

Research Article

A clinicopathological analysis of 151 odontogenic tumors based on new WHO classification 2022: A retrospective cross-sectional study

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Abstract: Background: Odontogenic tumors are a diverse group of lesions with a variety of clinical behavior and histopathologic subtypes, from hamartomatous and benign to malignant. The study aimed to examine the clinical and pathological features of odontogenic tumors in Baghdad over the last 11 years (2011–2021). Materials and Methods: The present retrospective study analyzed all formalin-fixed, paraffin-embedded tissue blocks of patients diagnosed with an odontogenic tumor that were retrieved from archives at a teaching hospital/College of Dentistry in Baghdad University, Iraq, between 2011 and 2021. The diagnosis of each case was confirmed by examining the hematoxylin and eosin stained sections by two expert pathologists. Data from patients' case sheets were collected, including age, gender, location, and histopathological information. The type of lesions was evaluated based on the World Health Organization's most recent classification (March 2022). Results: There were 151 odontogenic tumor during this period. The most common type (39.1%) was Solid ameloblastoma. The mandibular tumors (76.8%) were more than the maxillary tumors (23.2%). The female to male ratio was 1.1:1. The most cases are found between the 2nd and 5th decades of life. Conclusions: Solid ameloblastoma was the most common odontogenic tumor, while primordial odontogenic tumor was the rarest, Odontogenic tumors were slightly more common in females than in males, the most common cases occur in the mandible., the outcome of the study gives valuable information regarding the patients' profile and type of odontogenic tumors over 11 years, which could aid in the early diagnosis and enhance the intervention.

Keywords: odontogenic tumors, Ameloblastoma, Keratocyst; WHO 2022

Introduction

Odontogenic tumors (OT) are a diverse group of lesions with a variety of clinical behaviors and histopathologic pictures. OT are particularly unique to the jaws, emerging from the tissues that form the teeth ^(1,2). The main scenario of OT development is the interactions between odontogenic ectomesenchyme and epithelium ⁽³⁾. The most recent update of the World Health Organization (WHO) classification of OT (5th edition) was published in March 2022 ⁽⁴⁾. In general, the classification depends on which tooth germ shows the neoplastic change: epithelial, mesenchymal (ectomesenchymal), or mixed; and whether the OT reveals benign or malignant microscopic picture ⁽⁵⁾. Malignant OT are exceedingly rare ⁽⁶⁾. Despite the fact that a number of previous epidemiological studies on OT have been conducted around the world ^(7,8), clear information about the demographic profile and behaviors of OT in the Iraqi population is scarce. This study aimed to evaluate the types and demographic features of OT in Iraqi population over a period of 11 years (2011-2021) based on the WHO classification of OT (fifth edition).

Materials and Methods

The retrospective cross-sectional study was conducted between 10/November/2021 to 5/June/2022 after ethical approval was obtained from the ethical committee in the College of Dentistry/University of Baghdad (Ref: 125, 28/November/2019). All (3992) recodes of oral biopsies at the pathological laboratory in the College of Dentistry/University of Baghdad were checked and the OT samples had been isolated. The diagnosis of OT was confirmed by examining the histopathological picture in each case by two pathologists using light microscope. The type and subtype (if any) of each OT have been registered according to the latest criteria of the WHO published in 2022. The associated demographic data with each OT, including jaw, sex, and age, was gathered from the case sheets.

Statistical analysis

The descriptive analysis included frequency and percentage for the distribution of the tumor types and subtypes, sex, site, and age group, mean and standard deviation for age. The inferential statistic depended on the chi square test. All analysis was conducted by SPSS, statistical software for Windows (version 19.0), released in 2012 by IBM Crop (Armonk, NY: IBM Corp).

Results

The total number of OT was 151 (3.78%) cases out of the total number of all biopsies, classified into 146 (96.69%) benign tumors and 5 (3.31%) malignant tumors. The sex distribution of the OT patients was 80 (53%) females and 71 (47%) males with no significant difference. The age ranged from 5 to 85 years, and the mean age was 35.52, and about two thirds of the cases were in 2nd to 5th decades. The mandibular cases were 116 and the maxillary were 35 cases only.

