandible. The analysis results suggest that the age group is a factor associated with the occurrence of cysts.

**Keywords:** Cysts. Maxilla. Epidemiology. Pathology, oral.

## Introduction

The cyst is defined as a pathological cavity often lined by epithelium and usually filled with liquid, semi-liquid or gas[1]. It is subdivided into odontogenic and non-odontogenic. When these cysts result from the proliferation of epithelial remnants associated with the formation of teeth, such as epithelial cell rests of Malassez, rests of Serres, and pericoronal follicles, they are called odontogenic cysts. The non-odontogenic ones result from the trapping of epithelial rests from the ectoderm during the embryonic processes of the mouth and face, developing in the fusion line of the facial bones[2].

Odontogenic cysts are the most common osteodestructive lesions in the human skeleton and may present different clinical behaviors. Regarding their origin, they can be classified as inflammatory or developmental cysts[3,4]. Inflammatory cysts come up associated with a tooth without pulp vitality and are the most common maxillary cysts, depending on the nature of the inflammatory response, there may be chronic or even acute inflammation with the appearance of abscesses. Developmental cysts are usually asymptomatic but have growth potential, becoming widespread[1]. Non-odontogenic cysts are classified as developmental cysts in the oral and maxillofacial region with uncertain pathogenesis. These lesions slowly increase in size, possibly in response to a slight increase in luminal hydrostatic pressure[2].

Epidemiological data for cysts and tumors have been widely reported in the literature, with a focus on the most destructive lesions[5]. According to Açikgoz et al.[6], in a study carried out in Turkey, among the lesions diagnosed in the oral cavity, cysts represented 14.7%. In Brazil, Pereira et al.[7] indicate that the occurrence of cysts is low, with 1.3% of diagnoses reported in theirs studies. The importance of research is highlighted for the knowledge of which cystic lesions occur most frequently in the stomatognathic system, as well as the profile of the affected population. Thus, this study aimed to determine the prevalence of cysts associated with maxillary bones, analyzing variables related to their occurrence to assist strategies that contribute to both diagnosis and treatment.

## Materials and methods

### Design and Study Area

This is a cross-sectional study, based on secondary data from biopsy records and conclusive anatomopathological reports of cysts diagnosed from 2006 to 2017 at a Reference Center for Oral Lesions (CRLB) of the State University of Feira de Santana (UEFS). This study was approved by the Ethics Committee of the Institution (Protocol number 015/2008, CAAE 0015.0.059.000-08).

### Eligibility criteria

The study included patients who had a single biopsy record, whether incisional or excisional, during the period from 2006 to 2017, who presented conclusive histopathological reports of cysts in the maxillomandibular complex and who had signed the Informed Consent Form in the medical records. The criteria for exclusion were:

medical records that had no confirmation of diagnoses with attached histopathological report; different diagnoses for the same patient. All biopsied surgical specimens were evaluated by the service's oral pathologists.

### Study variables

The variables analyzed included sociodemographic variables (gender, age), anatomical site (maxilla versus mandible; posterior versus anterior), and histopathological diagnosis of the lesions.

### Data Collection Procedure

Data collection was performed by a single examiner who, through the records in the CRLB biopsy book, sought the conclusive results of cysts. Cysts were grouped into odontogenic and non-odontogenic, according to the newest classification proposed by the World Health Organization[8].

### Data analysis

The information collected was analyzed using the software called Statistical Package for the Social Sciences (SPSS) version 21.0, following the sequence and distribution of the study variables, with absolute and percentage distributions being presented. The cysts were grouped into four groups for analysis, three being the most prevalent and the fourth group called "others containing the others." To assess the association between the variables studied and the types of the cyst, the chi-square statistical test was used, with a significance level of $p \leq 0.05$. For variables that presented class intervals with an occurrence lower than 5, the Likelihood-ratio test was applied.

## Results

During the study period, 2006 to 2017, 2,051 biopsies were performed at a Reference Center for Oral Lesions (CRLB) of the State University of Feira de Santana (UEFS). Only 290 (14.13%) individuals presented a conclusive histopathological diagnosis for some type of intraosseous lesion. Of these, 138 were definitive for cysts, representing 47.58% of the total intraosseous lesions.

As for sociodemographic characteristics, most affected individuals were female, with a total of 60.1% of cases (n=83). The age groups included were from zero to 90 years of age, with the 4th decade of life being the most prevalent, with a total of 19.7% of the records (Table 1).

