ORIGINAL RESEARCH PAPER
Volume - 11 | Issue - 09 | September - 2022 | PRINT ISSN No. 2277 - 8179 | DOI : 10.36106/ijsr
INTERNATIONAL JOURNAL OF SCIENTIFIC RESEARCH

CLINICOPATHOLOGIC PROFILE OF ODONTOGENIC LESIONS – A FOUR YEAR RETROSPECTIVE STUDY IN A TERTIARY CARE CENTRE

Oral Pathology

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ABSTRACT

Background: Odontogenic cysts and tumors are the most frequent osseous destructive lesions of the jaws. Very few studies include Asians, especially from the Indian subcontinent are reported. **Aim:** The present study is designed to determine the relative frequency and clinicopathological characteristics of odontogenic cysts and tumors relative to age, gender and site distribution over a period 2018-2021in a Tertiary dental Health Care Centre in Kerala. **Materials and Methods:** Archives of biopsy reports of histopathologically diagnosed cases of odontogenic cysts and odontogenic tumours were retrieved from the Department of Oral Pathology and Microbiology, Government Dental College, Thrissur during the time period January 2018 through December 2021. Age, gender and site of lesion were recorded. The data were analyzed using SPSS software. **Results:** From a total of 648 oral lesions, 174 cases (26.9%) were odontogenic lesions. About 35 cases of odontogenic tumors (5.4%) and 139 cases of odontogenic cysts (21.5%) were found. The most common tumor was ameloblastoma which constituted 54.3%. Mandible was the most common jaw involved (65.7%). Odontogenic cysts constituted 139 cases (21.5%) of oral biopsies. Periapical cyst was the most common odontogenic cyst and accounted for 51.8%. Dentigerous cyst was the second most common cyst forming 20.1% of odontogenic cysts. **Conclusion:-** This study showed similar as well as contradictory results compared to other studies, probably due to geographical and ethnic variations which is yet to be corroborated.

KEYWORDS

odontogenic tumours, odontogenic cyst, Ameloblastoma, Periapical cyst

INTRODUCTION

Odontogenic lesions are the most frequent osseous destructive lesions of the jaws. All these lesions originate by aberrations in the normal pattern of odontogenesis and thereby reflect the complex development of oro-dental structures[1,2]. These lesions are derived from epithelial, ectomesenchymal and/or mesenchymal elements that are, or have been, part of tooth forming apparatus[3]. Moreover, some of these lesions have shown neoplastic alterations or aggressive clinical behavior[4,5,6].

Odontogenic tumors (OTs) comprise a complex group of lesions of diverse histopathologic types and clinical behaviour and accounts for 1% of all the tumours of the jaw[7]. They constitute a group of heterogenous lesions that range from hamartomatous or non-neoplastic tissue proliferations to malignant neoplasm with metastatic capabilities[8]. These tumours like normal odontogenesis, demonstrate varying inductive interactions between odontogenic epithelium and odontogenic ectomesenchyme[9]. They are found exclusively within the maxillofacial skeleton (intraosseous) or in the gingiva overlying tooth-bearing areas or alveolar mucosa in edentulous regions[10].

Odontogenic cysts arise from the epithelial components of the odontogenic apparatus or its remnants that lie entrapped within bone or in the gingival tissue[11].These lesions generally show slow and expansive growth and are associated in some cases with marked bone destruction and recurrence causing bone or tooth resorption, fracture, or tooth displacement[12,13,14,15]. Their genesis is closely related to dental ontogeny, 90% of them are formed from odontogenic epithelium or its embryonic remnants, nevertheless, in most cases, their etiology is still unknown[16,17,18]

Despite the importance of these lesions, information regarding their demographic profile in different populations is scarce. Very few studies include Asians, especially from the Indian subcontinent. The present study is designed to determine the relative frequency and clinicopathological characteristics of odontogenic cysts and tumors relative to age, gender and site distribution at a teaching institute in Thrissur over the period of 4 years.

