Original Article

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Dentistry Section

Demographic Profile and Clinicopathological Characteristics of Odontogenic Cysts and Tumours: A 10-Year Retrospective Cross-sectional Study

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ABSTRACT

Introduction: Epidemiological studies on Odontogenic Cysts (OC) and Odontogenic Tumours (OT) were conducted in different parts of the world, and much less are reported in the literature from the Kanyakumari population in Tamil Nadu. The present study may serve as baseline data for future multicentric longitudinal research.

Aim: To evaluate the demographic and clinicopathological characteristics of OCs and OTs diagnosed over a 10-year period and compare the findings with previously published reports in the literature from other parts of India and worldwide.

Materials and Methods: The current demographic retrospective cross-sectional study was conducted in the Department of Oral Pathology and Microbiology, Sree Mookambika Institute of Dental Sciences, Kulasekharam, Kanyakumari, Tamil Nadu, India. It was based on the epidemiologic and clinicopathological data of all patients reported with a histopathologic diagnosis of OC and 7 tumours, retrieved from the archives of the Department of Oral and Maxillofacial Pathology over a period of 10 years from January 2015 to December 2024. All cases with definitive histopathological diagnosis of OC and OT with complete demographic and clinical data and histologic slides were included in the study. The microscopic slides were examined, and the diagnosis was modified according to the 2022 World Health Organisation (WHO) classification of odontogenic and maxillofacial bone tumours. Patient's age, gender, site of lesion, clinical and pathological data were analysed using descriptive statistics.

Results: Among 82 cases, a total of 49 (59.75%) cases were males, and male-to-female ratio was 1.44:1. Data from 540 samples of oral biopsies was retrieved. Of these, 82 cases of OCs (15%) and 35 cases of Odontogenic Tumours (OTs) (6.5%) were used in the present study after reassessing the diagnosis. Radicular Cyst (RC) was the most common OCs, 40 cases (49%) with a mean age of 35 years and male predilection and anterior maxillary predominance. Among the OTs, Ameloblastoma (AME) constituted 17 cases (48.5%) followed by six cases of Odontoma (OD) and Cement-Ossifying Fibroma (COF) each. AME showed a strong male predilection, and the most favoured anatomical site is mandibular posteriors (76.47%).

Conclusion: The current study reflects not only differences in the distribution of odontogenic lesions but also similarities among the varied population samples assessed both in India and around the world, which contribute significantly to enhancing the concepts of treatment and prognosis.

Keywords: Ameloblastoma, Calcifying epithelial odontogenic tumour, Odontoma

INTRODUCTION

Odontogenic lesions are a broader term, of which OCs and OTs constitute more than two-thirds. Although the malignant counterparts of OT are rare, these lesions show a great impact on an individual's well-being, facial aesthetics, and oral function. Taking into account the heterogeneous nature of these lesions, the World Health Organisation (WHO) constantly updates the classification of these lesions, with the most recent being the WHO classification of odontogenic and maxillofacial bone tumours (5th edition) in 2022 [1-3].

Although numerous studies on the prevalence of OC and OTs are reported worldwide, the epidemiologic data vary depending on the geographic location, population and ethnic differences. Among the previously published literature, studies based on the Tamil Nadu population [4-6] remain scarce, with most of the studies being focused on the northern districts and were based on the WHO 2005 classification [3]. A significant research gap exists regarding the demographic and clinicopathologic distribution of OC and OTs among Kanyakumari population; hence, the current study aimed to assess the same and compare the data obtained with similar studies from India and other parts of the world. This Institutional retrospective study may provide baseline data for further multicentric and longitudinal studies.

MATERIALS AND METHODS

The current retrospective cross-sectional study was conducted at the Department of Oral Pathology and Microbiology, Sree Mookambika Institute of Dental Sciences, Kulasekharam, Kanyakumari, Tamil Nadu, India, over a period of 10 years from January 2015- December 2024. It was based on the frequency and clinicopathological details of patients with histopathologically confirmed diagnosis of OCs and OTs, retrieved from the archives of the Department of Oral and Maxillofacial Pathology. The study was reviewed and approved by the Institutional Review Board and Ethical Committees (SMIDS/IHEC No: 05/Protocol No: 38/2024).

