How to Cite:
Shetty, U. A., Pousya, V. S., Bhandary, S., Gadkari, S. N., Paiwal, K., & Rajendrakumar , P. N. (2022). Ameloblastoma–A rigorous odontogenic tumours of the jaws: A regional retrospective analysis. *International Journal of Health Sciences*, *6*(S5), 8736–8747.
https://doi.org/10.53730/ijhs.v6nS5.10674

Ameloblastoma–A rigorous odontogenic tumours of the jaws: A regional retrospective analysis

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***Abstract*---**Background: Ameloblastoma is an aggressive odontogenic tumor that is often asymptomatic and slow-growing. Although it is benign in nature, due to its invasive characters and tendency to recur it is considered as a localized malignant tumour. Procedure: This is a retrospective study that involves 87 confirmed cases of ameloblastoma over 10 years. The case records and biopsy reports were retrieved from the archives of the Department of Oral & Maxillofacial Pathology and Oral Microbiology, A B Shetty Memorial Institute of Dental

Sciences. Results and conclusion: The results revealed that age group between 26-50 years (49.4%) were affected the most, and had a male predilection (58.6%) and maximum involvement of jaw was mandible (88.5%), site involvement was the body of the mandible (52.9%), the radiographic feature was the multicystic type (56.3%), the histopathological variant was follicular (33.3%) and out of the total number of cases analysed 9 cases had recurrence (10.3%). Clinical significance: The purpose of this study is to analyse and evaluate the distribution and frequency of ameloblastoma among various entities such as age group, jaw involved, site, histopathological variant, radiographic feature, and recurrence, to promote early diagnosis and treat them effectively.

***Keywords*---**Odontogenic tumor, Benign, Maxilla, Mandible.

Background

Ameloblastoma is a benign odontogenic tumour arising from the odontogenic epithelium with no influence on the ectomesenchyme.[1] It is a locally invasive tumour and generally occurs in jawbones.[2,3] Ameloblastoma usually arises from epithelial and/or ectomesenchymal tissue participating in the odontogenesis.[4]Ameloblastomas accounts for about half of all odontogenic tumours (48.9%) with female to male and maxilla to mandible ratios of 1:1.7 and 1:8, respectively.[5]

The 2005 classification of ameloblastoma was solid/multicystic, extraosseous/peripheral, desmoplastic, and unicystic ameloblastoma. Whereas in 2017 revised WHO classification of ameloblastoma was narrowed down to ameloblastoma, unicystic ameloblastoma, and extraosseous/peripheral forms. Because most conventional ameloblastomas showed cystic degeneration with no physiologic differences, hence the nomenclature “solid/multicystic” was discarded. Follicular, plexiform, acanthomatous, granular cell, basaloid, and desmoplastic ameloblastoma are the histopathologic variants of ameloblastoma. The follicular pattern seems to be the most prevalent.[6] This tumour is thought to be derived from Serre’s epithelial cell rests, the epithelial cell rest of malassez, epithelium of odontogenic cysts, and basal cell layer of the gingiva or oral mucosa.[7,8]

The tumour is asymptomatic and slow-growing. The clinical signs are dental malocclusion, pain, and paraesthesia of the afflicted area.[9] Radiographs reveal a well-defined unilocular or multilocular radiolucency that may or may not be related to an unerupted tooth.[10] Ameloblastoma histologically demonstrates proliferating odontogenic epithelium in a fibrous stroma background.[10] Histologic subtypes can be distinguished by various patterns produced by a particular variant.[8]

The follicular variant shows central portions of the neoplastic islands that are loosely structured and resemble the stellate reticulum of a budding tooth germ,

while the outer cells are columnar(palisaded) and also have reverse nuclear polarity.[11]

Plexiform variant presents with a thin lamina similar to strands. There are two unique patterns of plexiform variant. The cells are basaloid in one of the patterns, and they are frequently grouped in a double row of basaloid cells. The second pattern has thicker cords and more squamous central cells, but neither pattern has peripheral palisading or reverse nuclear polarity. The distinctive feature of the acanthomatous variant is central squamous differentiation and it may frequently get mixed up with squamous cell carcinoma or squamous odontogenic tumour.[11] The granular cell and basal cell variants present with granular cell and basaloid cell morphology respectively. Whereas the granular cell may sometimes complicate the diagnosis because of the nuclear crowding and hypercellularity of basal cells which may raise an alarm for malignancy, but by itself, it is not malignant.[11]

