

Clinicopathological analysis of 847 odontogenic cysts examined over 10 years period: A retrospective study



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Abstract

Objective: The purpose of this study is to analyze and report the prevalence, frequency, sex distribution, site distribution and clinicopathological features of odontogenic cysts in an institutional academic Dental Hospital by studying the biopsy specimens and clinical records obtained from the archives of the Department of Oral and Maxillofacial Surgery and Department of Pathology, JNMCH, Aligarh Muslim University, India, during the past 10 years.

Material and Methods: Data on odontogenic jaw cysts treated between 2009 and 2018 were retrieved from clinical files; imaging and histopathology reports and a total of 847 patients were included. In each case, we analyzed age, gender, type and number of cysts, and cyst location. Imaging characteristics and pathologies associated with cystic lesions were also determined.

Results: Diagnosis of odontogenic cyst was made in 847 cases and accounted for 10.9 % of all lesions biopsied (7748) throughout the period. Mean age of the patient was 28.2 years, and 57.3 % were males. The overall male to female ratio was 1.34:1. Radicular cyst was most prevalent histological type (54.54 %) followed by dentigerous cyst, odontogenic keratocyst, lateral periodontal cyst, residual cyst, botryoid odontogenic cyst, gingival cyst.

Conclusion: The prevalence, distribution and characteristics of odontogenic cysts of oral cavity and jaws, have some differences as well as similarities with findings of studies in different populations. The prevalence of inflammatory cyst was greater than developmental cyst in this study.

Keywords: Epidemiology, Odontogenic cyst, Prevalence

Cite this Article: Ansari M, Alam S, Meraj F, Ahmad SS. 2021. Clinicopathological analysis of 847 odontogenic cysts examined over 10 years period: A retrospective study. *Journal of Dentomaxillofacial Science* 6(2): 114-118. DOI: [10.15562/jdmfs.v6i2.1063](https://doi.org/10.15562/jdmfs.v6i2.1063)

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Introduction

Cysts occurring in the oral and maxillofacial region can be categorized as either odontogenic or non-odontogenic based on the origin of the epithelial lining from which the cyst is derived. Non odontogenic cysts arise from the ectoderm involved in facial tissue development while odontogenic cyst are derived from the epithelial component of the odontogenic apparatus or its remnants that lie entrapped within the bone or gingival tissue. Epithelial rests of Malassez, the dental lamina (cell rests of Serres) or the enamel organ are commonly involved derivatives for odontogenic cysts.¹ Odontogenic cysts are further classified on the basis of their origin as developmental or inflammatory. Inflammatory cyst is associated with inflammation while developmental cyst are of unknown etiology.² Some of the odontogenic cysts are known to have an aggressive behavior and propensity to recur and may also resemble odontogenic tumors.³ Surgically excised tissue should therefore be duly studied histopathologically and accurately diagnosed to ensure appropriate treatment.

Perusal of the literature reveals that odontogenic cysts may have wide variations in occurrence from 0.8% to 45.9% of the lesions diagnosed in the oral

cavity;^{4,5} however, few reports can be found in the literature on the prevalence of Odontogenic cysts among the North Indian population.

Thus, the aim of the present study was to determine and relate demographic and clinicopathological characteristics of different types of Odontogenic cysts diagnosed histopathologically over a period of 10 years in a subset of north Indian population.

Material and Methods

This retrospective study was approved by the research committee of our institution. Case records from the patients diagnosed as Odontogenic cysts between January 2009 and December 2018 (10 years) were retrieved from the patients' clinical files, histopathology records, and imaging (panoramic and periapical radiographs in all cases, and CT in some cases) of the oral and maxillofacial surgery unit. The histopathological diagnosis of Hematoxylin/eosin-stained slides of Odontogenic cysts or nonspecific cyst were reevaluated and ascertained to be in alignment with the criterion laid down by 2017 World Health Organization (WHO) histologic classification of odontogenic lesions.⁶

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Received: 23 February 2021
Revised: 16 March 2020
Accepted: 20 July 2021
Available Online: 1 August 2021

In 2005 WHO had issued a classification categorizing odontogenic keratocysts as keratocystic odontogenic tumors (KOT). The 2017 WHO consensus group however reconsidered this categorization as they did not find sufficient evidence to support a neoplastic origin and reclassified it as odontogenic keratocysts.⁶ These histologic presentations were therefore included in our study as odontogenic cysts and the results were elaborated based on this categorization.

In every case the following information was obtained: age, gender, type and number of cysts, and lesion location. Patient's age was reported as decade of life, from the first to the eighth decade or older.

