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Pattern of Cystic Lesion of the Jaws on Radiographs in Patients Reported to Saidu College of Dentistry, Swat

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ABSTRACT

Background: Jaw cystic lesions are a significant concern in dental practice, often leading to functional and aesthetic complications if not identified and treated promptly.
Objective: To determine the pattern and location of jaw cystic lesions on radiograph.
Materials and Methods: This descriptive cross-sectional study, conducted at Saidu College of Dentistry analyzed 137 panoramic radiographs with cystic lesions. Ethical approval and informed consent were obtained. Radiographs were selected using non-probability consecutive sampling and classified based on clear operational definitions. Data on demographics and lesion characteristics were recorded. Statistical analysis included descriptive measures, stratification by gender and location, and chi-square testing.
Results: The mean age was 37.7 ± 15.6 years with 56.9% males. Radicular cysts were the most common (47.45%), followed by dentigerous cysts (32.12%), odontogenic keratocysts (18.98%), and eruption cysts (1.46%). Radicular cysts were mainly found in the anterior maxilla and mandible, dentigerous cysts in the mandibular angle, and odontogenic keratocysts in the mandible body. Eruption cysts were exclusive to the posterior maxilla. Gender distribution was not significant ($p = 0.89$), but lesion location showed statistical significance ($p < 0.001$).
Conclusion: Radicular cysts are the most common cystic lesions, particularly in the anterior maxilla and mandible. Clinicians should be aware of the distinct patterns of jaw cystic lesions to ensure early diagnosis and effective management, minimizing morbidity
Keywords: Dentigerous cyst, Eruption cyst, Jaw cysts, Odontogenic keratocyst, Panoramic radiographs, Radicular cyst.

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INTRODUCTION

A cyst is defined as a cavity lined with epithelium, containing fluid, semifluid, or gaseous material, but no pus accumulation. The sources of cystic lesions of the jaws can be either odontogenic or non-odontogenic, arising from developmental defects, chronic inflammation, or traumatic insults.[1] On clinical grounds, these lesions appear as painless swellings; however, secondary infection or rapid growth can lead to symptoms such as pain due to nerve impingement or the release of acute-phase products, deformity, or functional issues.[2] On radiographic examinations, such as panoramic imaging, these lesions are typically seen as unilocular or multilocular radiolucencies, sometimes associated with tooth displacement, root resorption, or other structural deformations.[3]

Accurate diagnosis of jaw cysts includes a detailed clinical evaluation, imaging studies, and histopathology.[4] Radiolucent areas are commonly detected by x-rays, including orthopantomograms and periapical views; additional advanced imaging techniques such as cone beam computed tomography (CBCT) provide a better ability to determine size and characteristics.[5] Confirmatory approaches available include aspiration cytology or a biopsy, after a detailed histopathological examination.[6]

Radicular, dentigerous and odontogenic keratocysts are the most commonly observed jaw cysts. The most common are radicular cysts formed in association with dental caries and necrotic pulp.[7] Dentigerous cysts are odontogenic cysts forming around the crowns of the unerupted teeth, usually while of odontogenic keratocysts, or keratocystic odontogenic tumor, is an aggressive one with high rate of recurrence. The eruption cyst, calcifying odontogenic cyst and residual cyst are less frequently encountered cystic lesions.[8]

The prompt diagnosis and treatment of jaw cysts prevents complications such as tissue damage, infection and a chance for malignant transformation.[9] Intervention as early as possible can keep functionality and lessen the need of major procedures. The treatment of the cyst depends on the size, type and location and may employ techniques of the management of the cyst, including marsupialization or enucleation.[10]

This study aimed to determine the radiographic patterns and presentation of cystic lesions in the jaws in patients reporting to Saidu College of Dentistry. This will raise awareness among clinicians about the burden

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of these problems. Understanding the epidemiology and characteristics of these lesions can guide clinicians in formulating effective management strategies and reducing the morbidity associated with delayed or inappropriate treatment. There is no local study on this subject.

