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Original Article

Dentistry Section

Prevalence of Odontogenic Tumours: A Study of 122 Cases among Karnataka Population

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ABSTRACT

Introduction: Tumours arising from odontogenic tissues are rare and constitute a heterogeneous group of interesting lesions. Studies on incidence of Odontogenic Tumours (OT) published from many countries show a distinct geographic variation.

Aim: The aim of present study was to compare and correlate the frequency of individual OT in India as well as the other parts of the world based on 2005 World Health Organisation (WHO) classification.

Materials and Methods: This Institution-based retrospective study conducted in Department of Oral Pathology and Microbiology at Government Dental College and Research Institute, Bengaluru, Karnataka, India, from April 2015 to September 2016. Total of 122 cases of odontogenic tumours documented in duration of 10 years (2005 to 2014) were categorised based on WHO 2005 classification. The histological type, age, gender, anatomical site and symptoms were systematically tabulated.

Results: Odontogenic tumours constituted 9.5% (122 cases) of the total oral biopsies (1284 cases) received in a 10-year period. Among these, 95.9% of the tumours were benign and 4.1% were malignant. The most frequent tumour being ameloblastomas 39.3% followed by keratocystic odontogenic tumour 35.2%, odontome 4.9%, calcifying cystic odontogenic tumour 4.9% and adenomatoid odontogenic tumour 4%. While odontome, generally regarded as the most frequent OT in American and European countries, only accounted for 4.9%, the third most common tumour in the present study. The mean age of patients was 32.37 years (range: 9-70 years). Their exist a slight male predominance, more predilection to posterior region of mandible and majority of tumours presented with pain and swelling.

Conclusion: The relative frequency of odontogenic tumours reported in our Institution was similar to the studies reported in India, Asian and African population, but differs from that of European and American countries. There is a definite geographic variation in the prevalence of OT published worldwide.

Keywords: Frequency, Geographic variation, Global continents, Incidence, World health organisation classification

INTRODUCTION

Odontogenic Tumours (OT) are rare entities accounting for 1% of jaw tumours arising from the odontogenic epithelium and/or mesenchymal remnants present in the developing tooth germ [1]. These tumours were found exclusively in tooth bearing areas and can occur intraosseous or extraosseous [2]. Numerous classifications have been framed based on their origin and behaviour. In the past many studies have been carried out based on 1971 Pindborg's and 1992 Kramer's World Health Organisation (WHO) classification relating to the frequency of odontogenic tumours [3,4]. In 2005, WHO modified the older classification and introduced new classification as third edition WHO histological typing of odontogenic tumours [5]. Frequency of OT has been disputed due to controversies and confusions in the tumour taxonomy, subtyping and pleomorphism in its presentation [3,4]. In comparison to 1992 classification, revised 2005 WHO classification has made major changes to simplify the terminologies used for documentation purpose. Most malignant tumours in new classification is generally considered to be a counterpart of benign odontogenic tumours. The first major modification is introducing Keratocystic Odontogenic Tumour (KCOT) as neoplasm, categorised as cyst in previous classification and second major modification is calcifying cystic odontogenic tumour and dentinogenic ghost cell tumour replacing calcifying odontogenic cyst from 1992 classification [6].

Studies have been carried out globally to assess the relative frequency of odontogenic tumours following the WHO 2005 classification and it has been observed that after modification there exists a wide variation in prevalence of odontogenic tumours [7]. Due to their varying clinical behaviour and diverse histopathological presentations, a better knowledge regarding their frequency is required. The relative frequency of OT following WHO 2005 classification are found to be scanty in India. The aim of present study was to compare and correlate the frequency of individual OT in India as well as the other parts of the world based on 2005 WHO classification.

MATERIALS AND METHODS

This institution-based retrospective study conducted in Department of Oral Pathology and Microbiology at Government Dental College and Research Institute, Bengaluru, Karnataka, India, from April 2015 to September 2016. Data retrieved from all the biopsy reports documented in duration of 10 years from January 2005 to December 2014 were considered.