All radiographs were re-evaluated with regard to the localization, peripheral shape, and pathologies associated with cystic lesions. The maxilla and mandible were divided into two anatomic regions: anterior (from canine to canine segment), posterior (from mesial of the first premolar and distally to the last molar present including the ascending ramus in mandible). The imaging patterns of peripheral cyst shape were classified as unilocular with smooth corticated border, unilocular with irregular or scalloped border, or multilocular. Lesions which were traversed by thin radiopaque septa dividing the lesion into multiple small compartments were considered as multilocular. Pathologies associated with cystic lesion were categorized as: Displacement of tooth, resorption of root.⁷ Microsoft Excel 2013™ software was utilized for analysis of data and construction of illustrative graphs.

Results

Prevalence and frequency of odontogenic cysts

Among the 7748 oral biopsy specimens retrieved, we found 847 cases (10.9%) of odontogenic cysts. These included 462 cases (54.5%) of radicular,

187 cases (22.1%) of dentigerous, 171 cases (20.2%) of keratinizing odontogenic (KOC), 9 cases (1.1%) of residual, and 15 cases (1.8%) of lateral periodontal cyst, and 3 cases (0.35%) of other odontogenic cysts like botryoid odontogenic, and gingival cysts [figure 1](#). The three most prevalent odontogenic cysts (Radicular, Dentigerous and Odontogenic keratocyst) taken together comprised 96.8% of the total odontogenic cysts diagnosed in our set up.

Age and Sex Predilection

485 cases (57.2%) were observed in men and 362 cases (42.7%) were seen in women, with a male:female ratio of 1.34:1. The mean age was 28.2 years (range: 5-86 years), with 262 cases (30.9%) and 316 cases (37.3%) being diagnosed in the second and third decades of life, respectively. Radicular cysts were most frequently seen in the second and third decades, dentigerous cysts in the second decade, and odontogenic keratocyst in the third decade of life [figure 2](#) and [figure 3](#), [table 1](#) and [table 2](#).

Location

Of the 847 cysts, 410 cysts (48.4%) were on the maxilla and 437 cysts (51.6%) were on the mandible. In maxilla, the anterior region was the most commonly involved region (271 cysts, 66.1%), whereas in the mandible the posterior region (219 cysts, 50.1%) and anterior region (218 cysts, 49.9%) nearly had equal prevalence. The inflammatory cysts (radicular or residual cysts) was predominantly encountered in the anterior maxilla (59 cysts, 53.2%). Development cyst was most commonly seen in the posterior mandible (Dentigerous cysts: 50.8%, Odontogenic keratocyst: 55.56%) [figure 4](#) and [table 3](#).

Radiological findings and Pathologies associated with cystic lesions

The most frequent radiological feature of these lesions was unilocular (88.78%). Most and multilocular types of cysts were diagnosed as odontogenic keratocyst. Unilocular odontogenic keratocyst often had scalloped border. [Table 4](#) reports pathologies and their relative prevalence in associated odontogenic cystic lesions. 127 pathologies (14.99%) were found among 847 cases. Root resorption was the most common pathology (65 cases, 7.67%), followed by displacement of tooth and /or root (62 cases, 7.31%). Dentigerous cysts, radicular cysts and odontogenic keratocysts were found to be most frequently associated with pathologies. 14.1% (65 cases) of radicular cysts, 24.6% (46 cases) of dentigerous cysts and 7.6% (13 cases) of odontogenic keratocysts were associated with pathologies. Root resorption and displacement of tooth/root and preventing eruption of adjacent teeth were seen most commonly with dentigerous cysts. [Table 4](#).