MATERIALS AND METHODS

This descriptive cross-sectional study was conducted at the Radiology Department of Saidu College of Dentistry, Swat, from December 28, 2024, to January 15, 2025. The study was performed on available panoramic radiographs from the last two years, which were obtained using a non-probability consecutive sampling technique. Ethical approval for the study was obtained from the institutional review board of Saidu College of Dentistry before its commencement. Informed consent was obtained from all patients as part of their treatment, that their records and radiographs could be used for research purposes.

A sample of 137 patients' panoramic radiographs with cystic lesions was calculated using OpenEpi at a 95% confidence level, 6% absolute precision, a design effect of one, and a frequency of odontogenic keratocyst estimated at 15% based on a previous study.[11]

The study included patients who had complete panoramic radiographs, radiographs clearly showing cystic lesions, and individuals of all ages and genders. However, patients were excluded if their radiographs contained artifacts or if they had systemic conditions, as noted in their records or observed on radiographic evaluation, that could interfere with diagnosing jaw cysts, such as Paget's disease.

The data collection involved thoroughly reviewing archived panoramic radiographs from the Radiology Department. A subject specialist carefully examined each radiograph to identify cystic jaw lesions. For every identified case, demographic details such as the patient's age and gender were recorded. To classify the cystic lesions observed, specific operational definitions were applied. A radicular cyst was defined as one occurring at the apex of a non-vital tooth, showing a well-defined radiolucent lesion with a corticated margin on radiographs. A dentigerous cyst was identified as a cyst associated with the crown of an unerupted or developing tooth, appearing as a radiolucent lesion around the crown. An odontogenic keratocyst (OKC) was noted for its aggressive nature, presenting as a unilocular or multilocular radiolucent lesion with well-defined margins. A calcifying epithelial odontogenic cyst (CEOC), also called a Gorlin cyst, was classified as a rare cyst with mixed radiopaque and radiolucent features, often accompanied by calcifications. Lastly, an eruption cyst was defined as a lesion occurring in the soft tissue over an erupting tooth, typically presenting as a soft tissue swelling. Single author (AS) performed all radiographic diagnosis.

The data were analyzed using R software 4.3.2. Descriptive statistics were computed, with frequencies and percentages calculated for categorical variables such as gender and pattern, while the mean and standard deviation were computed for continuous variables like age. The pattern of cystic lesions was stratified by gender and location to assess effect modification using chi-square test. A p-value of <0.05 was considered the threshold for significance.

RESULTS

The study included 137 participants with an average age of 37.7 years. Slightly more than half were male (56.9%), while females made up 43.1% of the group. Most participants (62.8%) were between 31 and 65 years old, with the rest (37.2%) aged 5 to 30 years. (Table 01)

Of the 137 jaw cystic lesions analyzed, radicular cysts were the most common, observed in 65 cases (47.45%), followed by dentigerous cysts in 44 cases (32.12%) and odontogenic keratocysts in 26 cases (18.98%). Eruption cysts were the least frequent, identified in 2 cases (1.46%). (Fig 01)

Table 02 summarizes the distribution of jaw cystic lesions by gender. Radicular cysts were the most common in both females (50.85%) and males (44.87%), followed by dentigerous cysts, odontogenic keratocysts, and eruption cysts. No significant gender-based difference was observed ($p = 0.89$).

Table 03 presents the distribution of jaw cystic lesions by location. Radicular cysts were most frequent in the anterior maxilla (n = 31, 47.69%) and anterior mandible (n=21, 32.31%), while dentigerous cysts predominantly occurred at the mandible angle (n = 24, 54.55%). Odontogenic keratocysts were primarily located in the mandible body (n = 22, 84.62%), and eruption cysts were exclusively observed in the posterior maxilla (n = 2, 100%). The distribution of lesions by location was statistically significant ($p < 0.001$).