Inclusion criteria: Histopathologically diagnosed odontogenic tumours with complete data were included in a study. Recurrent cases were considered as single entity.

Exclusion criteria: Reports with incomplete data and tumour-like lesions were excluded from the study.

Study Procedure

Total 122 cases of histologically diagnosed cases of odontogenic tumours were categorised based on the criteria suggested by WHO histological typing 2005 classification [5]. The histological type, age, gender, anatomical site and symptoms were systematically reviewed and tables were generated accordingly. For site specification jaws were divided in to anterior and posterior zones of maxilla and mandible. Anterior zone includes incisors, canines and premolars. posterior zone includes tuberosity of maxilla and ramus, coronoid and condylar process of mandible.

STATISTICAL ANALYSIS

Descriptive statistics was used for data analysis. The values have been presented in numbers and percentages.

RESULTS

In the present study, a total number of oral biopsies received in a 10-year period was 1284 cases, among theses 122 cases were histologically diagnosed OT constituting 9.5%. There were 63 males (51.6%) and 59 females (48.4%). Majority of the lesions were seen in 3rd decade. A total of 117 (95.9%) lesions were benign and 5 (4.1%) were malignant. The most frequent tumour being Ameloblastoma (AME) 49 cases (40.16%) followed by 43 cases (35.24%) of Keratocystic Odontogenic Tumour (KCOT) six cases of Odontome (OD) and Calcifying Cystic Odontogenic Tumour (CCOT) each. Five cases Adenomatoid odontogenic tumour (AOT) and four cases of Odontogenic Myxoma (OM) were recorded. Other benign OT were negligible in number forming single cases of Ameloblastic Fibroma (AF), Ameloblastic Fibrodentinoma (AFD) and Cementoblastoma (CB). The most common malignant odontogenic tumour is Ameloblastic Carcinoma (AC) accounted for 3 cases (2.45%), and single case of Clear Cell Odontogenic Carcinoma (CCOC), Ameloblastic fibrodentinosarcoma (AFDS) and Primary Introsseous Squamous Cell Carcinoma (PIOC) were found [Table/Fig-1].

The age of the patients ranged from 8 to 79 years, with a mean age of 32.37 years. The majority of cases were distributed between the ages of 20 and 39 years with a peak incidence in the third decade of life. The AME were observed in 2nd to 6th decade but peak in 3rd decade with mean age of 35.61 years. Majority of KCOT were seen in 2nd and 3rd decade with mean age of 30.58 years. AOT and OD were common in 2nd decade with mean age of 22 and 20 years, respectively [Table/Fig-2].

An almost equal gender distribution of OT with a slight males predominance was noticed. Female preponderance was observed among CCOT with a M:F ratio of 1:5, AOT 1:4, OD 1:2 and AME 1:1.3, whereas KCOT showed male prevalence with M:F ratio of 2.07:1 [Table/Fig-1]. The anatomical sites of occurrence of OT are presented in [Table/Fig-3]. In general, the mandible was the most frequently affected site, corresponding to 72.13% of all the cases, while the maxilla was affected in 27.8%. The maxilla to mandible ratio of 1:3.32. The most frequently affected site was the mandibular molar/ramus segment, particularly for AME and KCOT. AOT, CCOT and OD cases were located in anterior zone of both jaws.

[Table/Fig-4] presents symptoms with majority (45.1%) of the cases presented with asymptomatic swelling followed by pain and swelling in 34.4% and 11.4% of cases, presented with pain.