The desmoplastic variant presents with loss of peripheral palisading with a reverse nuclear polarity which is induced by the tumour cells in the stroma showing desmoplasia.[11]The desmoplastic variant is characterized with definitive clinical and radiographic features but presents with similar clinical behaviour as conventional ameloblastoma.[12]

The hybrid type is a more complex and unique variant of ameloblastoma which often is challenging because it usually shows more than two variants mostly histopathological. Many authors have contributed various case reports but the exact histopathological features are still uncertain. But the clinical and radiographical features are very similar to all the variants of ameloblastoma but for positive identification, tissue diagnosis is a must.[13] Waldron and El-Mofty reported an unusual type of ameloblastoma which showed histologically areas of both classic follicular or plexiform pattern and areas of desmoplastic variant, hence it was referred to as hybrid ameloblastoma.[14,15]

Unicystic ameloblastoma is a term used to describe cystic lesions that have clinical, radiographical, and gross features similar to that of a mandibular cyst but may exhibit a typical ameloblastomatous epithelium lining the cystic cavity, with or without luminal and /or mural proliferation.[16]

Ameloblastoma although is benign in nature it is a belligerent tumour of jaws due to its high recurrences. Therefore, this review aims at discussing the distribution and frequency of ameloblastoma among various entities such as age group, jaw involved, site, histopathological variant, radiographic feature, and recurrences, spanning 10 years at a single institution.

Materials and Methodology

This retrospective study was conducted using case records and biopsy reports of all confirmed cases of ameloblastoma for 10 years. The records were retrieved from archives of the Department of Oral & Maxillofacial Pathology and Oral Microbiology, A B Shetty Memorial Institute of Dental Sciences, Mangalore. The study comprised of 87 confirmed cases of ameloblastoma, the parameters such as

age, gender, jaw involvement, site, histopathological variant, radiographic feature, and recurrence were considered and used for analysis.

For analysis, the entities were categorized into various subdivisions for convenience. Age was categorized into 1) people whose age is less than 25years (<25years) 2) people aged between 26 and 50 (26-50years) 3) people aged above 50years (>50years), the mandible was categorized into 1) anterior-mandible (Ant-Mand) 2) posterior- mandible (post-Mand) 3) body of the mandible 4) angle of the mandible 5) body and angle of mandible 6) body, angle, and ramus of mandible. Similarly, for maxilla it was categorized into 1) anterior-maxilla (Ant-Max) 2) posterior-maxilla (post-Max). Descriptive analysis and counts/percentage, mean, standard deviation, and confidence interval were performed to calculate the frequency and percentages of these variables.

Results

Demographic Features (Table-1)

Among the 87 cases considered in the study about 28 cases (32.2%) occurred in patients aged below 25 years(<25years), 43 cases (49.4%) in patients aged between 26-50 years, and 16 cases (18.4%) in patients aged above 50 years of age(>50years) Figure-1.