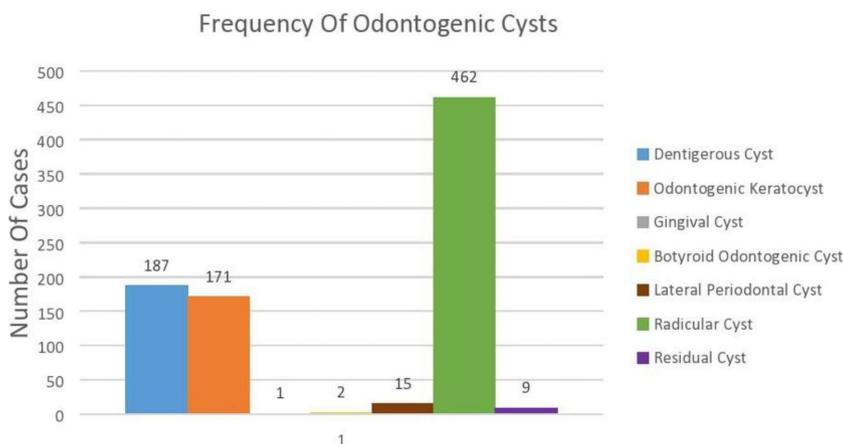


Figure 1 Odontogenic cysts

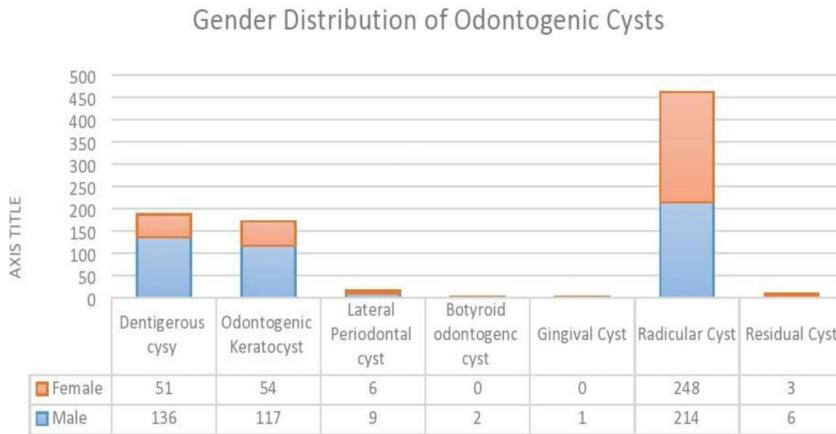


Figure 2 Gender of odontogenic cysts

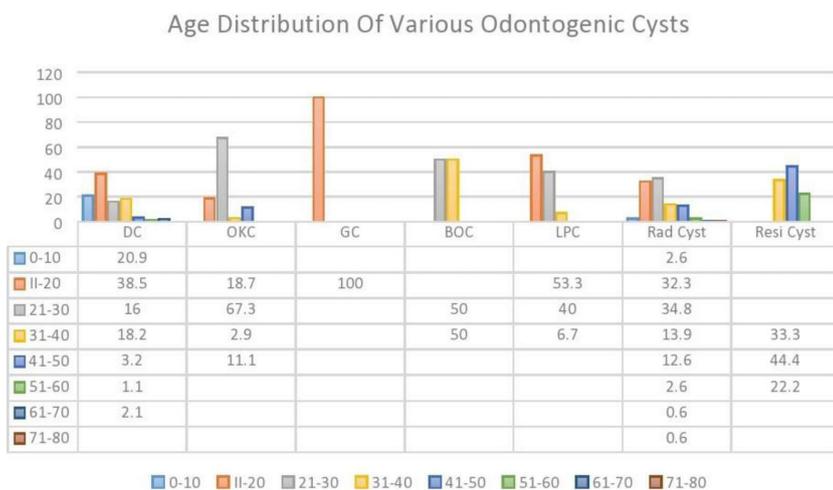


Figure 3 Age of various odontogenic cysts

Discussion

Knowledge regarding the incidence of odontogenic cysts as well as their clinical characteristics like age and site of presentation may aid the clinician in formulating a differential diagnosis. The final diagnosis must however always be based on histopathological examination because of the variations of some odontogenic cysts to have a more aggressive nature towards recurrence and also because of clinical and radiographic similarity of many odontogenic tumors like ameloblastoma and adenomatoid odontogenic tumors to odontogenic cysts.

Among the 7748 oral biopsy specimens retrieved, we found 847 cases (10.9%) of odontogenic cysts. Previous studies from various geographical region have reported prevalence of odontogenic cysts between 5.4%-33.8%.^{1,2,4,7-10} Our findings closely parallel prevalence.⁸⁻¹⁰

Radicular cysts classified as an inflammatory cysts originates from the proliferation of epithelial rests of Mallasez. This was the most common diagnosis encountered accounting for 54.5% of all odontogenic cysts. Various studies have reported

an incidence between 41.2%¹¹ to 65.1%.¹² The findings in our study is almost similar to incidence of 52.3% reported by Shear.¹³ Our results show an increase in the incidence of radicular cysts between the second and third decades of life in agreement with other studies.^{8,14,15} The most common site of presentation, in our study, was the anterior maxilla (55%) followed by the anterior mandibular region (25%). Greater incidence of traumatic injuries in the anterior maxilla may be responsible for the higher incidence in that region. The prevalence among the female gender was slightly higher (53.67%; M: F = 0.86:1) than the male gender in the present study, which is in agreement with findings from some studies^{8,16} and in disagreement with many other studies.^{5,17,15} The inflammatory genesis of radicular cysts was related to possible long term chronic pathologic processes. The gender disparity might be attributed to women in North Indian population delaying seeking medical and dental treatment as cultural expectation of caring about their family welfare outweighs care of their own health. The delay in seeking treatment might also be attributed to the socioeconomic constraint of availing proper dental care.