Histological types	No. of cases (n)	%	Mean age	Male		Females		Male:Female ratio
				(n)	%	(n)	%	
Ameloblastoma	49	40.16	35.61	21	42.8	28	57.2	1:1.3
Keratocystic odontogenic tumour	43	35.24	30.58	29	67.4	14	32.6	2.07:1
Odontome	06	4.91	20	2	33.3	4	66.7	1:2
Calcifying cystic odontogenic tumour	06	4.91	43.3	1	16.6	5	83.4	1:5
Adenomatoid odontogenic tumour	05	4.09	22	1	20	4	80	1:4
Odontogenic myxoma	04	3.27	22.5	2	50	2	50	1:1
Ameloblastic fibroma	01	0.81	15	1	100	0	-	-
Ameloblastic fibrodentinoma	01	0.81	75	1	100	0	-	-
Cementoblastoma	01	0.81	35	1	100	0	-	-
Ameloblastic carcinoma	03	2.45	33.5	2	66.6	1	33.4	2:1
Clear cell odontogenic carcinoma	01	0.81	25	0	-	1	100	-
Ameloblastic fibrodentinosarcoma	01	0.81	15	0	-	1	100	-
Primary introsseous squamous cell carcinoma	01	0.81	35	0	-	1	-	-
Total	122	100	32.37	63		59		1:0.9

[Table/Fig-1]: Distribution of odontogenic tumours according to age and gender.

Histological types	0-9 n (%)	10-19 n (%)	20-29 n (%)	30-39 n (%)	40-49 n (%)	50-59 n (%)	60-69 n (%)	70-79 n (%)	Total N (%)	Mean age (in years)
Ameloblastoma	1 (0.81%)	6 (4.91%)	16 (13.11%)	7 (5.73%)	8 (6.55%)	8 (6.55%)	2 (1.63%)	1 (0.81%)	49 (40.16%)	35.61
Keratocystic odontogenic tumour	0	10 (8.1%)	15 (12.29%)	8 (6.55%)	6 (4.91%)	2 (1.63%)	2 (1.63%)	0	43 (35.24%)	30.58
Odontome	1 (0.81%)	2 (1.63%)	2 (1.63%)	1 (0.81%)	0	0	0	0	6 (4.91%)	20
Calcifying cystic odontogenic tumour	0	1 (0.81%)	1 (0.81%)	1 (0.81%)	0	2 (1.63%)	0	1 (0.81%)	6 (4.91%)	43.3
Adenomatoid odontogenic tumour	0	3 (2.45%)	1(0.81%)	0	1 (0.81%)	0	0	0	5 (4.09%)	22
Odontogenic myxoma	0	2 (1.63%)	1 (0.81%)	1 (0.81%)	0	0	0	0	4 (3.27%)	22.5
Ameloblastic fibroma	0	1 (0.81%)	0	0	0	0	0	0	1 (0.81%)	15
Ameloblastic fibrodentinoma	0	0	0	0	0	0	0	1 (0.81%)	1 (0.81%)	75
Cementoblastoma	0	0	0	1 (0.81%)	0	0	0	0	1 (0.81%)	35
Ameloblastic carcinoma	0	0	2 (1.63%)	0	1 (0.81%)	0	0	0	3 (2.45%)	33.5
Clear cell odontogenic carcinoma	0	0	1 (0.81%)	0	0	0	0	0	1 (0.81%)	25
Ameloblastic fibrodentinosarcoma	0	1 (0.81%)	0	0	0	0	0	0	1 (0.81%)	15
Primary introsseous squamous cell carcinoma	0	0	0	1 (0.81%)	0	0	0	0	1 (0.81%)	35
Total	2 (1.63%)	26 (21.31%)	39 (31.96%)	20 (16.39%)	16 (13.11%)	12 (9.83%)	4 (3.27%)	3 (2.45%)	122 (100%)	32.37

[Table/Fig-2]: Distribution of lesions by histological diagnosis and age group in years.