Sample size: As this was a time-bound study, the sample size was determined by the total number of eligible cases from the Institutional records and a convenience sampling technique was preferred.

Inclusion criteria: Cases with complete demographic and clinical details, histopathological slides or paraffin-embedded blocks available are included in the study.

Exclusion criteria: Patient cases with incomplete demographic and clinical data or with missing histological slides and repeated biopsy cases were excluded.

Study Procedure

All relevant data, including patient age, gender, location and tumour histopathology, were extracted from medical records. Haematoxylin and eosin-stained slides for all included cases were retrieved, cross-examined by a certified oral pathologist, and reviewed; the final diagnosis was modified according to the 2022 WHO classification of odontogenic and maxillofacial bone tumours [1,2].

STATISTICAL ANALYSIS

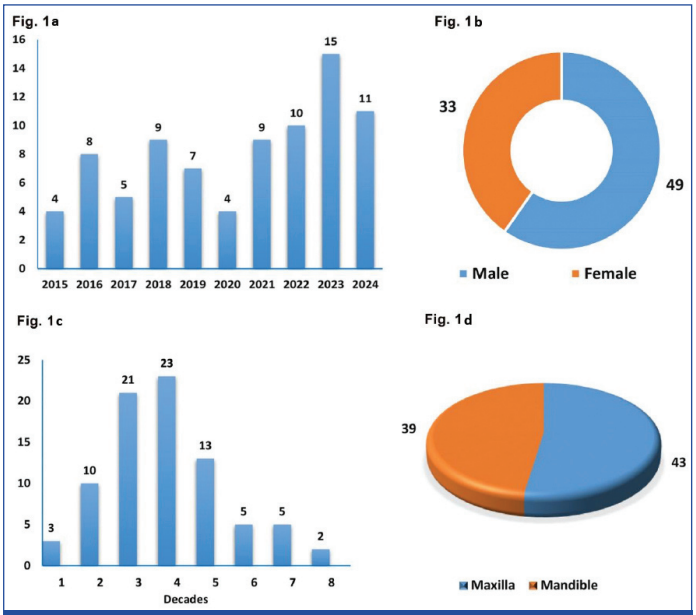
Data collected were tabulated and entered into Statistical Package of the Social Sciences (SPSS) version 20.0 to calculate the frequencies, percentages, and mean. Before the study, the two observers discussed potential discrepancies and followed clear diagnostic criteria. The two observers were calibrated using predefined diagnostic criteria. However, the disagreements later in the study were reevaluated jointly and a consensus diagnosis was reached.

RESULTS

Data from 540 samples of oral biopsies were retrieved from archives. Of these 540 cases, 82 cases of OCs and 35 cases of OTs were used in the present study after reassessing the diagnosis, adapted from the latest WHO 2022 classification. OCs constituted 15%, and OTs made up 6.5% of total biopsies.

Odontogenic Cysts (OC)

Eighty-two cases of OC were retrieved from the archives of the Institution, with a reported increase in diagnosis since 2021, with the highest cases seen in 2023 [Table/Fig-1a]. A total of 49 (59.75%) cases were males, and the male-to-female ratio was 1.44:1 [Table/Fig-1b]. The mean age of all cases was 43 years, with a wide age range from 8 to 78 years. However, 67 patients (88%) were reported in the second to fifth decades [Table/Fig-1c]. The maxilla to mandible distribution was almost equal, with 43 cases (52.4%) out of 82 reported in the maxilla and the remaining 39 cases (47.5%) in the mandible [Table/Fig-1d]. The ratio of incidence of OC in maxilla and mandible is reported to be 1.1:1. The clinicopathological features of OC included in the study are summarised in [Table/Fig-2].