MATERIALS AND METHODS

The study was a retrospective descriptive study. Archives of biopsy reports of histopathologically diagnosed cases of odontogenic cysts and odontogenic tumours were retrieved from the Department of Oral Pathology and Microbiology Government Dental College, Thrissur during the time period January 2018 through December 2021. Patient's records were assessed to select those cases diagnosed as odontogenic cysts and tumors of the oral cavity. Odontogenic cysts and tumors were classified according to the WHO classification,2022. Clinical information regarding gender, age and anatomic site were obtained from the patient's records for each case. Incompletely filled records and recurrent cases were excluded. The age groups were subdivided into 9 decades (for example, 0–9 years as first decade, 10-19 as second decade etc.). Data was recorded and analyzed by descriptive statistics using the Statistical Package for Social Sciences (SPSS). Chi-square test and Fisher's exact test were performed. $P < 0.05$ was considered statistically significant. This retrospective study was approved by the Institutional Ethics Committee for Research.

RESULTS

From a total of 648 oral lesions in our archives during 2018-2021, 174 cases (26.9%) were odontogenic lesions. About 35 cases odontogenic tumors (5.4%) and 139 cases of odontogenic cysts (21.5%) were found. Of all odontogenic tumors 97.1% were benign and 2.9% were malignant. The most common tumor was ameloblastoma which constituted 54.3% of odontogenic tumors. Unicystic and peripheral types (UA &PA) formed 20% and 2.9%, respectively. Two cases each of Odontome & Squamous Odontogenic tumor (SOT) and one case of Calcifying epithelial odontogenic tumor (CEOT), Adenomatoid odontogenic tumor (AOT), Dentinogenic ghost cell tumor (DGCT) and Ameloblastic Carcinoma were also observed. The frequency distribution of odontogenic tumors according to histopathology is shown in Figure 1.

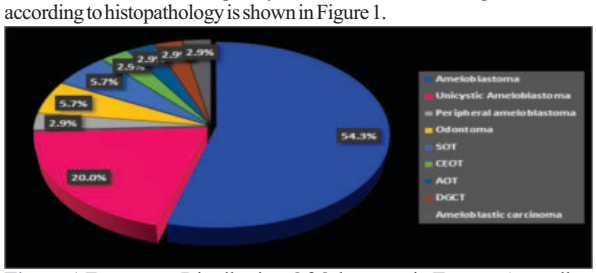

Figure 1 Frequency Distribution Of Odontogenic Tumors According To Histopathology

Of the 19 conventional ameloblastomas, 16cases (84.2%) occurred in the third to sixth decades of life with peak in the 3rd decade. Unicystic ameloblastoma (UA) occurred in the 5th decade (42.9%), Odontoma (50%) showed a higher frequency in the second decade and third decade. The distribution of odontogenic tumors according to age is shown in Figure 2. Fischer's exact test done did not show a significant association between age and OTs(p=0.308).

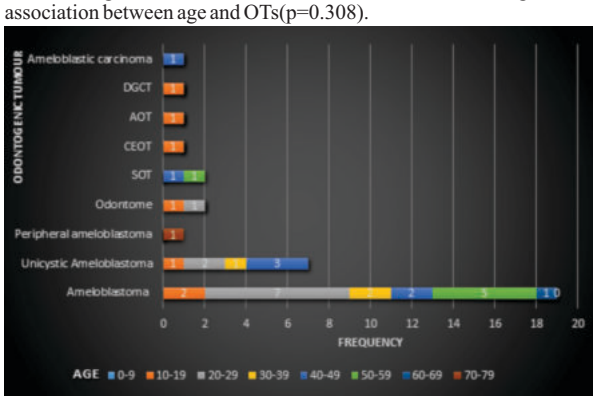

Figure 2. Distribution of odontogenic tumors according to age

Odontogenic tumors showed a slight female predilection. About 45.7% of cases were males and 54.3% were females. Ameloblastoma and UA showed a female predominance with a male to female ratio of 0.7:1 and 0.4:1 respectively. Odontoma showed an equal distribution among both genders. The distribution of odontogenic tumors according to gender is shown in Figure 3. No significant association between gender and OTs were obtained by Fischer's exact test (p=0.678).

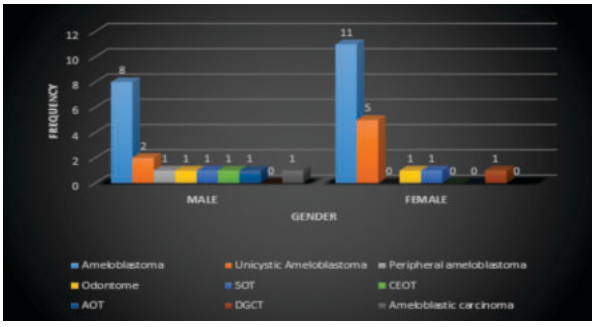

Figure 3 Distribution of odontogenic tumors according to gender

Mandible was the most common jaw involved (65.7%). In 51.4% of odontogenic tumors, mandibular posterior region was involved. The distribution of OTs based on different anatomic sites is shown in Figure 4. Fischer's exact test showed a significant association between anatomic site and OTs(p=0.011).