Histological types	Anterior maxilla n (%)	Posterior maxilla n (%)	Anterior mandible n (%)	Poserior mandible n (%)	Maxilla:Mandible ratio
Ameloblastoma	4 (8.2%)	4 (8.2%)	5 (10.2%)	36 (73.4%)	1:5.12
Keratocystic odontogenic tumour	3 (6.9%)	8 (18.6%)	7 (16.27%)	25 (58.13%)	1:3.22
Odontome	2 (33.3%)	1 (66.6%)	2 (33.3%)	1 (66.6%)	1:1
Calcifying cystic odontogenic tumour	3 (50%)	1 (16.6%)	1 (16.6%)	1 (16.6%)	1:0.5
Adenomatoid odontogenic tumour	4 (80%)	0	1 (20%)	0	1:0.25
Odontogenic myxoma	0	3 (75%)	0	1 (25%)	1:0.33
Ameloblastic fibroma	0	0	0	1 (100%)	-
Ameloblastic fibrodentinoma	0	0	0	1 (100%)	-
Cementoblastoma	0	0	0	1 (100%)	-
Ameloblastic carcinoma	0	0	0	3 (100%)	-
Clear cell odontogenic carcinoma	0	1 (100%)	0	0	-
Ameloblastic fibrodentinosarcoma	0	0	0	1 (100%)	-
Primary introsseous squamous cell carcinoma	1 (100%)	0	0	0	-
Total	17 (13.9%)	18 (14.7%)	16 (13.1%)	71 (58.1%)	1:2.48

[Table/Fig-3]: Distribution of odontogenic tumours according to the site.

Histological types	Pain	Pain and swelling	Asymptomatic swelling	Not specified
Ameloblastoma	4 (8.16%)	16 (32.6%)	25 (51.02%)	4 (8.16%)
Keratocystic odontogenic tumour	9 (20.09%)	15 (34.8%)	18 (41.8%)	1 (2.32%)
Odontome	0	2 (33.3%)	3 (50%)	1 (16.6%)
Calcifying cystic odontogenic tumour	-	-	3 (50%)	3 (50%)
Adenomatoid odontogenic tumour	-	1 (20%)	4 (80%)	-
Odontogenic myxoma	-	2 (50%)	1 (25%)	1 (25%)
Ameloblastic fibroma	-	-	1 (100%)	-
Ameloblastic fibrodentinoma	-	-	-	1 (100%)
Cementoblastoma	1 (100%)	-	-	-
Ameloblastic carcinoma	-	3 (100%)	-	-
Clear cell odontogenic carcinoma	-	1 (100%)	-	-
Ameloblastic fibrodentinosarcoma	-	1 (100%)	-	-
Primary introsseous squamous cell carcinoma	-	1 (100%)	-	-
Total	14 (11.47%)	42 (34.4%)	55 (45.1%)	11 (9.1%)

[Table/Fig-4]: Distibution of odontogenic tumours according to symptoms.

DISCUSSION

In present study, the relative frequency of odontogenic tumours was 9.5% which was similar to the study conducted by Ladeinde AL et al., [8] in Nigeria (9.6%) and higher than the existing frequency in other parts of India (2.13-6.08%), [9-14] and Asia (1.7-6.8%) [15,16]. On the other hand, African studies reported a higher frequency, comprising 19%-32% of all odontogenic tumour and tumour-like lesions [17]. Whereas, lesser range was noted in Caucasians 0.3-3% [18]. The high frequency of OTs in the current study could be related to ease medical access to government hospital in the city centre, where patients are referred from nearby hospitals and private clinics. In case of surgical and aesthetic dental treatment, the cost effectiveness is free or very minimal.

Global frequency of odontogenic malignant tumours reported by Avelar RL et al., and da silva LP et al., were 4% and 4.3%, respectively [18,19]. In present series malignant tumours represented 4.1% of all OT found similar to the studies conducted in India [10,13]. European countries observed less number of malignant OT accounting for 0.2%-1.1% [18-21]. Contrary to these findings Kebede B et al., [22] reported 19.6% in Ethiopia and Akram S et al., [23] reported 21.3% in Pakistan population, which was found to be highest in the world.