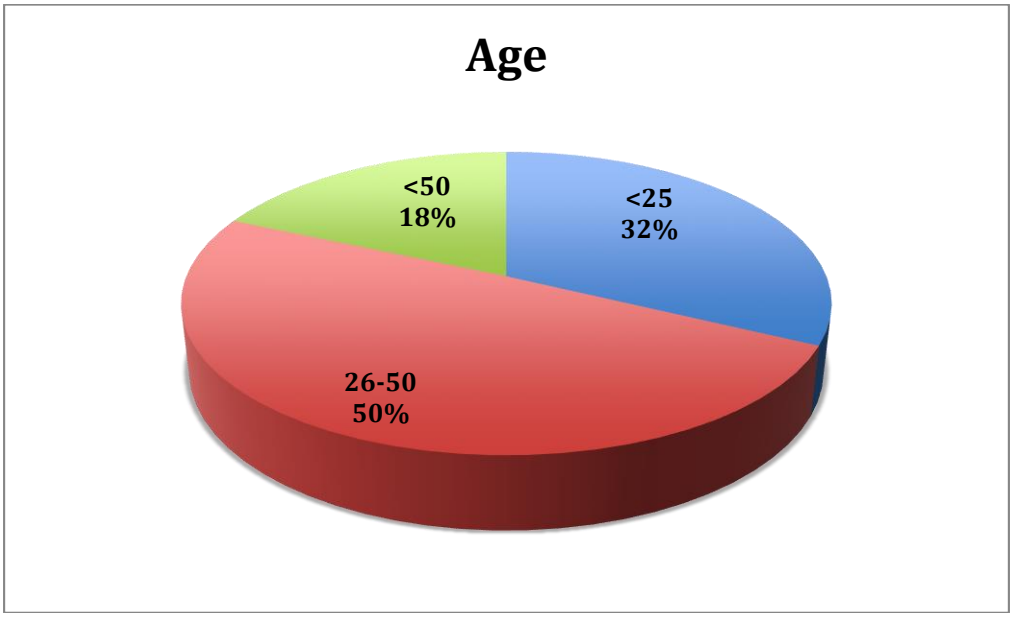

Figure -1 Distribution among various age groups

The majority of the tumour occurred in males about 51 cases (58.6%) and in femalesabout 36 cases (41.4%) Figure-2.

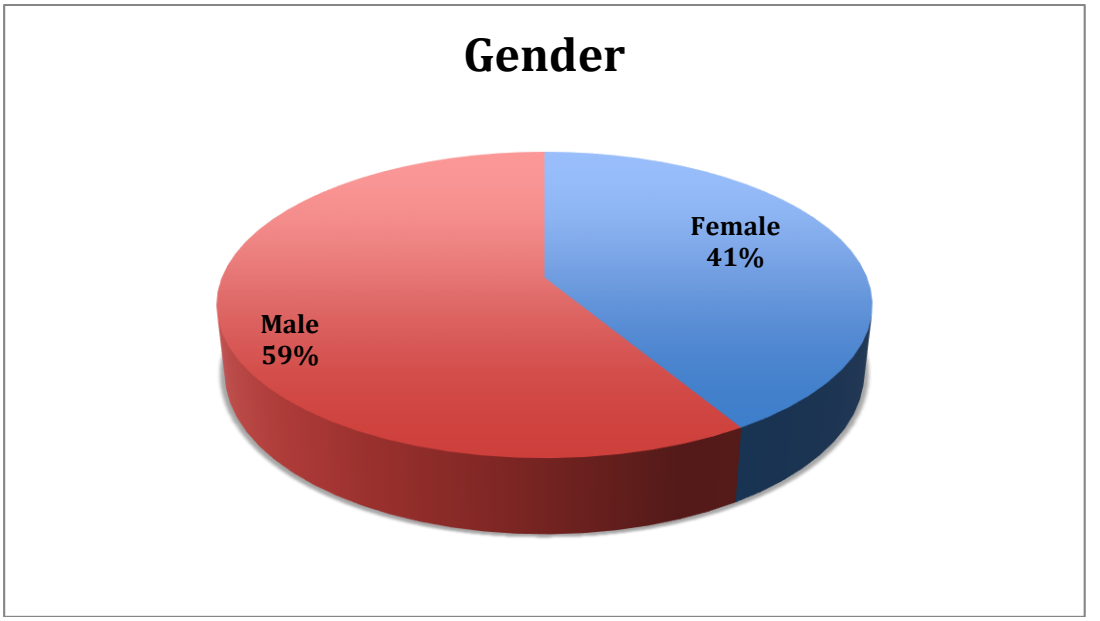

Figure – 2 Distribution of occurrence in males and females

Table-1 Description of various parameters reported in the study

		Frequency	Percent
Age	<25	28	32.2
	26-50	43	49.4
	>50	16	18.4
Gender	Female	36	41.4
	Male	51	58.6
Jaw	Mand	77	88.5
	Max	10	11.5
Right/Left	b/l	9	10.3
	Left	36	41.4
	Midline	3	3.4
	Right	39	44.8
Site	Anterior – max	1	1.1
	Post -max	9	10.3
	Anterior – Mand	1	1.1
	Posterior -mand	5	5.7
	Body	46	52.9
	Angle	5	5.7
	Body & angle	11	12.6
	body angle & ramus	9	10.3