Residual cysts are retained radicular cysts from teeth that have been extracted. Residual cyst occurs as a remnant of infection within the jaw due to improper removal of the infected tissue during the removal of tooth.¹⁶ In the present study residual cyst was the fifth most prevalent odontogenic cyst accounting for just 1.06% of the reported cases which is less than that reported by Ledesma et al.¹⁸ accounting 6.1% and Ochsenius et al.¹⁴ mentioning 13% of cases as residual cysts. These lesions occur in the sixth decade with male predominance and mainly in the mandibular anterior region. In the present study, residual cysts occurred in younger age group with the greatest incidence in the 4th decade with Male: Female ratio of 2:1. The presence in younger patients may be attributed to early loss of teeth.¹

Dentigerous cysts has been defined by Shear as cysts that affect the crown of an unerupted tooth and are attached to its cervical area. It has been commonly reported in studies as the second most prevalent odontogenic cyst frequently affecting the posterior mandible and male gender.^{5,4,19,20} Similar findings were observed in the present study with dentigerous cyst having prevalence of 22.1% (second only to radicular cyst which had a higher prevalence) affecting predominantly males (Male: Female 2.67:1) and posterior mandible being the most common site of occurrence (50.8%). The high frequency of dentigerous cyst in posterior mandible has been ascribed by Jones et al. to third molars being the most commonly impacted teeth.⁵

Odontogenic keratocyst was renamed 'keratocystic odontogenic tumor' and categorized as a neoplasm in the classification released by WHO in 2005. This was done on account of its high recurrence rate, aggressive clinical behavior, association with nevoid basal cell carcinoma syndrome, and mutations in the PTCH tumor suppressor gene.²¹ The 2017 WHO classification however reverted back to the original and accepted terminology of odontogenic keratocyst and recognized it as an odontogenic cyst. The reversion was based on evidence of many studies showings that the PTCH gene mutation could be found in non-neoplastic lesions, including dentigerous cysts.²² Furthermore, many researchers suggested that resolution of the cyst after marsupialization was not compatible with a neoplastic process.²³⁻²⁵ Both orthokeratinised and parakeratinised histologic variants were previously categorized as odontogenic keratocysts. According to the new WHO classification however orthokeratinised histologic form has been placed under a separate category as orthokeratinised odontogenic cyst. However for the sake of comparison with other studies we have placed both parakeratinised and orthokeratinised variants of keratogenic cysts under odontogenic keratocysts.

Odontogenic keratocyst was the third most prevalent cyst in our study with frequency of 20.18%. Daley et al.¹² (4.88%), Selvamani et al.²⁶ (5.2%) and Shear¹³ (11.2%) reported much lower frequency. The lower incidence quoted in certain studies like Selvamani et al. may be due to the author characterizing Odontogenic Keratocysts as Keratanoid Odontogenic Tumor based on the classification issued by WHO in 2005.²¹ They considered only the orthokeratinised variant as odontogenic keratocyst. Other studies by Mosqueda et al.¹⁰ (21.5%) and Ledesma¹⁸ (18.8%) have reported frequency of odontogenic keratocyst nearly similar to our findings (20.18%). Most cases of OKC were diagnosed in men between the second and third decades of life in the posterior region of mandible which is in agreement with findings from many other studies.^{5,10,18,20,8} While OKC has been reported to have high recurrence rate, no systematic data of follow up visits were available and were not included in the analysis in our study.

A lateral periodontal cyst is a developmental cyst that originates from epithelial rests in the periodontal ligament and occurs lateral to the root of a vital tooth. They are usually asymptomatic and are often found during routine radiographic examination. Botryoid Odontogenic Cyst as a polycystic variant of lateral periodontal cyst.²⁷ Studies in literature have found a frequency of 0.3% to 8% among all odontogenic cysts.^{2,3,6,8} We found 15cases (1.8%)

of LPC and 2 cases (0.23%) of botryoid odontogenic cyst. Gingival cysts are relatively uncommon lesions that may arise due to traumatic implantation of the surface epithelium or from the cystic degeneration of deep projections of the surface epithelium, remnants of the dental lamina, enamel organ, or cell rests of Malassez.²⁸ We observed 1 case of a gingival cyst (0.12%), consistent with the results (0.4%).

The radiological presentation for radicular, residual and dentigerous cyst were generally unilocular with sclerosing margin which was in agreement with findings of most studies. Multilocular lesions with scalloped margins were often found in OKC.

The findings from our study shows the demographic and clinicopathological characteristics of various odontogenic cysts with some cysts having predilection for certain ages, sex and sites. The three most common cyst (radicular cyst, Dentigerous and Odontogenic keratocyst) comprised 96.8% of all odontogenic cysts. Odontogenic keratocysts can have marked propensity to recur and may have a clinically aggressive progression. Our finding highlights the need for establishing better follow up records and its analysis especially in pathologies suspected to have high recurrence rate.

Acknowledgment

None.

Conflict of Interest

The authors report no conflict of interest.

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