The incidence of age was found to be extending from 2nd to 5th decade, peak in 3rd decade with mean age of 32.37 years, similar to studies conducted in India, [13,24] Asia [25,26] and Africa, [17] However, many studies conducted in Brazil and American countries showed a decade less, that is in 2nd decade [27,28]. This could be due to regular dental check-up and early diagnosis of asymptomatic lesions in developed countries. Moreover, OD are common OT among European and American countries that occurs in 2nd decade of life [29].

In terms of gender, the majority of odontogenic tumours occurred in men, as evidenced by present study M: F ratio of 1:0.9, which is consistent with studies conducted in India [9-11], Asian [25,26] and African countries [25,30]. In contrast, American countries reported a female prevalence [31].

In the present study, highest frequency (71.3%) of OT were found in region of mandible with Maxilla:Mandible ratio of 1:3.3 that matches with the studies conducted in India [9,10,11]. Anyanechi CE and Saheeb BD (2014) in Africa showed higher Mandible:Maxilla ratio11:1 (91.7% tumours occurred in mandible) [32]. In contrast, Regezi JA et al., reported inclination towards maxilla [27] and few studies reported equal distribution among both jaws [33-35]. These discrepancies could be due to the distribution of various odontogenic tumours at specific site. Most common tumours seen in association with maxilla were OD, CCOT, AOT, odontogenic myxoma (anterior part of maxilla), whereas, AME, KCOT and AC located in posterior part of mandible [11].

The most common symptom of OT in the present study was painless swelling 45.1%, pain and swelling accounted for 34.4%. Findings were in agreement with Luppi CR et al., [36] and Jing WM et al., [25] reported majority of asymptomatic swelling. In contrast Servato JP et al., ascertained 50% of painful swellings [37].

The present study, showed AME as most common OT, constituted 40.16% which is in conformity with studies from Asia [25], Africa [17] and other parts of India [11,38] in contrast lowest incidence reported by Buchner A et al., (11.7%) in US [39]. AME was seen in all age groups with mean age of 35.6 years similar to studies conducted in Africa [8,33]. Female prevalence (M:F of 1:1.3) in present study was in agreement with many previous reports [40-42] and male preponderance reported by Arotiba JT et al., [33] and Odukoya O [43]. About 83.6% of AME in current series were found in posterior mandible, site of greatest predilection similar to studies conducted in Nigeria 99% [44], Malaysia 93% [45], Japan 95% [46]. However, studies from US, Canada, Mexico and Chile have shown an almost equal distribution among both the jaws [47,31,39,27]. The most frequent symptom was asymptomatic swelling of the face

or jaw leading to gross disfigurement which is in agreement with many studies [33,43,48].

Following the introduction of KCOT in the WHO 2005 classification, the prevalence of odontogenic tumours increased significantly, accounting for 35% of all odontogenic tumours and being recognised as the most prevalent odontogenic tumours globally [19]. Rubini C et al., reported high frequency of KCOT (66.8%) in Italian population [21]. Present study revealed 35.24% of all OT ranking second in the series, which was similar to many studies conducted in India [34,11,12,14] and Asia [25,15]. It is quite interesting that western countries reported KCOT as the most commonly encountered OT [49- 52,20] in contrast lower frequency reported in Africa [17,22]. Third decade with mean age of 30.58 years found in present study was comparable with large number of series [21,30,34]. Male predilection with a ratio of 2.07:1 matches with previous series [4,33,53] and in contrast reports of female predilection [54,14,18,27,55]. Mandibular molar site was most commonly affected with Maxilla:Mandible ratio of 1:3.22 which was similar to majority of previous reports [25,37,28,33,53,54].