Xray	Mixed	3	3.4
	Multi	49	56.3
	Uni	35	40.2
Histopathological subtype	Acantomatous	4	4.6
	Desmoplastic	7	8.0
	Follicular	29	33.3
	Granular	2	2.3
	Hybrid	2	2.3
	Mixed	11	12.6
	Plexiform	15	17.2
	Unicystic	17	19.5
Recurrence	Recurrence	9	10.3
	No	78	89.7

Site Involvement (Table-1)

The commonly involved jaw was mandible in about 77 cases (88.5%) and maxilla about 10 cases (11.5%). The side involvement was maximal on the right side of the face about 39 cases (44.8%), left side was about 36 cases (41.4%), bilateral involvement was seen in 9 cases (10.3%) and 3 cases (3.4%) was seen in midline region. The commonly occurring site was 1) body of the mandible in about 46 cases (52.9%) followed by 2) 11 cases (12.6%) occurred in body and angle of mandible, 3) in body, angle, and ramus and 4) posterior maxilla it occurred in equal number about 9 cases (10.3%). Similarly, 5) posterior mandible and 6) angle of mandible had an equal occurrence in 5 cases (5.7%). The least occurring sites were 7) anterior maxilla and 8) anterior mandible in 1 case (1.1%) Figure-3.

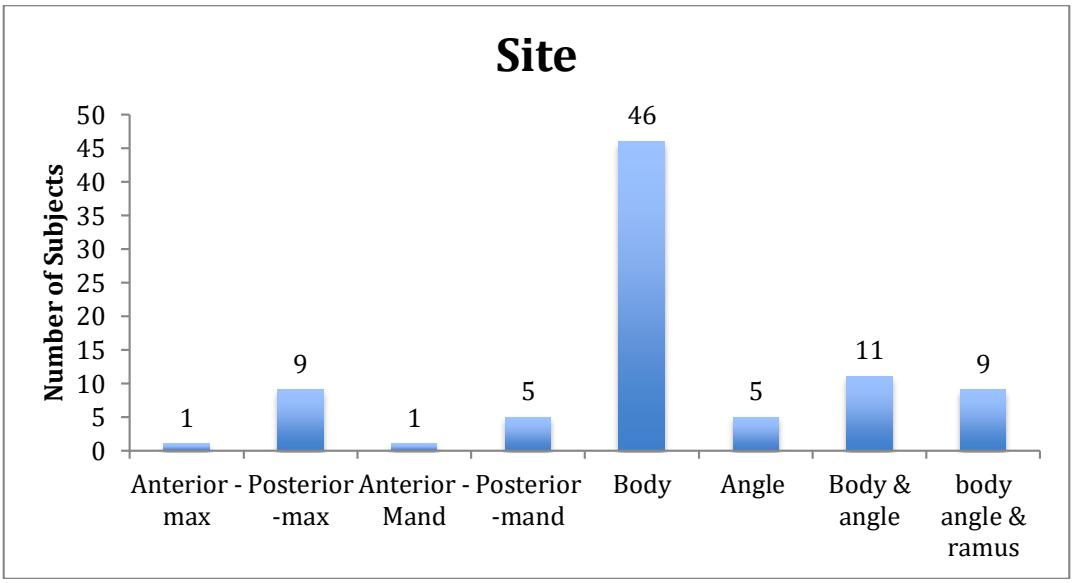

Figure –3 Representation of various site involving in maxilla and mandible among the subjects

Radiographic features showed three types: Multicystic, unicystic and mixed.
The multicystic appearance was the commonest occurring feature among 49 cases (56.3%) then followed by unicystic appearance in 35 cases (40.2%) and mixed locularity in 3 cases (3.4%) Figure-4.