**Table 1.** Distribution of absolute and relative frequencies of cysts by gender and age groups categorized by decades of life, CRLB/UEFS, Feira de Santana, Bahia, Brazil, 2006-2017.

| Gender | N | % |
|---|---|---|
| Male | 55 | 39.9 |
| Female | 83 | 60.1 |
| Total | 138 | 100,0 |

Continue

Continuation

| Age group (Decades) | N | % |
|---|---|---|
| 00-10 | 06 | 4.4 |
| 11-20 | 17 | 12.4 |
| 21-30 | 24 | 17.5 |
| 31-40 | 27 | 19.7 |
| 41-50 | 21 | 15.3 |
| 51-60 | 19 | 13.9 |
| 61-70 | 14 | 10.2 |
| 71-80 | 06 | 4.4 |
| 81-90 | 03 | 2.2 |
| Total | 137* | 100.0 |
| **Cysts** | | |
| Odontogenic | 134 | 97.1 |
| Non-odontogenic | 04 | 2.9 |

*There was a biopsy record and histopathological report in which the age of the patient diagnosed with dentigerous cyst was not described

Among the cysts, the radicular/residual cyst presented 41.3% (n=57), followed by the dentigerous cyst with 18.8% (n=26), and the odontogenic keratocyst corresponding with 10.9% (n=15) of the samples. Regarding the anatomical location, there was a predominance in the posterior region of the mandible, with 39.9% of cases (n=55) (Table 2).

**Table 2.** Distribution of absolute and relative frequencies of the types of cysts diagnosed and anatomical site, CRLB/UEFS, Feira de Santana, Bahia, Brazil, 2006-2017 (n=138).

| Cysts | N | % |
|---|---|---|
| Radicular/Residual | 66 | 47.8 |
| Dentigerous | 26 | 18.8 |
| Odontogenic keratocyst | 15 | 10.9 |
| Paradental | 07 | 5.1 |
| Gorlin | 06 | 4.4 |
| Adult's gingival | 04 | 3.0 |
| Glandular odontogenic | 04 | 3.0 |
| Orthokeratinized odontogenic | 02 | 1.4 |
| Buccal bifurcation | 02 | 1.4 |
| Nasolabial | 02 | 1.4 |
| Nasopalatine duct | 02 | 1.4 |
| Botryoid odontogenic | 01 | 0.7 |

Continue

| Continuation | | |
|---|---|---|
| Lateral periodontal | 01 | 0.7 |
| Anatomical Site | n | % |
| Mandible's anterior | 20 | 14.5 |
| Mandible's posterior | 55 | 39.9 |
| Maxilla's anterior | 44 | 31.9 |
| Maxilla's posterior | 19 | 13.7 |

The statistical analysis relating age group and anatomopathological diagnosis showed a statistically significant difference in the different types of the cyst (Likelihood-ratio p=0.000). The radicular/residual cyst had a higher occurrence in the age groups of 31-40 and 41-50 years (22.7%), the dentigerous cyst in 21-30 years (36%), the odontogenic keratocyst in 31-40 years (46.7 %) and the other cysts in 31-40 (19.7%) (Table 3).

**Table 3.** Bivariate analysis for radicular/residual cyst, dentigerous cyst, odontogenic keratocyst, and others with the variable age, CRLB/UEFS, Feira de Santana, Bahia, Brazil, 2006-2017 (n=137)*

| Age | Histopathological diagnosis | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | Radicular/ residual cyst | | Dentigerous cyst | | Odontogenic keratocyst | | Others | | Total | |
| | N | % | N | % | N | % | N | % | N | % |
| 0-10 | 01 | 1.5 | 02 | 8.0 | 00 | 0.0 | 03 | 9.7 | 06 | 4.4 |
| 11-20 | 04 | 6.1 | 06 | 24.0 | 01 | 6.7 | 06 | 19.4 | 17 | 12.4 |
| 21-30 | 07 | 10.6 | 09 | 36.0 | 02 | 13.3 | 06 | 19.4 | 24 | 17.5 |
| 31-40 | 15 | 22.7 | 03 | 12.0 | 07 | 46.7 | 02 | 6.5 | 27 | 19.7 |
| 41-50 | 15 | 22.7 | 00 | 0.0 | 00 | 0.0 | 06 | 19.4 | 21 | 15.3 |
| 51-60 | 09 | 13.6 | 03 | 12.0 | 02 | 1.3 | 04 | 12.9 | 18 | 13.1 |
| 61-70 | 09 | 13.6 | 02 | 8.0 | 01 | 6.7 | 03 | 9.7 | 15 | 10.9 |
| 71-80 | 06 | 9.1 | 00 | 0.0 | 00 | 0.0 | 00 | 0.0 | 06 | 4.4 |
| 81-90 | 00 | 0.0 | 00 | 0.0 | 02 | 13.3 | 01 | 3.2 | 03 | 2.2 |

* There was a biopsy record and histopathological report in which the patient's age diagnosed with dentigerous cyst was not described.
**Likelihood-ratio p=0.000.