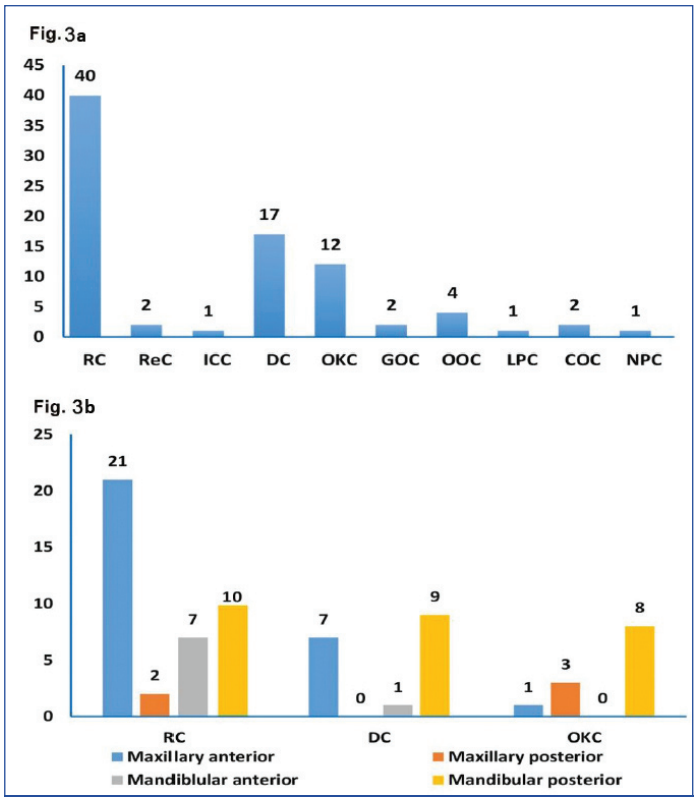
[Table/Fig-1]: a) OCs distribution per year; b) Gender distribution of OCs; c) Age distribution of OCs; d) Location distribution of OCs.

The RC was the most common OC that constituted 40 cases (48.7%), nearly half of the OC cases, with a mean age of 35.3 years and male predominance and frequent location being the anterior maxilla (52.5%). Followed by DC (20.7%), OKC (14.6%).

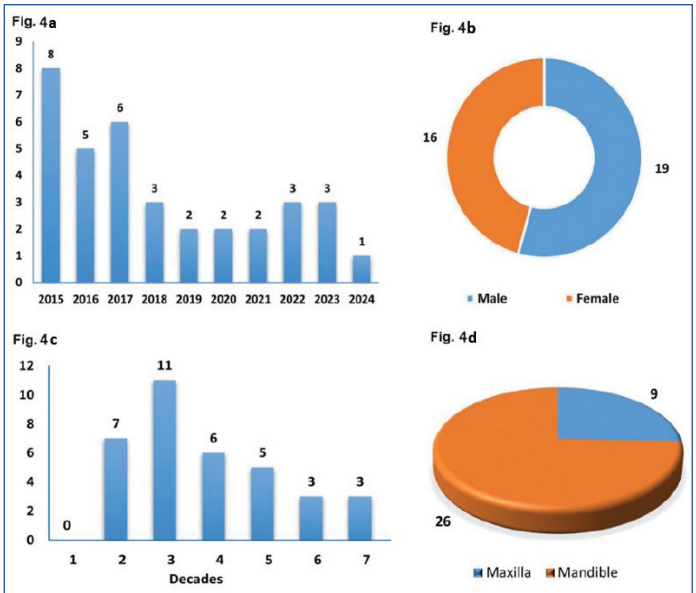
Clinicopathological features	n (%)	Age (in years) Mean (SD)	Gender		Location	
			Male n (%)	Female n (%)	Maxilla n (%)	Mandible n (%)
Radicular Cyst (RC)	40 (49%)	35.3 (12.8)	25 (62.5%)	15 (37.5%)	24 (60%)	16 (40%)
Residual cyst	2 (2.4%)	68.5 (1.5)	1 (50%)	1 (50%)	2 (100%)	0
Inflammatory Collateral Cyst (ICC)	1 (1.2%)	8 (NA)	0	1 (100%)	0	1 (100%)
Nasopalatine Duct Cyst (NPC)	1 (1.2%)	30 (NA)	1 (100%)	0	1 (100%)	0
Dentigerous Cyst (DC)	17 (20.73%)	27 (12.8)	10 (58.8%)	7 (41.1%)	7 (41.1%)	10 (58.8%)
Odontogenic Keratocyst (OKC)	12 (14.6%)	44 (16.54%)	9 (75%)	3 (25%)	4 (33.3%)	8 (66.66%)
Glandular Odontogenic Cyst (GOC)	2 (2.4%)	25 (6.5)	1 (50%)	1 (50%)	2 (100%)	0
Orthokeratinised Odontogenic Cyst (OOC)	4 (4.8%)	26 (6.64)	1 (25%)	3 (75%)	2 (50%)	2 (50%)
Calcified Odontogenic Cyst (COC)	2 (2.4 %)	31 (16)	0	2 (100%)	0	2 (100%)
Lateral Periodontal Cyst (LPC)	1 (1.2 %)	42 NA	1 (100%)	0	0	1 (100%)