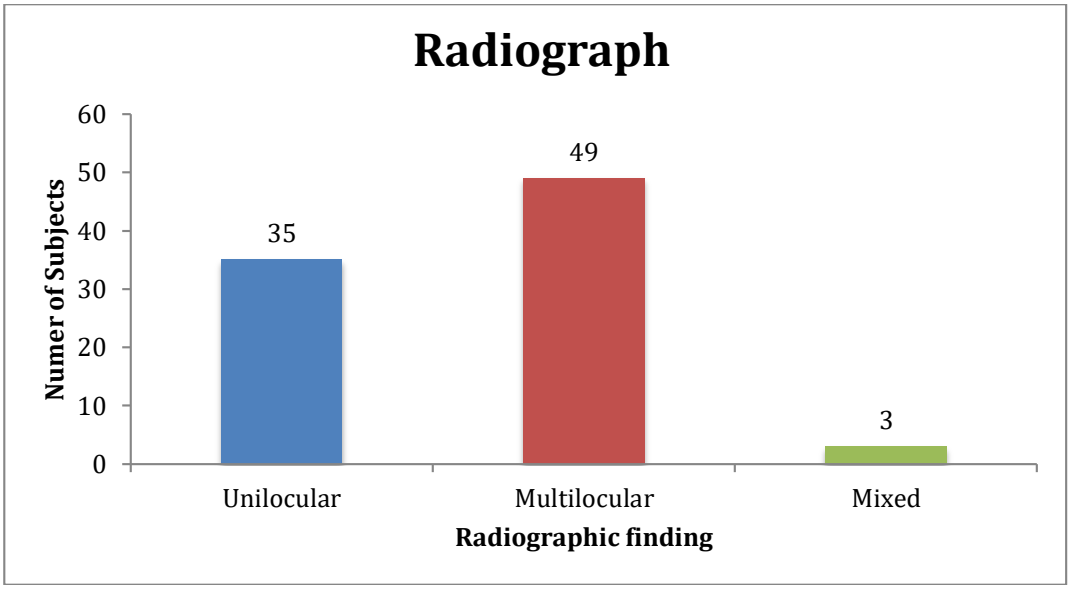

Figure – 4 Representation of radiographic feature of number of subjects

Histopathological Subtypes and Recurrence

Among the eight variants of ameloblastoma the most commonly occurred histopathological subtype was follicular occurring in about 29 cases (33.3%) followed by unicystic occurring in 17 cases (19.5%), the plexiform variant in 15 cases (17.2%), the mixed variant in about 11 cases (12.6%), desmoplastic in 7 cases (8%), acanthomatous in 4 cases (4.6%) then the least occurred was granular and hybrid variants in 2 cases (2.3%). The maximal cases had no recurrence of about 78 cases (89.7%) and few had recurrence about 9 cases (10.3%) Figure-5.

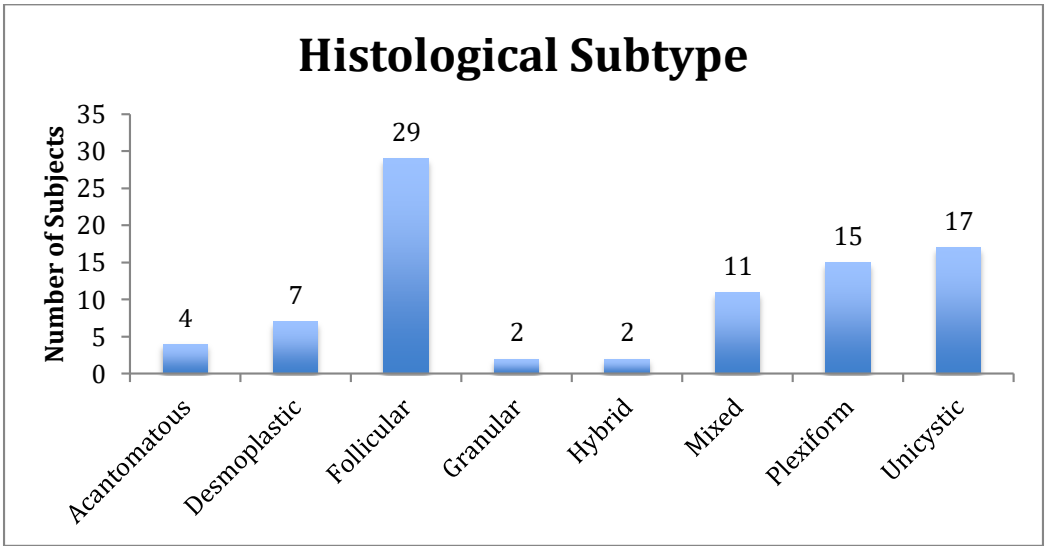

Figure – 5 Representation of various histological subtype occurring in number of subjects