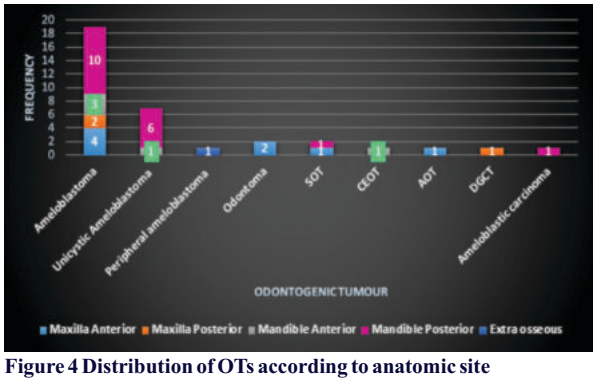

Figure 4 Distribution of OTs according to anatomic site

Odontogenic cysts constituted 139 cases (21.5%) of oral biopsies. Periapical cyst was the most common odontogenic cyst and accounted for 51.8% of odontogenic cysts. Dentigerous cyst was the second most common cyst forming 20.1% of odontogenic cysts. Odontogenic Keratocyst (OKC) accounted for 18% of cases. The frequency distribution of odontogenic cysts according to histopathology is shown in Figure 5.

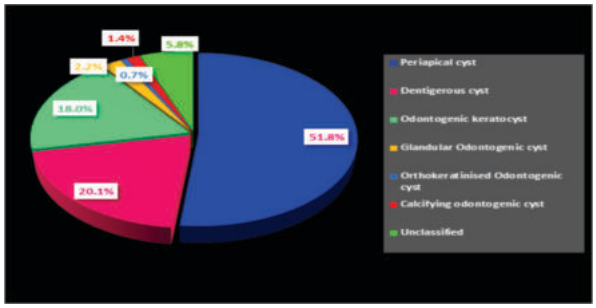

Figure5 Distribution of odontogenic cysts according to histopathology

Overall, a male predilection was noticed as shown in Figure 6. Nearly 63.3% of odontogenic cyst occurred in males and 36.7% in females. The distribution of odontogenic cysts according to gender is shown in Figure 6. We could not demonstrate a significant association between gender and odontogenic cysts by Fischer's exact test (p=0.807).

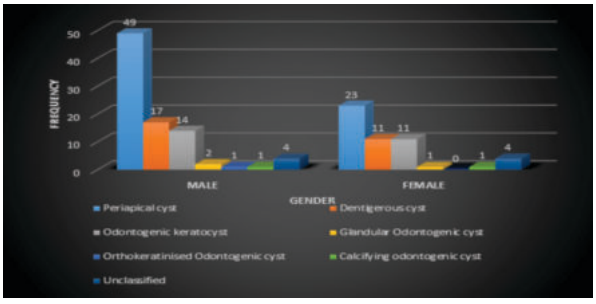

Figure 6 Distribution of odontogenic cysts according to gender

Radicular cyst showed a peak incidence in third and fourth decades (38.9%). The dentigerous cyst was more common in the first and second decades (50%) whereas OKC occurred in the second and third decades (60%). The distribution of odontogenic cysts according to age is given in Figure 7. Fischer's exact test showed no significant correlation between age and odontogenic cysts (p=0.465).

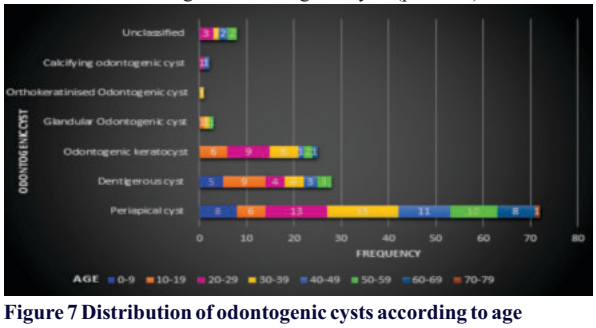

Figure 7 Distribution of odontogenic cysts according to age

The mandible was the most common jaw affected by the odontogenic cysts (48.9%). In 38.1% of cases mandibular posterior region was involved. The next common site was a maxillary anterior region (36%). Radicular occurred mostly in the maxillary anterior region (47.2%) whereas Dentigerous cyst showed almost equal distribution between maxillary anterior (35.7%) and mandibular posterior regions (42.8%). The distribution of odontogenic cyst according to anatomic site is given in Figure 8. A significant association existed between anatomic site and odontogenic cysts (p=0.023) by Fischer's exact test.