Table 01. Demographics of the participants

Characteristic	N = 137
Age (Years), Mean ± SD	37.73 ± 17.82
Gender, n (%)	
Female	59 (43.07)
Male	78 (56.93)
Age Category (Years) n (%)	
5 - 30	51 (37.23)
31- 65	86 (62.77)

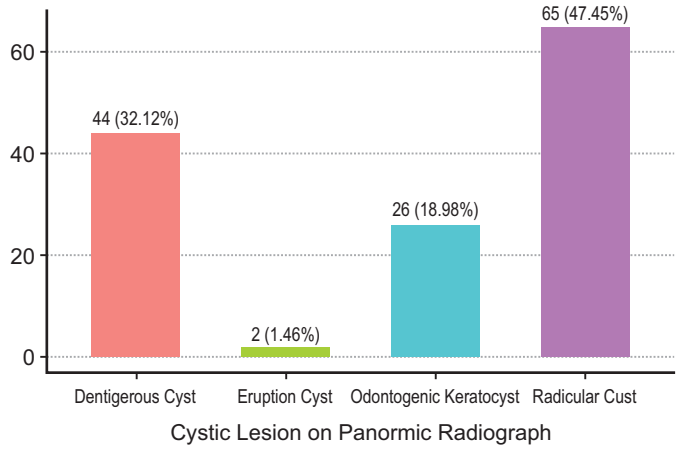


Figure 01. Distribution of jaw cystic lesions

Table 02. Distribution of Cystic lesions of the jaw by genders

Characteristic	Female, N = 59	Male, N = 78	p-value*
Cystic lesions of the jaw			
Dentigerous cyst	18 (30.51)	26 (33.33)	0.89
Eruption Cyst	1 (1.69)	1 (1.28)	
Odontogenic keratocyst	10 (16.95)	16 (20.51)	
Radicular cyst	30 (50.85)	35 (44.87)	

n (%), *Fisher's exact test

Table 03. Distribution of Cystic lesions of the jaw by locations

Location	Dentigerous Cyst, N = 44	Eruption Cyst, N = 2	Odontogenic Keratocyst, N = 26	Radicular Cyst, N = 65	p-value*
Anterior Mandible	0 (0.00)	0 (0.00)	0 (0.00)	21 (32.31)	<0.001
Mandible Angle	24 (54.55)	0 (0.00)	0 (0.00)	1 (1.54)	
Mandible Body	7 (15.91)	0 (0.00)	22 (84.62)	0 (0.00)	
Mandible Ramus	5 (11.36)	0 (0.00)	0 (0.00)	0 (0.00)	
Posterior Mandible	0 (0.00)	0 (0.00)	0 (0.00)	3 (4.62)	
Posterior Maxilla	0 (0.00)	2 (100.00)	4 (15.38)	9 (13.85)	
Anterior Maxilla	8 (18.18)	0 (0.00)	0 (0.00)	31 (47.69)	

n (%), *Fisher's exact test

DISCUSSION

In this study, we found that radicular cysts were the most common type of jaw cyst, followed by dentigerous cysts and odontogenic keratocysts. Eruption cysts were quite rare in comparison. The radicular cysts were most often found in the front parts of the upper and lower jaws, while dentigerous cysts were more common in the lower jaw at the angle. Odontogenic keratocysts were mostly located along the body of the lower jaw, and eruption cysts were seen only in the back of the upper jaw.