According to histopathological subtype occurring in particular gender, males were affected more with plexiform variant in 12 cases (23.5%), unicystic variantin 10 cases (19.6%), mixed tumours in 8 cases (15.7%), and hybrid variant in 2 cases (3.9%). The females were more affected in follicular variant 15 cases (41.7%), desmoplastic variant in 5 cases (13.9%), and granular variant in about 1 case (2.8%). The maximal number of ameloblastoma occurred in males 51 cases (58.6%) compared to females 36 cases (41.4%). Table-2

Table-2 Description of Histopathological subtype occurring in gender

Subtype	Gender		Total
	Female	Male	
Acantomatous	2(5.6%)	2(3.9%)	4(4.6%)
Desmoplastic	5(13.9%)	2(3.9%)	7(8.0%)
Follicular	15(41.7%)	14(27.5%)	29(33.3%)
Granular	1(2.8%)	1(2.0%)	2(2.3%)
Hybrid	0	2(3.9%)	2(2.3%)
Mixed	3(8.3%)	8(15.7%)	11(12.6%)
Plexiform	3(8.3%)	12(23.5%)	15(17.2%)
Unicystic	7(19.4%)	10(19.6%)	17(19.5%)
	36(41,4%)	51(58.6%)	**87(100.0%)**
	Fisher's exact value= 9.01, p=0.22(NS) *P<0.05 statistically significant p>0.05 non-significant, NS		

Considering the age, the most commonly occurred histopathological subtype was follicular variant in patients aged between 26-50 years of age 18 cases (41.9%), unicystic variant occurred in 10 cases (35.7%) among the age group less than 25 years of age (<25 years), plexiform variant occurred maximally in the age group less than 25 years (<25 years) in 7 cases (25.0%), mixed variant occurred in 5

cases (11.6%) among patient aged between 26-50 years of age, hybrid variant occurred in 1 case between two age groups patient aged less than 25 years (<25 years)(3.6%) and patient aged between 26-50 years (2.3%). The granular variant occurred only in one category that is inpatient aged below 25 years (<25 years) 2 cases (7.1%). Whereas desmoplastic had occurred in more inpatient aged between 26-50 years of age about 6 cases (14.0%). The acanthomatous variant had occurred in equal number that is 2 cases in two categories patient aged between 26-50 years (4.7%) and above 50 years (>50 years) (12.5%). The variants desmoplastic and acantomatous had not occurred in the category of patients aged below 25 years (>25 years). Table-3

Table-3 Description of Histopathological subtype occurring in different age group

Subtype	Age			Total
	<25	26-50	>50	
Acantomatous	0	2(4.7%)	2(12.5%)	4(4.6%)
Desmoplastic	0	6(14.0%)	1(6.3%)	7(8.0%)
Follicular	6(21.4%)	18(41.9%)	5(31.3%)	29(33.3%)
Granular	2(7.1%)	0	0	2(2.3%)
Hybrid	1(3.6%)	1(2.3%)	0	2(2.3%)
Mixed	2(7.1%)	5(11.6%)	4(25.0%)	11(12.6%)
Plexiform	7(25.0%)	6(14.0%)	2(12.5%)	15(17.2%)
Unicystic	10(35.7%)	5(11.6%)	2(12.5%)	17(19.5%)
	28(32.2%)	43(49.4%)	16(18.4%)	**87(100.0%)**
	Fisher's exact value= 21.47, p=0.03* *P<0.05 statistically significant p>0.05 non-significant, NS			

Table-4: This is a crosstabulation representing histopathological subtype occurring in particular site in the jaws

Histo subtype		Site								Total
		Angle of mand	Ant - Mand	Ant-max	Body of mand	Body & angle of mand	body angle & ramus of mand	Post-max	Post-mand	
Acantomatous	N	0	0	0	4	0	0	0	0	4
	%	0.0%	0.0%	0.0%	8.7%	0.0%	0.0%	0.0%	0.0%	4.6%
Desmoplastic	N	0	0	1	2	0	0	4	0	7
	%	0.0%	0.0%	100.0%	4.3%	0.0%	0.0%	44.4%	0.0%	8.0%
Follicular	N	1	0	0	17	4	3	2	2	29
	%	20.0%	0.0%	0.0%	37.0%	36.4%	33.3%	22.2%	40.0%	33.3%
Granular	N	0	0	0	2	0	0	0	0	2
	%	0.0%	0.0%	0.0%	4.3%	0.0%	0.0%	0.0%	0.0%	2.3%
Hybrid	N	0	0	0	2	0	0	0	0	2
	%	0.0%	0.0%	0.0%	4.3%	0.0%	0.0%	0.0%	0.0%	2.3%
Mixed	N	1	0	0	4	1	3	1	1	11
	%	20.0%	0.0%	0.0%	8.7%	9.1%	33.3%	11.1%	20.0%	12.6%
Plexiform	N	1	0	0	7	4	1	1	1	15
	%	20.0%	0.0%	0.0%	15.2%	36.4%	11.1%	11.1%	20.0%	17.2%