Third most common tumour in the present study was OD accounting for 4.9% consistent with majority of studies in India [10,38] and Asia [25]. These findings were not in accordance to the epidemiological data of European [56-58] and American [27,59-61] population. The reason for the low incidence of OD in under developed and developing countries could be due to their uneasy access to medical care centres and traditional treatment for minor lesions. Self-limited growth and indolent behaviour of OD goes unnoticed. If found in routine radiographs, patients decline treatment for these asymptomatic lesions unless the lesions are symptomatic or swelling resulting in disfigurement of face. The other reason could be insufficient/improper updating of data and discarding the surgically removed lesions without sending samples for histopathological evaluation [8,34]. Females were affected more than males, with M:F ratio of 1:2 in the present study, which supports previous research [33,61,62]. OD were common in second decade of life with Maxilla: Mandible ratio of 1:1. Maxillary anterior region was the common site of involvement which was in concordance to earlier reports [14,27,62,63].

Calcifying Odontogenic Cyst (COC) was reintroduced as Calcifying Cystic Odontogenic Tumour (CCOT) in WHO 2005 classification [6]. Very few studies reported CCOT as relatively common tumour which accounted only for 2.35% globally [19], third most common tumour (4.9%) in the current study was similar to previous reports [13,11]. The mean age in present study was 43.3 years, CCOT primarily occurs among younger age group, usually seen in 2nd and 3rd decade of life [9]. The current study female preponderance (M:F 1:5) is similar to that of Niranjan KC and Shaikh Z [12], in contrast to male prevalence reported by Gill S et al., [11] and Sriram G and Shetty RP [9] Approximately 62% was found in anterior maxilla [11]. It was difficult to compare the data with other studies, as these tumours were found to be uncommon.

Adenomatoid odontogenic tumour was found to be the fourth most common tumour in present study (4.09% cases) which was in agreement with previous studies [17,26,10,38]. Highest frequency reported by Arotiba JT et al., (13%) [33], among African population and lowest frequency reported by Siar CH and Ng KH, (0.3%) among Malaysians [45]. Present data with second decade of life and female preponderance (M:F ratio1:4.4) matches with global findings [18] with greatest predilection for anterior maxilla (80%) similar to studies conducted by Arotiba JT et al., [33] and Taghavi N et al., [64]. It is surprising that 75% of AOT were reported in mandible by Iyogun CA et al., in Nigerians. The reason for mandibular predilection is not clear, but it can be related to the environmental factor or the type of AOT seen in this region [65].

Odontogenic myxoma is relatively uncommon tumour of odontogenic mesenchymal origin [19]. There were 4 cases reported of OM (3.27%) confirming the rarity of tumours generally agrees with studies conducted in India, Asia and Africa [25,66,9,67,10,23]. According to the studies of America and Europe, OM is the most common OT [8]. Mean age in the present study was 22.5 years seen in second decade similar to Lima-Verde-Osterne R et al., [52]. Unlike the previous reports mentioning fourth and fifth decade of life [68]. Male predilection with 1:0.5 observed in present study was in accordance to Adebeyo et al., [53] and few series favor female prevalence [68,52]. while some claim an even gender predilection [69]. Two-third of these lesions were found in maxilla in present study like reported elsewhere [27,31,33,60]. Contradictory to these findings Odukoya O [43] and Ladeinde AL et al., [8] reported mandible preponderance.

In the present study, authors found AC to be the most common malignant OT accounting for 2.45% of all OT, where many continents reported AC and PIOSS as commonest malignant odontogenic tumours [19]. Demographic distribution of odontogenic tumours from different parts of the world is tabulated in [Table/Fig-5] [6,9-14,20,23,25,49,50,56,57,66,67,70].