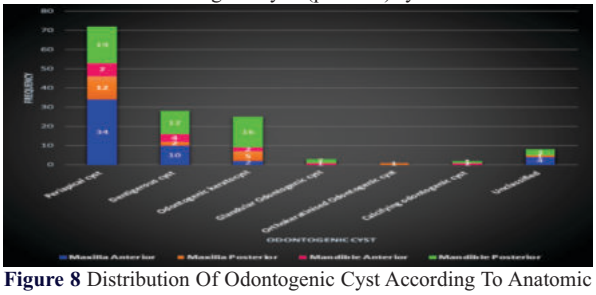

Figure 8 Distribution Of Odontogenic Cyst According To Anatomic Site

DISCUSSION

This study describes a series of Odontogenic Lesions reported at the Oral Pathology Department, Government Dental college, Thrissur, which is the major referral centre in the region for all types of dental treatment. The incidence and epidemiological behavior of odontogenic lesions demonstrate geographical variations in different regions of the world. In this study, odontogenic cysts and tumors constituted 26.9% of total oral biopsies.

The relative frequency of odontogenic tumors (OTs) in the present study was 5.4% of all specimens received between January 2018 and December 2021. The fact that most OTs remain painless throughout the course of the disease is the main reason that patients do not present until the tumors have reached enormous sizes[19,20]. Knowing the frequency and basic clinical features of OTs is important because this allows us to establish more precisely the expression of these lesions in diverse populations, which in turn helps to identify the groups at risk and possible factors associated with their development, as well as to formulate more precise differential diagnoses[21].

Odontogenic tumors have variable incidence worldwide and may present regional differences. The incidence in our study was 5.4% which is higher when compared to other studies from India[22,23] and America[24,25], but lower than those from Africa[26]. It was also corresponding with the findings of some studies from India and Asia [27,28,29].

The difference in the prevalence of odontogenic tumors in different parts of the world denotes that the incidence of these lesions possibly is related to the racial and environmental factors[4]. It also indicates that prevalence of OTs varies depending on the version of classification followed. In India, there is variation in frequency rates of OTs, most likely due to inherent regional disparities.

In this study, 97.1% of tumors were benign and 2.9% malignant, which is in line with most other reports[7,30,31,32]. Among these tumors, benign epithelial tumors were the most commonly encountered which is similar to previous reports from Africa, Nigeria, Hong Kong, Turkey, and China[33,34,35,36].Interestingly, this is in contrast to reports from the United States, Mexico, Chile, Germany, and Canada where epithelial and mesenchymal tumors have been reported as the most commonly encountered OT[24,37].

The most common odontogenic tumor in this study is Ameloblastoma (54.3%). This was similar to studies from Asian and African[26,29,38,39] countries. In the current institutional study Unicystic ameloblastoma (20%) was the second most common tumor followed by odontoma (5.7%). This was in accordance with findings by Bhat A[40]. The high frequency of Ameloblastoma and low frequency of Odontoma are consistent with data from other countries [7,15,22,26]. Contradictory findings were observed in some other studies which stated that Odontoma occurred more frequently than Ameloblastoma. In this study, Odontoma is in the third position. These discrepancies in the number of Odontomas being less in some populations in comparison with others are probably the result of geographic variation, or may be due to the lack of routine dental care as these tumours remain unnoticed for years. Moreover, after surgical removal these tumours might not been sent for histopathological examination. Moreover, Odontomes exhibit self-limited growth and do not cause clinical symptoms.

Overall a slight female predilection (male:female = 0.84:1) of odontogenic tumors was noticed in this study. This is in concordance with studies from America and Europe[10,32,37,41]. Contrasting findings were seen in studies from China, Africa, Australia and another study from India where a male predilection was noted[26,27,29].