Unicystic	N	2	1	0	8	2	2	1	1	17
	%	40.0%	100.0%	0.0%	17.4%	18.2%	22.2%	11.1%	20.0%	19.5%
Total	N	5	1	1	46	11	9	9	5	87
	%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%

Discussion

Ameloblastoma is an odontogenic benign tumour of the maxilla and mandible with a well-documented propensity for loco-regional invasion and risk of recurrence.[17]The onset of ameloblastoma is insidious and it may take years before a patient develops any symptoms. The patient often presents with a history of painless swelling of the jaw occasionally with loose teeth. Clinical examination will reveal the presence of a submucosal mass arising from the underlying mandible or maxilla.[18]

Radiographic evaluation is necessary to assess the features of a tumour and the extent of bone involvement.[19] Obtaining a tissue diagnosis is crucial before one embarks on a definite treatment.[17] Locally aggressive behaviour is often seen in follicular, acanthomatous, and granular cell subtypes of ameloblastoma.[20] Milman et al. presented a study in 2016 that indicated a higher proportion of patients that were diagnosed with ameloblastoma occurring in the maxillary region, which they believe reflects their centre's tertiary and referral character. Their research confirmed that maxillary ameloblastoma is more common in men and develops at an older age, which explains the demographics of their patient population.[17,21]This is disputable to the current study because the majority of the tumour occurrence was in the mandible compared to maxilla.

Reichart et al. conducted a comprehensive research in which they examined data on the demographics and clinical presentation of ameloblastoma in 3677 individuals. According to their findings, the tumour most commonly manifested itself as a swelling over the afflicted region (mandible in 80% of instances) in people aged 36 and higher, with an even gender distribution.[22] It supports the current study in which the most affected age group was between 26-50 years (49.4%), had male predilection (58.6%), and occurred maximally on the mandible (88.5%).

According to literature and a retrospective study conducted by Singh T et al. on the demographic data and treatment outcomes in ameloblastoma among the Australian population, the majority of the males (63%) were affected, it was commonly diagnosed in the mean age group of 43 years, the majority of the tumours occurred in the mandible (80.5%) in the posterior aspect of the jaws (85%). All the tumours were unilateral (95.1%), affecting the right or left sides of the jaw in roughly equal amounts. Only a few tumours have crossed the midline and affected both sides of the mandible.[23]There is close proximity to the results of our study whereas in our study the majority of the tumour's occurred on the right side of the jaw (44.8%) followed by the left side (41.4%) and occurred bilaterally approximately in 9 cases (10.3%) and crossed the midline in 3 cases (3.4%). And 9 cases (10.3%) had recurrence during the period of study.

Conclusion

The goal of reporting ameloblastomas in this region has been accomplished. Despite the limited sample size, the data is valuable for bettering one's understanding of the tumour. Studies on the incidence of ameloblastomas in the Indian population are scarce, hence to obtain a demographic distribution of ameloblastoma among the various Indian population, similar studies, and meta-analyses, at various levels of society and geographic locations must be conducted. The knowledge of the biological behaviour of ameloblastoma is still inadequate for drawing an absolute conclusion. There are not many large-scale studies done with long-term follow-up results.[23]Ameloblastoma is usually diagnosed at a late stage because of its poor symptoms. An early diagnosis that correlates with histological, clinical, and radiographic characteristics to reach a definitive diagnosis is one of the most important variables in treatment therapy.

Acknowledgement

We would like to acknowledge our indebtedness and render our warmest thanks to Prof (Dr) Pushparaja Shetty, Head of the Department, Oral and Maxillofacial Pathology and Oral Microbiology, AB Shetty Memorial institute of Dental Sciences, Nitte Deemed to be University,Mangalore for his guidance and support.

Source of Funding

Nil

Conflict Of Interest

Nil

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