[Table/Fig-2]: Summary of the clinicopathological features of each OC in the current study.

Four cases of orthokeratinised OC and two cases each of residual cyst, COC and GOC were reported. Only one case each of ICC, LPC and Nasopalatine Duct Cyst (NPC) was found and included in the study [Table/Fig-3a]. There were 17 cases of DC reported, with a mean age of 27 years, with 10 (58.8%) being males and posterior mandibular predominance. OKC represented the third most common OC with a frequency of 14.6% with a male predominance of 75%. Most of the cases reported were in the mandibular posterior region. Distribution of OCs according the specific location is depicted in [Table/Fig-3b].



[Table/Fig-3]: a) Number of cases of each Odontogenic Cyst (OC); b) Distribution of OCs according the specific location.

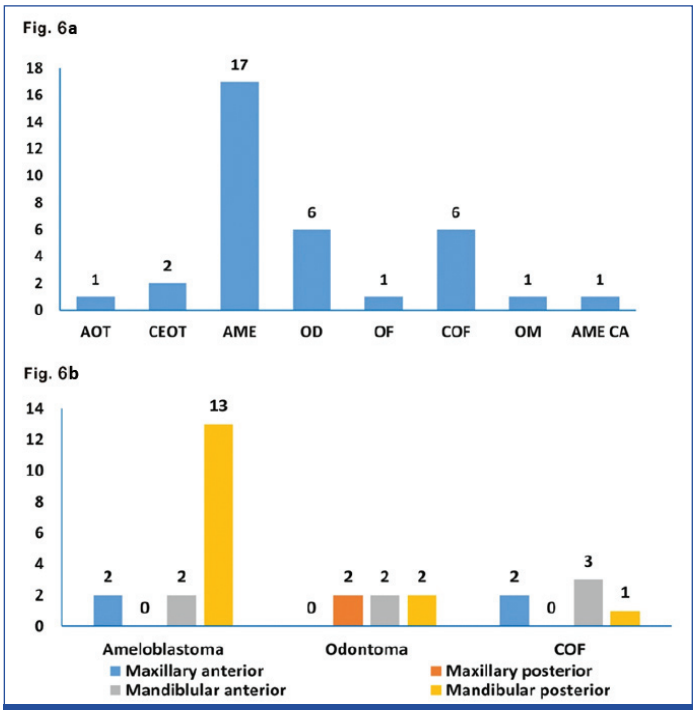


[Table/Fig-4]: a) OTs distribution per year; b) Gender distribution of OTs; c) Age distribution of Ots; d) Location distribution of OTs.