Ameloblastoma showed a male to female ratio of 0.73:1. This result was different from studies in China, Nigeria and another study from India where male predilection was noticed[26,27,29]. However, studies from Brazil showed a female predilection[11,12,14]. This possibly discloses a gender difference among different populations.

This study showed that odontogenic tumors showed a peak occurrence in the third decade, similar to earlier studies from Nigeria, China and India[26,38,42]. However, studies from Chile and Brazil showed peak in second decade[24,43]. This may be because odontoma constituted the most common odontogenic tumor in those populations or may be due to a racial difference in incidence[22].

Of 19 ameloblastomas, 16cases (84.2%) occurred in the third to sixth decades of life with peak in the 3rd decade. Unicystic ameloblastoma (UA) occurred in the 5th decade (42.9%), Odontoma (50%) showed a higher frequency in the second decade and third decade.

Mandible was the most common jaw involved (65.7%) by OTs with maxilla to mandible ratio of 0.48:1. In 51.4% of odontogenic tumors, mandibular posterior region was involved. This is similar to other studies from Asia and Africa[2,8,22,31]. However, studies from American continent showed an almost equal predilection for both the jaws[10,24,25]. This might be due to the lower frequency of ameloblastoma in that population.

Odontogenic cysts comprised 139 cases (21.5%) of oral biopsies during 2018–2021. This frequency of odontogenic cysts is similar to other studies in the Saudi Arabia, India and UK[15,22,44.] The most common odontogenic cyst in the present study was radicular cyst, similar to other studies[41,45,46]. Radicular cysts comprised 51.8% of odontogenic cysts, which is higher than most of the other studies[45,46]. A putative explanation to justify this high prevalence of radicular cyst could be related to caries. Radicular cyst in most cases is a consequence of deep carious lesions and dental pulp necrosis. This disease is still the major oral health problem worldwide and presents a prevalence classified as "very high" in all age ranges. However, a study from Sicily showed a higher frequency of 84.5%[41].

In this study Radicular cysts were mostly diagnosed in male patients which is in accordance with earlier reports. This may be because women are probably more concerned of their oral health [4,22.]

The frequent location of radicular cyst was the maxillary anterior zone mainly associated to central and lateral incisor teeth which is also in accordance with other studies[47.]

Dentigerous cyst (DC) constituted 20.1% of odontogenic cysts. This result is in accordance with a systematic review by Johnson et al [47]. However, Kambalimath et al [48] and Ramachandra et al[49] found DC to be the most common odontogenic cyst in their study. The mean prevalence of DC in our study was in 2nd to 4th decade. Our finding was consistent with earlier studies[49]. However, the incidence is lower than studies from Brazil and Saudi Arabia [15,45].

Generally odontogenic cysts showed a definite male predilection with a male to female ratio of 1.73:1. Dentigerous cyst also showed a male preponderance with M:F ratio of 1.55:1. This might be due to a smaller jaw size and a greater trend for prophylactic extraction of third molars in females[22]. In the present study, dentigerous cyst showed an almost equal predilection for maxillary anterior and mandibular posterior regions. This is in contrast to other studies showing a definite predilection for the mandibular posterior region[45,46]. Aesthetic concerns of the patients regarding non-eruption of anterior teeth, especially canine might have resulted in an increased reporting of dentigerous cyst in our region. Any geographical difference in the population regarding the site of occurrence is yet to be ruled out.

In this study, OKC accounts for 18 % of odontogenic tumors, forming the third most common odontogenic cyst. This is consistent with previous reports [28,45]. OKC was more commonly seen in the wide age range of 19-40 years and this is in concordance with various other studies [22,28]. A definite male predilection was seen in this study similar to the findings from other studies[28,48,49]. The most common site was the posterior mandible as seen in other reports[22,23,45]. Orthokeratinized Odontogenic Cyst (OOC) showed a mean prevalence of 3.03%. Similar to OKC, OOC was also common in 2nd to 4th decade but showed a female predilection.

Other cysts like Glandular odontogenic cyst (GOC) and calcifying odontogenic cyst (COC) showed prevalence of 2.2% and 0.7%. GOC and COC were more common in 4th to 5th decade, with a definite female predilection. Similar findings were seen in other reports also[48].

CONCLUSION

The present study reviewed the epidemiological profile of odontogenic cysts and tumors in a tertiary dental healthcare setting in Kerala. Thus, providing the relative distribution of different odontogenic cysts and tumors reported at our institution.