Radicular cysts were most often found in anterior parts of the upper and lower jaws, likely because they are linked to dental caries and infections in the tooth roots.[12] Dentigerous cysts were more common in the lower jaw, especially at the angle, likely due to impacted wisdom teeth.[13] Odontogenic keratocysts were typically seen along the body of the lower jaw, often related to unerupted teeth.[14] Eruption cysts, on the other hand, were only found in the maxillary posterior regions usually associated with the eruption of molars. similar results were found in previous study.[15]

Previous research on odontogenic cysts has been conducted in various parts of the world, helping to broaden our understanding of prevalence, location, and demographic distribution of these cysts. In Brazil,

Grossmann et al.[16] observed that cysts had a balanced gender distribution, with the second to fourth decades of life being the peak age range, particularly in the third decade. They also found that most cysts were located in the posterior mandible. In Mexico, Ledesma-Montes et al.[17] reported that radicular cysts being the most common, followed by dentigerous cysts and odontogenic keratocysts. Similarly, Ochsenius et al.[18] from Chile found that dentigerous cysts were more common in the mandibular angle, while odontogenic keratocysts were mainly found in the posterior mandible.

In Pakistan, Awan et al.[11] found that radicular cysts were the most common, often linked to dental caries. Their findings align with ours, where radicular cysts accounted for 58% of cases, followed by dentigerous cysts (25%) and odontogenic keratocysts (15%). We also observed that the anterior maxilla was the most common site for radicular cysts, similar to Grossmann et al.,[16] although in our study, patients primarily presented with swelling and infection, rather than pain. Dentigerous cysts, which are mainly located in the mandible (around 80%), were the second most common cyst in our study, mirroring findings from Ochsenius et al.[18] Additionally, odontogenic keratocysts (OKCs), the third most prevalent in our study, were predominantly found in the posterior mandible, just as reported by Grossmann et al.

In our study, we found that the location of cysts was statistically significant ($p < 0.001$), with radicular cysts most often appearing in the anterior maxilla (47.69%) and anterior mandible (32.31%). Dentigerous cysts were most commonly located at the mandibular angle (54.55%), while odontogenic keratocysts were mostly found in the mandible body (84.62%). Interestingly, eruption cysts were exclusively located in the posterior maxilla. Our findings align with those of previous studies,[11,18] especially the prevalence of radicular cysts in the anterior maxilla. However, we also noted some differences, such as a higher proportion of radicular cysts in the maxilla compared to the mandible, and a greater overall frequency of lesions in the maxilla (53%) compared to the mandible (47%). This could be due to the higher rate of dental caries in our population, which may predispose individuals to develop radicular cysts in the maxilla.

The cross-sectional design of study limits causal inferences, and the reliance on panoramic radiographs without histopathological confirmation may affect diagnostic accuracy. The single-center sample may also restrict the generalizability of findings. Future multicenter studies with larger samples and histopathological validation are recommended to enhance diagnostic precision and broaden applicability.

CONCLUSION

It can be concluded that the most common cystic lesion was the radicular cyst, followed by dentigerous cysts and odontogenic keratocysts, with eruption cysts being the least frequent. Radicular cysts were mainly found in the anterior maxilla and mandible, dentigerous cysts in the mandibular angle, odontogenic keratocysts in the mandible body, and eruption cysts in the posterior maxilla. There were no significant gender-based differences in the distribution of these lesions.

Ethical Consideration

This study was approved by Institutional Review Board of Saidu College of Dentistry, Swat, Pakistan.

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Conflict of Interest

Authors declared no conflict of interest.

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DATA SHARING STATEMENT: The data that support the findings of this study are available on request from the corresponding author. The data is not publicly available due to privacy or ethical restrictions.

AUTHORS' CONTRIBUTION

The following authors fulfill authorship criteria as per ICMJE guidelines;

Saboor A, Ilyas M: Substantial contribution to conception and design, drafting the manuscript, final approval, agreed to be accountable for all the work.

Ali W, Abbasi S: Substantial contribution to conception and design, data acquisition, drafting the manuscript, final approval, agreed to be accountable for all the work.

Arifi AA: Analysis and interpretation of data, drafting the manuscript, final approval, agreed to be accountable for all the work.

Shams S: Analysis and interpretation of data, critical revision, final approval, agreed to be accountable for all the work.

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