Odontogenic Tumours

In the present series, out of 35 OTs, 34 cases were benign and one malignant lesion was included. Most of the tumours are reported in 2015 and 2017 with a slight gradual decrease in the following years [Table/Fig-4a]. These tumours affected individuals from 12 years to 68 years with a peak incidence in third decade and a mean age of 31 years. A comparative male predominance was noted with M:F ratio of 1.8:1 [Table/Fig-4b,c]. Regarding the maxilla to mandible distribution, out of 35, nine cases were reported in maxilla (25.7%) and the rest 26 cases (74.2 %) in mandible. The ratio of incidence of OT in maxilla and mandible is reported to be 0.3:1 [Table/Fig-4d]. [Table/Fig-5] summarise the clinicopathological features of OT included in the study.

in Central India (15.3%) and North India (13.9%) [7,8]. These observations are also in agreement with previous worldwide studies from Brazil (9.94%) [9], Chile (10%) [10] and Libya (14.8%) [11]. A comparatively higher frequency was reported in Iran (16.9%) [12] and Turkey (36%) [13]. Studies in the South Indian population in literature showed comparatively less prevalence of 8.5%, 9.6% and 11.2% [14-16]. Lesions were seen to occur in a wide age range from 7-78 years, with 28% of cases reported in the 4th decade of life. This finding is in accordance with various studies from India



[Table/Fig-6]: a) Overall OT frequency in the current study; b) Distribution of OTs according to the specific location.

Clinicopathological features	n (%)	Age (in years) Mean (SD)	Gender		Location	
			Male n (%)	Female n (%)	Maxillan (%)	Mandible n (%)
Ameloblastoma (AME)	17 (48.5%)	34 (17.59)	10 (58.8%)	7 (41.1 %)	2 (11.8%)	15 (88.2%)
Calcifying epithelial Odontogenic Tumour (CEOT)	2 (5.7 %)	50 (2)	1 (50%)	1 (50%)	1 (50%)	1 (50%)
Adenomatoid Odontogenic Tumour (AOT)	1 (2.8%)	20 (NA)	0	1(100%)	1 (100%)	0
Odontoma (OD)	6 (17.1%)	25 (3.46)	2 (33.3%)	4 (66.6%)	2 (33.3%)	4 (66.6%)
Odontogenic fibroma	1 (2.8%)	41 (NA)	1 (100%)	0	1 (100%)	0
Cemento-Ossifying Fibroma (COF)	6 (17.1%)	32 (12.9)	4 (66.7 %)	2 (33.3 %)	2 (33.3%)	4 (66.7 %)
Odontogenic Myxoma (OM)	1 (2.8%)	12 (NA)	1 (100%)	0	1 (100%)	0
Ameloblastic Carcinoma (AC)	1 (2.8%)	59 (NA)	0	1 (100%)	0	1 (100%)

[Table/Fig-5]: Summary of the clinicopathological features of each OT in the current study.

The AME was the most frequent, OT encountered in the study, constituting 48.5% of total cases followed by six cases of OD and COF each (17.1%). Other OTs concluded in the study are two cases of CEOT and one case each of AOT, OF, Odontogenic Myxoma (OM) and Ameloblastic Carcinoma (AC) [Table/Fig-6a]. AME showed an average age of occurrence of 34 years, with a male predominance with M:F ratio 1.42:1, and the most favoured anatomical site is the mandibular posterior region (76.47%). No cases of extraosseous AME, adenoid AME or primordial odontogenic tumour were reported in the current retrospective study. The distribution of OTs according to the specific location is depicted in [Table/Fig-6b].

DISCUSSION

Odontogenic Cyst (OC)