According to the present study we found a higher incidence of

odontogenic cyst than odontogenic tumors, with a male predilection. Moreover, we also observed variation in relative incidences of odontogenic cysts and tumors among different population which may be attributed to the geographic variations.

Variability in the data with previous studies can be attributed to the diverse demographic factors. These findings can help us in better understanding of such lesions and ameliorate the diagnosis of odontogenic cysts and tumors.

It is noteworthy that due to the small number of odontogenic tumors observed in this study, some tumors have not been diagnosed or merely small numbers have been reported. Subsequently, further studies are recommended to find out the relative frequency of odontogenic tumors and cysts in our country.

REFERENCES

1. Taghavi, N., Rajabi, M., Mehrdad, L., & Sajjadi, S. (2013). A 10-year retrospective study on odontogenic tumors in Iran. *Indian Journal of Dental Research*, *24*(2), 220.
2. Sharma, P. N., Ranka, R. K., Chaudhary, M. S., Gawande, M. N., Hande, A. H., & Zade, P. F. (2020). Odontogenic tumors: A review of 93 cases in the Vidharba region of Maharashtra. *Journal of Oral and Maxillofacial Pathology: JOMFP*, *24*(1), 185.
3. Reichart, P., & Philipsen, H. P. (2004). *Odontogenic tumors and allied lesions*. Quintessence publishing company.
4. Baghaei, F., Zargaran, M., Najmi, H., & Moghimbeigi, A. (2014). A clinicopathological study of odontogenic cysts and tumors in hamadan, iran. *Journal of Dentistry*, *15*(4), 167
5. Neville, B. W., & Damm, D. (2009). D, Allen CM, Bouquopt JE Oral and Maxillofacial Pathology. *St Louis: 3th ed., Saunders*, 84-99.
6. Regezi JA, Sciubba JJ, Jordan RCK. Oral pathology: Clinical pathologic correlations. 5th ed. St.Louis: Saunders; 2008. p. 248, 261.
7. Lawal, A. O., Adisa, A. O., & Olusanya, A. A. (2013). Odontogenic tumours: A review of 266 cases. *Journal of clinical and experimental dentistry*, *5*(1), e13.
8. Singh, J., Singh, S., Chandra, S., & Samadi, F. M. (2020). Prevalence and distribution of odontogenic cysts and tumors in North Indian population: a database study with systematic review. *International Journal of Applied Biology and Pharmaceutical Technology*, *11*(2), 46-59.
9. Bilodeau, E. A., & Collins, B. M. (2017). Odontogenic cysts and neoplasms. *Surgical pathology clinics*, *10*(1), 177-222.
10. Buchner, A., Merrell, P. W., & Carpenter, W. M. (2006). Relative frequency of central odontogenic tumors: a study of 1,088 cases from Northern California and comparison to studies from other parts of the world. *Journal of oral and maxillofacial surgery*, *64*(9), 1343-1352.
11. Souza, L. B. D., Gordón Nuñez, M. A., Nonaka, C. F. W., Medeiros, M. C. D., Torres, T. F., & Emiliano, G. B. G. (2010). Odontogenic cysts: demographic profile in a Brazilian population over a 38-year period.
12. Prockt, A. P., Schebela, C. R., Maito, F. D., Sant'Ana-Filho, M., & Rados, P. V. (2008). Odontogenic cysts: analysis of 680 cases in Brazil. *Head and neck pathology*, *2*(3), 150-156.
13. Ha, W. N., Kelloway, E., Dost, F., & Farah, C. S. (2014). A retrospective analysis of oral and maxillofacial pathology in an Australian paediatric population. *Australian dental journal*, *59*(2), 221-22
14. Nonaka CF, Henriques AC, de Matos FR, de Souza LB, Pinto LP. Nonodontogenic cysts of the oral and maxillofacial region: demographic profile in a Brazilian population over a 40-year period. Eur Arch Otorhinolaryngol. 2011;268:917-22.