When associating sex with histopathological diagnosis and anatomical location with histopathological diagnosis, there was no statistically significant difference in the different cysts (Pearson's Chi-square test p= 0.222 and Likelihood-ratio test p= 0.568, respectively) (Table 4).

**Table 4.** Bivariate analysis for radicular/residual cyst, dentigerous cyst, odontogenic keratocyst, and others with the variables sex and anatomical location, CRLB/UEFS, Feira de Santana, Bahia, Brazil, 2006-2017 (n=138).

| Gender* | Histopathological diagnosis | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | Radicular/ residual cyst | | Dentigerous cyst | | Odontogenic keratocyst | | Others | | Total | |
| | N | % | N | % | N | % | N | % | N | % |
| Male | 29 | 43.9 | 13 | 50.0 | 05 | 33.3 | 8 | 25.8 | 55 | 39.9 |
| Female | 37 | 56.1 | 13 | 50.0 | 10 | 66.7 | 23 | 74.2 | 83 | 60.1 |
| **Anatomical site**** | **Histopathological diagnosis** | | | | | | | | | |
| | Radicular/ residual cyst | | Dentigerous cyst | | Odontogenic keratocyst | | Others | | Total | |
| | N | % | N | % | N | % | N | % | N | % |
| Mandible's anterior | 07 | 10.6 | 03 | 11.5 | 04 | 26.7 | 06 | 19.4 | 20 | 14.5 |
| Mandible's posterior | 22 | 33.3 | 13 | 50.0 | 06 | 40.0 | 14 | 45.2 | 55 | 39.9 |
| Maxilla's anterior | 25 | 37.9 | 07 | 26.9 | 04 | 26.7 | 08 | 25.8 | 44 | 31.9 |
| Maxilla's posterior | 12 | 18.2 | 03 | 11.5 | 01 | 6.7 | 03 | 9.7 | 19 | 13.8 |

*Pearson's chi-square p=0.222
** Likelihood-ratio p=0.568

## Discussion

In the analysis, it was observed that the most frequent type of cyst was radicular/residual (41.3%), followed by dentigerous cyst (18.8%) and odontogenic keratocyst (10.9%). This prevalence is also described in work by Kalimbamath et al.[9], who carried out a ten-year retrospective study in India on the prevalence of odontogenic cysts. The result also corroborates the findings of Martinelli et al.[10], Pereira et al.[7], Villasis-Sarmiento et al.[11], Louredo et al.[12] e Açikgoz et al.[6], who present the most frequent radicular cyst.

Pontes et al.[13], when analyzing the relative frequency of cysts and tumors in the six years in Bahia, described the paradental cyst with the highest percentage, which differs from this study in which the paradental cyst occupies the fourth position. According to the author, this study obtained a reduced sample of cysts and considered not significant, which may have occurred because it was a study with medical records of patients who underwent surgical treatment under general anesthesia, and cysts are usually treated with local anesthesia, in addition, with the classification used (adapted from WHO 1992 and 2005) the odontogenic keratocyst was classified as a keratocystic odontogenic tumor and represented 26% of the sample. Ramachandra et al.[14] also found in their work the prevalence of odontogenic cysts and tumors in the six years carried out in India, a divergence with the result discussed in this research, reporting higher diagnostic results for dentigerous cysts, followed by the radicular cyst.

The most affected sex was female (60.1%). This data agrees with Martinelli et al.[10] e Pereira et al.[7], both retrospective prevalence studies carried out in Brazil. It agrees with Açikgoz et al.[6], who researched the prevalence of cysts in Turkey over eight years. However, disagree with their data: Pontes et al.[13], Louredo et al.[12], Kambalimath et al.[9],

Ramachandra et al.[14], and Villasis-Sarmiento et al.[11], because, for this group of researchers, they report the male sex as more prevalent.