The prevalence of OCs in the current study, over a period of 10 years is 15%. A similar range of prevalence is noted from studies [16-18] and other parts of the world [19-23]. Like most of the studies, the current cohort also reported a strong male predilection. One Indian study from Kerala and another Brazilian study showed an equal gender distribution in OCs [16,24]. Regarding location distribution, OCs are more commonly encountered in the maxillary anterior region, which may invariably correspond to a higher frequency of RC reported. About 50% of the OCs are constituted by RC, as previously reported studies, while some international studies from Canada and Italy showed 65-84% [25,26]. Previous studies showed higher male predilection to RC, mainly in the third to fourth decades, similar to the current research [27-30]. The most common site involved was the maxillary anterior region in the present study. This is in agreement with other studies [24,31-33]. ICC is a rarely histologically reported condition owing to the fact that most of the cases are conservatively treated, may go undetected or resolve spontaneously with tooth eruption. The frequency of residual cysts is low in published literature, with a wide range and mandibular

predilection. Only two cases are reported in the current study, with equal gender distribution, and both lesions are in the maxilla. The second most common OC is DC, followed by OKC, the reverse is also reported in literature. GOC is classically present in the anterior mandible crossing the middle, while our series showed two cases, both in maxilla. The demographic details of OCs in the current study are compared with selected Indian studies that are summarised in [Table/Fig-7].

Pradesh, Gujarat, and Rajasthan [38-43]. The mandible-to-maxilla ratio of OTs reflects the classic location of mandibular posterior predominance as in similar Indian studies and from other countries like Kenya [19], Saudi Arabia, Bangladesh, European countries, Sri Lanka, Turkey and Japan [44-49]. This may be due to the higher frequency of AME reported in the study. Age incidence and male predilection are similar to those reported in the literature, with a wide range extending from the second to

OC distribution	Current Study (Kanyakumari, Tamil Nadu)	Deepthi PV et al., (Thiruvananthapuram, Kerala) [15]	Savithri V et al., (Kochi, Kerala) [16]	Kambalimath P et al., (Bhopal) [7]
Sample size	82	872	67	150
Period	10 years	15 years	5 years	10 years
Mean age	43	36 {Radicular Cyst (RC)}	19.12	33.2
M:F Ratio	1.5:1	1.2:1	1.01:1	1.38:1
Maxilla: Mandible ratio	1.1:1	Maxillary predominance	1:1.64	1.1:1
Radicular Cyst (RC)	40	655	28	73
Residual cyst	2	44	5	9
Inflammatory Collateral Cyst (ICC)	1	-	8	-
Surgical ciliated cyst	NR	-	-	-
Nasopalatine Duct Cyst (NPC)	1	-	5	-
Gingival cysts	NR	-	-	4
Dentigerous Cysts (DC)	17	150	9	26
Orthokeratinised Odontogenic Cyst (OC)	4	-	1	
Lateral Periodontal Cyst (LPC)	1	9	-	9
Calcifying Odontogenic Cyst (OC)	2	-	1	3
Glandular Odontogenic Cyst (OC)	2	-	-	3
Odontogenic Keratocyst (OKC)	12	-	10	8

[Table/Fig-7]: Comparison of OC distribution in the current study and other Indian studies.
NR: Data not reported by the source

OT distribution	Current study (Kanyakumari, Tamil Nadu)	Gupta B, Ponniah I (Chennai, Tamil Nadu) [4]	Singhal A et al., (Puducherry, Tamil Nadu) [5]	Pandiar D et al., (Kozhikode, Kerala) [55]	Syed S et al., (Goa) [38]
Sample size	35	489	61	395	114
Period	10 years	38 years	10 years	13 years	20 years
Mean age	31	32	32.64	32.69	3rd and 4th decade
M:F Ratio	1:1.8	1.1:1	0.6:1	1.4:1	1.2:1
Maxilla: Mandible ratio	1:2.8	1:4	2.9:1	2.4:1	0.29:1
Adenomatoid Odontogenic Tumour (AOT)	1	45	6	20	12
Squamous odontogenic tumour	NR	3	NR	NR	NR
Calcifying epithelial odontogenic tumour	2	4	6	6	NR
Ameloblastoma (AME)	17	331	16	102	66
Odontoma (OD)	6	38	NR	35	8
Ameloblastic fibroma	NR	1	NR	10	1
Dentinogenic ghost cell tumour	NR	NR	NR	NR	1
Odontogenic fibroma	1	2	4	14	2
Cementoblastoma	NR	4	NR	3	1
Cemento Ossifying Fibroma (COF)	6	NR	NR	NR	21
Odontogenic myxoma	1	13	1	6	1
Ameloblastic Carcinoma (AC)	1	NR	1	4	1
Primary intraosseous carcinoma NOS	NR	15	NR	9	NR

[Table/Fig-8]: Comparison of OT distribution in the current study and other Indian studies [4,5,38,55].