15. Al Sheddi, M. A. (2012). Odontogenic cysts. A clinicopathological study. *Saudi medical journal*, *33*Gohel, A., Villa, A., & Sakai, O. (2016). Benign jaw lesions. *Dental Clinics*, *60*(1), 125-141. (3), 304-308.
16. Gohel, A., Villa, A., & Sakai, O. (2016). Benign jaw lesions. *Dental Clinics*, *60*(1), 125-141.
17. Slootweg PJ. Lesions of the jaws. Histopathology. 2009;54:401-18
18. Martin, L., & Speight, P. M. (2015). Odontogenic cysts. *Diagnostic Histopathology*, *21*(9), 359-369.
19. Sekerci, A. E., Nazlım, S., Etoz, M., Denız, K., & Yasa, Y. (2015). Odontogenic tumors: a collaborative study of 218 cases diagnosed over 12 years and comprehensive review of the literature. *Medicina oral, patologia oral y cirugia bucal*, *20*(1), e34.
20. Tawfik, M. A., & Zyada, M. M. (2010). Odontogenic tumors in Dakahlia, Egypt: analysis of 82 cases. *Oral Surgery, Oral Medicine, Oral Pathology, Oral Radiology, and Endodontology*, *109*(2), e67-e73.
21. Taylor, A. M. (2008). New findings and controversies in Odontogenic tumors. *Medicina oral, patología oral y cirugía bucal. Ed. inglesa*, *13*(9), 5.
22. Deepthi, P. V., Beena, V. T., Padmakumar, S. K., Rajeev, R., & Sivakumar, R. (2016). A study of 1177 odontogenic lesions in a South Kerala population. *Journal of Oral and Maxillofacial Pathology: JOMFP*, *20*(2), 202.
23. Nalabolu, G. R., Mohiddin, A., Hiremath, S. K., Manyam, R., Bharath, T. S., & Raju, P. R. (2017). Epidemiological study of odontogenic tumours: An institutional experience. *Journal of infection and public health*, *10*(3), 324-330.
24. Ochsenius, G., Ortega, A., Godoy, L., Peñafiel, C., & Escobar, E. (2002). Odontogenic tumors in Chile: a study of 362 cases. *Journal of oral pathology & medicine*, *31*(7), 415-420.
25. Osterne, R. L. V., de Matos Brito, R. G., Alves, A. P. N. N., Cavalcante, R. B., & Sousa, F. B. (2011). Odontogenic tumors: a 5-year retrospective study in a Brazilian population and analysis of 3406 cases reported in the literature. *Oral Surgery, Oral Medicine, Oral Pathology, Oral Radiology, and Endodontology*, *111*(4), 474-481.
26. Ladeinde, A. L., Ajayi, O. F., Ogunlewe, M. O., Adeyemo, W. L., Arotiba, G. T., Bamgbose, B. O., & Akinwande, J. A. (2005). Odontogenic tumors: a review of 319 cases in a Nigerian teaching hospital. *Oral Surgery, Oral Medicine, Oral Pathology, Oral Radiology, and Endodontology*, *99*(2), 191-195
27. Varkhede, A., Tupkari, J. V., & Sardar, M. (2011). Odontogenic tumors: a study of 120 cases in an Indian teaching hospital.
28. Pandiar, D., Shameena, P. M., Sudha, S., Varma, S., Manjusha, P., Banyal, V. S., & Vijayan, P. (2015). Odontogenic Tumors: A 13-year Retrospective Study of 395 Cases in a South Indian Teaching Institute of Kerala. *Oral & Maxillofacial Pathology Journal*, *6*(2).
29. Luo, H. Y., & Li, T. J. (2009). Odontogenic tumors: a study of 1309 cases in a Chinese population. *Oral oncology*, *45*(8), 706-711.
30. Servato, J. P. S., Prieto-Oliveira, P., De Faria, P. R., Loyola, A. M., & Cardoso, S. V. (2013). Odontogenic tumours: 240 cases diagnosed over 31 years at a Brazilian university and a review of international literature. *International journal of oral and maxillofacial surgery*, *42*(2), 288-293.
31. Odukoya, O. (1995). Odontogenic tumors: analysis of 289 Nigerian cases. *Journal of oral pathology & medicine*, *24*(10), 454-457.
32. Daley, T. D., Wysocki, G. P., & Pringle, G. A. (1994). Relative incidence of odontogenic tumors and oral and jaw cysts in a Canadian population. *Oral Surgery, Oral Medicine, Oral Pathology*, *77*(3), 276-280.