The age group variable was the one with the greatest variations in the researchers studied. In this work, the fourth decade of life was more representative (19.7%), diverging from the findings of Jaeger et al.[15]. Martinelli et al.[10] cite the fifth decade of life as the most prevalent; Louredo et al.[12] the third decade together with Kambalimath et al.[9], Villasis-Sarmiento et al.[11] report the second decade of life as being the most prevalent and Ramachandra et al.[14] determine the most frequent mean age as 41.5 years (for this variable the author did not use age group).

The results also showed that the most common anatomical location is the posterior part of the mandible (39.9%), which is consistent with the study by Pontes et al.[13], Louredo et al.[12], Villasis-Sarmiento et al.[11], Martinelli et al.[10] and Ramachandra et al.[14]. The last two mentioned studies did not classify subdivisions (anterior and posterior); and differ from the results of Pereira et al.[7], Kambalimath et al.[9] and Açikgoz et al.[6] who report a higher frequency of involvement in the maxilla (without specifying region).

The different results that were found for the variables presented can be justified mainly by the type of classification used by their authors or changes that have occurred in them over the years. As an example, we have the classification of the World Health Organization, which had its penultimate version updated in 2017[8], where the keratocystic odontogenic tumor and calcifying epithelial odontogenic tumor were now classified as odontogenic keratocyst and Gorlin cyst, respectively. These modifications would cause significant changes in the work of Nalabolu et al.[16] and Alshedd et al.[17] where the odontogenic keratocyst had great prominence being classified as a tumor. In addition, we can take into account the different periods during which the studies were carried out, access to health services in each region surveyed, and the genetic factors of each population.

The statistical analysis relating age group and the anatomopathological diagnosis was the only analysis in this study that obtained a statistically significant difference in the different types of cysts in agreement with the study by Açikgoz et al.[6] and Pereira et al.[7] This suggests that age is a factor associated with the type of cyst.

When associating sex with the histopathological diagnosis, there was no statistically significant difference in the different types of cysts, corroborating the findings of Pereira et al.[7] On the other hand, the study carried out by Villasis-Sarmiento et al.[11] reports that there was a statistically significant difference in the association of females with radicular cysts and males with dentigerous cysts.

In the association of the anatomical location with the histopathological diagnosis, there was no statistically significant difference in the different types of cysts, confirming the studies by Pereira et al.[7]

The associations that did not obtain a statistically significant difference can be justified by the lack of relationship between the types of lesions and the variables used and/or by the reduced number of samples.

Due to this being a descriptive study, the variables analyzed do not allow for inferring causality, requiring further longitudinal studies. However, the results contribute

to a better understanding of the clinical-epidemiological profile of individuals and indications of the needs of a given population; thus, preventive and treatment actions should not be ignored by health professionals and government entities. According to the findings, there are few retrospective epidemiological surveys with statistical analysis like this one evaluating cystic lesions.

In conclusion, cysts were more commonly diagnosed in women, with the most prevalent age group being the fourth decade of life and the most prevalent anatomical location being the posterior region of the mandible. The radicular/residual cysts group had the highest frequency among all lesions. The analysis results suggest that the age group is a factor associated with the occurrence of the pathologies studied in this work since the other variables did not present statistical significance.

## Conflict of interest

None.

## Acknowledgments

None.

## Data availability

Datasets related to this article will be available upon request to the corresponding author.

## Authors contribution

**Jener Gonçalves de Farias:** Substantial contributions to the acquisition, analysis, interpretation of data for the work; and drafting the work and Final approval of the version to be published; and Agreement to be accountable for all aspects of the work in ensuring that questions related to the accuracy or integrity of any part of the work are appropriately investigated and resolved. **Daisy Silva de Melo:** Substantial contributions to the acquisition, analysis, interpretation of data for the work; and drafting the work and Final approval of the version to be published; and Agreement to be accountable for all aspects of the work in ensuring that questions related to the accuracy or integrity of any part of the work are appropriately investigated and resolved. **Taiane de Santana Azevêdo Falcão:** Substantial contributions to the acquisition, analysis, interpretation of data for the work; and drafting the work and Final approval of the version to be published; and Agreement to be accountable for all aspects of the work in ensuring that questions related to the accuracy or integrity of any part of the work are appropriately investigated and resolved. **Alessandra Laís Pinho Valente Pires:** Substantial contributions to the acquisition, analysis, interpretation of data for the work; and drafting the work and Final approval of the version to be published; and Agreement to be accountable for all aspects of the work in ensuring that questions related to the accuracy or integrity of any part of the work are appropriately investigated and resolved.

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