Odontogenic Tumours

The relative frequency of AME among the OTs in the present study was 48.5% found to be similar in comparison with other published literature from different geographic locations. This al so supports the observation that these lesions were more common in Africans and Asians than Caucasians [34-37]. Male predilection is reported, and similarly, observations are reported in other Indian states such as Goa, Maharashtra, Kerala, Andhra

the fifth decade of life. The current study shows OD is the second most common OT reported. However, a South American study presented OD as the most common OT, followed by AME in the second position [50]. The existing data of OD frequency from literature does not correspond to the actual scenario, because it is often asymptomatic and accidentally diagnosed in routine radiographs and rarely sent for histopathologic studies. The maxillary anterior region is the most common site of occurrence

in various Institutional studies, whereas in the current study, most cases are reported in the maxillary and mandibular posterior regions [48,51]. COF was included in odontogenic lesions in the WHO 2017, and does not differentiate between the central and peripheral forms. The most common age of presentation is the second and third decades, and the female gender is predominantly affected. Studies reporting on the site of presentation are, anterior maxilla is the most common site for peripheral COF, whereas posterior mandible is the preferred site for central lesions [52-54]. In the present study, out of four peripheral COFs, three cases were in the anterior maxilla and one case in the mandibular anterior region. Two cases of central COF in the present study showed mandibular anterior predominance. Although rare, two cases of CEOT have been reported, with an equal gender predilection, both in the posterior region, one in the maxilla and one in the mandible. Only one case of malignant odontogenic lesion of AC is reported in a female patient in the mandibular posterior region. Since other OTs such as AF, OF, AOT, and OM have very low incidence rates, comparing their demographic data becomes difficult. No cases of rare lesions like adenoid AME or primordial odontogenic tumour were encountered in the current study. Comparison of the current study with reported studies worldwide, the frequency and demographic details, even though the sample size is low. The demographic details of OTs in the current study are compared with selected Indian studies that are summarised in [Table/Fig-8] [4,5,38,55].

The present study is the first of its kind among the Kanyakumari population in the published literature, to the best of our knowledge. This study can contribute as baseline data for future multicentric longitudinal studies. In the current evidence-based dentistry and region-oriented healthcare planning, study results may help in improving diagnostic vigilance among clinicians and assist in resource allocation and service planning.

Prospective multicentric longitudinal follow-up studies with more parameters, imaging modalities, immunohistochemistry and molecular data that can better reflect the aggressiveness and may help in predicting recurrences. When carried out on a larger scale involving all the all healthcare centres in the district level, the data can project a more representative epidemiological profile of the actual epidemiological scenario.

Limitation(s)

The present study was limited by its retrospective single-centre design and dependence on available archival records. Cases with incomplete demographic or histopathological information were excluded, which may have introduced selection bias. The reduction in biopsy submissions during the Coronavirus disease 2019 (COVID-19) pandemic may also have influenced case frequency. Furthermore, changes in WHO classification systems over time may limit direct comparison with earlier studies.

CONCLUSION(S)

The current study reflects not only differences in the distribution of odontogenic lesions but also similarities among the varied population samples assessed both in India and around the world. The most common OC was RC, and the most common OT was AME. Regional differences can occur, and knowledge of the relative incidence of odontogenic lesions in various parts of the world improves the understanding of the lesions which contribute significantly to enhance understanding of the epidemiological and clinicopathological patterns of odontogenic lesions.

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Authors' contribution: All authors have made substantive contributions to the present study (conceptualisation, data acquisition, data analysis and interpretation, methodology) and manuscript preparation (writing and revision, resources and supervision), and all have reviewed the final paper before submission.

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