Author and year	Place of study	Total number of odontogenic tumours	Frequency (%)	1st Common tumour	2nd Common tumour	3rd Common tumour	Maxilla:Mandible ratio	Average age	Male: Female	Malignant tumours
Zhang M et al., (2007) [6]	Japan	289	4.1%	KCOT 29.76%	AME 28.03%	OD 26.64%	1:2.91	32.36	1:0.91	0.69%
Jing WM et al., (2007) [25]	China	1642	NS	AME 40.3%	KCOT 35.8%	OD 4.7%	1:4	32.1	1.4:1	3%
Sriram G and Shetty RP, (2008) [9]	India (Mumbai)	250	NS	AME 61.5%	AOT 12.4%	OM 6%	1:3.8	29.81	1.2:1	1.2%
EL-Gehani R et al., (2009) [66]	Libya	148	6.2%	KCOT 35%	AME 22.3%	OD 18.8%	1:2.07	32.4	1.31:1	0
Tawfik MA and Zyada MM (2010) [67]	Egypt	82	NS	AME 41.5%	KCOT 19.5%	OD 13.4%	0.2:1	29.57	1.2:1	3.7%
Gupta B and Ponniah I (2010) [10]	India (Tamil Nadu)	489	4.13%	AME 67.69%	AOT 9%	OD 7.77%	1:4.02	32.64	1.08:1	3.07%
Gill S et al., (2011) [11]	India (Gujarat)	209	5.3%	AME 47.4%	KCOT 23.4%	OD 5.3%	1:2.3	24.19	1.3:1	NS
Şenel FÇ et al., (2012) [56]	Turkey	86	0.13%	OD 41.8%	KCOT 17.4%	AME 12.7%	1:1.2	32.19	1:1.3	6.8%
Iatrou I et al., (2010) [57]	Greece	40	40/211	OD 52.5%	KCOT 17.5%	AFO 12.5%	1:1.5	NS	1.1:1	0

Chrysomali E et al., (2013) [20]	Greece	652	2.2%	KCOT 52.7%	OD 18.9%	AME 16.1%	2:1	38.0	1.2:1	0.2%
Ramos GD et al., (2013) [49]	Brazil	78	3%	KCOT 51%	AME 23%	OD 17%	1:3.86	30.36	1.2:1	0
Niranjan KC and Shaikh Z (2014) [12]	India (Karnataka)	133	2.13%	AME 54.8%	KCOT 24%	AOT 7.5%	1: 4.7	29.9	1:1.06	2.25%
Pandiar D et al., (2015) [13]	India (Kerala)	395	6.08%	KCOT 35.9%	AME 25.9%	CCOT 10.6%	1:2.43	32.69	1.4:1	3.3%
da Silva LP et al., (2016). [50]	Brazil	289	4.79%	KCOT 34.6%	AME 32.9%	OD 11.4%	1:2.5	35	1.3:1	0.7%
Nalabolu GR et al., (2017) [14]	India (Andra Pradesh)	161	2.17%	AME 49%	KCOT 32%	OD 6.2%	1: 2.8	32.14	1.43:1	0
Akram S et al., (2017) [23]	Pakistan	141	2.35%	KCOT 27%	AME 24.8%	OF 18.4%	1:2.27	34	1.71:1	21.3%
Ismail S and Saw CL, (2018) [70]	Malaysia	173	6.3%	AME 55.5%	KCOT 22%	OD 9.2%	1:1.9	33.5	1:3.4	1.2%
Present study	India (Karnataka)	122	9.5	AME 40.16%	KCOT 35.24%	OD 4.9% and CCOC 4.9%	1:3.32	32.37	1:0.9	4.1%

[Table/Fig-5]: Demographic distribution of odontogenic tumours from different parts of the world [6,9-14,20,23,25,49,50,56,57,66,67,70].
*NS: Not specified

Limitation(s)

Radiographic features for these odontogenic tumours could not be included in the study due to inadequate data from the department's archives. The main limitation of the present study was that the latest WHO classification of odontogenic tumour (2017) was not followed.

CONCLUSION(S)

The relative frequency of odontogenic tumours was found to be 9.5% with AME being the most common odontogenic tumour, despite the inclusion of KCOT in WHO 2005 classification. These findings were found to be similar to majority of studies conducted in India, Asia, Africa but differs from that of European and American countries. Definitely there exists geographic variations, since most of the reports from Asia and Africa showed AME and KCOT as common odontogenic tumour, but European and American countries found odontome to be the most common odontogenic tumour. To determine the cause of these global variations, more research should be undertaken in larger populations.

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