33. Arotiba, J. T., Ogunbiyi, J. O., & Obiechina, A. E. (1997). Odontogenic tumours: a 15-year review from Ibadan, Nigeria. *British Journal of Oral and Maxillofacial Surgery*, *35*(5), 363-367.
34. Wu, P. C., & Chan, K. W. (1985). A survey of tumours of the jawbones in Hong Kong Chinese: 1963–1982. *British Journal of Oral and Maxillofacial Surgery*, *23*(2), 92-102.
35. Günhan, Ö., Erseven, G., Ruacan, Ş., Celasun, B., Aydintug, Y., Ergun, E., & Demiriz, M. (1990). Odontogenic tumours. A series of 409 cases. *Australian dental journal*, *35*(6), 518-522.
36. Lu, Y., Xuan, M., Takata, T., Wang, C., He, Z., Zhou, Z., ... & Nikai, H. (1998). Odontogenic tumors: a demographic study of 759 cases in a Chinese population. *Oral Surgery, Oral Medicine, Oral Pathology, Oral Radiology, and Endodontology*, *86*(6), 707-714.
37. Larsson, Å., & Almerén, H. (1978). Ameloblastoma of the Jaws: An Analysis of a Consecutive Series of all Cases Reported to the Swedish Cancer Registry during 1958–1971. *Acta Pathologica Microbiologica Scandinavica Section A Pathology*, *86*(1.6), 337-349.
38. Jing, W., Xuan, M., Lin, Y., Wu, L., Liu, L., Zheng, X., ... & Tian, W. (2007). Odontogenic tumours: a retrospective study of 1642 cases in a Chinese population. *International journal of oral and maxillofacial surgery*, *36*(1), 20-25.
39. Adebayo, E. T., Ajike, S. O., & Adekeye, E. O. (2005). A review of 318 odontogenic tumors in Kaduna, Nigeria. *Journal of oral and maxillofacial surgery*, *63*(6), 811-819.
40. Bhat, A., Mitra, S., Chandrashekar, C., Solomon, M., & Kulkarni, S. Odontogenic cysts and odontogenic tumors in a large rural area from India.
41. Tortorici, S., Amodio, E., Massenti, M. F., Buzzanca, M. L., Burruano, F., & Vitale, F. (2008). Prevalence and distribution of odontogenic cysts in Sicily: 1986-2005. *Journal of oral science*, *50*(1), 15-18.
42. Sriram, G., & Shetty, R. P. (2008). Odontogenic tumors: a study of 250 cases in an Indian teaching hospital. *Oral Surgery, Oral Medicine, Oral Pathology, Oral Radiology, and Endodontology*, *105*(6), e14-e21.
43. Fernandes, A. M., Duarte, E. C. B., Pimenta, F. J. G. S., Souza, L. N., Santos, V. R., Mesquita, R. A., & de Aguiar, M. C. F. (2005). Odontogenic tumors: a study of 340 cases in a Brazilian population. *Journal of oral pathology & medicine*, *34*(10), 583-587.
44. Jones, A. V., Craig, G. T., & Franklin, C. D. (2006). Range and demographics of odontogenic cysts diagnosed in a UK population over a 30.year period. *Journal of Oral Pathology & Medicine*, *35*(8), 500-507.
45. Avelar, R. L., Antunes, A. A., Carvalho, R. W., Bezerra, P. G., Neto, P. J. O., & Andrade, E. S. (2009). Odontogenic cysts: a clinicopathological study of 507 cases. *Journal of oral science*, *51*(4), 581-586.
46. Núñez Urrutia, S., Figueiredo, R., & Gay Escoda, C. (2010). Retrospective clinicopathological study of 418 odontogenic cysts.
47. Johnson, N. R., Gannon, O. M., Savage, N. W., & Batstone, M. D. (2014). Frequency of odontogenic cysts and tumors: a systematic review. *Journal of investigative and clinical dentistry*, *5*(1), 9-14.
48. Kambalimath, D. H., Kambalimath, H. V., Agrawal, S. M., Singh, M., Jain, N., Anurag, B., & Michael, P. (2014). Prevalence and distribution of odontogenic cyst in Indian population: a 10 year retrospective study. *Journal of maxillofacial and oral surgery*, *13*(1), 10-15.
49. Ramachandra, S., Shekar, P. C., Prasad, S., Kumar, K. K., Reddy, G. S., Prakash, K. L., & Reddy, B. V. R. (2014). Prevalence of odontogenic cysts and tumors: A retrospective clinico-pathological study of 204 cases. *SRM Journal of Research in Dental Sciences*, *5*(3), 170.