The proportion of patients with Solid ameloblastoma was statistically significant, being the largest percentage (39.1%), while the proportion of patients with primordial odontogenic tumors was the lowest (1.3%). Table 1 illustrated the distribution of the OT types, age groups, jaw, and sex.

Table 1: The Incidence, gender, age, and jaw distribution of odontogenic tumors

	Variables	f, %	P- value*
Odontogenic Tumors Total number: 151	Solid Ameloblastoma ^b	59, 39.1	0.001
	Uncystic Ameloblastoma ^b	31, 20.5	
	Adenomatoid odontogenic tumor ^b	8, 5.3	
	Calcifying epithelial odontogenic tumor ^b	7, 4.6	
	Ameloblastic fibroma ^b	9, 6.0	
	Primordial odontogenic tumor ^b	2, 1.3	
	Odontoma ^b	10, 6.6	
	Odontogenic fibroma ^b	17, 11.3	
	Cementoblastoma ^b	3, 2.0	
	Ameloblastic carcinoma ^m	5, 3.3	
Age groups (years)	0-10	9, 6.0	0.001
	11-20	26, 17.2	
	21-30	34, 22.5	
	31-40	29, 19.2	
	41-50	23, 15.2	
	51-60	10, 6.6	
	61-70	14, 9.3	
	71-80	5, 3.3	
	81-90	1, 0.7	
Mean age ±SD	35.52 ± 18.7		
Age Min-Max	5-85		
Sex	Male	71, 47.0	0.001
	Female	80, 53.0	
Site	Upper jaw (Maxilla)	35, 23.2	0.001
	Lower jaw (Mandible)	116, 76.8	

b: benign tumor. **m:** malignant tumor. (**f, %**): frequency and percentage. **SD:** standard deviation.

*: High significant at ≤ 0.01 by chi-square test.

Regarding the histopathological variants, follicular type was predominant variant in solid ameloblastoma, while mural type was predominant in uncystic ameloblastoma. Other types were illustrated in table 2

Table 3 showed the correlation of age, sex, and the involvement of the jaw with the type of the OT. The age group (21-30) years had a statistical correlation with solid ameloblastoma and unicystic ameloblastoma. Females had higher rates of all types of OT than males, with the mandible being more involved than the maxilla.

Table 2: The variant distribution of the odontogenic tumors

Odontogenic tumors	Variants ^a
Solid Ameloblastoma Total cases:59	Follicular 48, 81.4
	Plexiform 6, 10.6
	Acanthomatous 2, 3.4
	Atypical 2, 3.4
	Desmoplastic 1, 1.7
Unicystic Ameloblastoma Total cases:31	Mural 14, 45.2
	Intraluminal 10, 32.3
	luminal 7, 22.6
Calcifying epithelial odontogenic tumor Total cases:7	Conventional 6, 85.7
	Without calcification 1, 14.3
Odontoma Total cases:10	Complex 5, 50.0
	Compound 5, 50.0
Adenomatoid odontogenic tumor Total cases:8	With calcification 4, 50.0
	Non calcifying 4, 50.0

a: frequency, percentage

Table 3: The Incidence, gender, age, and jaw distribution of each odontogenic tumors type.

Sex	Odontogenic Tumors									
	AB	UAB	AOT	COET	AF	POT	O	OF	CB	AC
Male ^a	26, 44.1	17, 54.8	4, 50.0	2, 28.6	6, 66.7	2, 100	3, 30.0	5, 29.4	3, 100.0	3, 60.0
Female ^a	33, 55.9	14, 45.2	4, 50.0	5, 71.4	3, 33.3	-	7, 70.0	12, 70.6	-	2, 40.0
P-value *	NS	NS	NS	NS	NS		NS	NS		NS
Age (y)										
Mean ±SD	38.25 ±16.8	33.39 ±14.6	35.75 ±0.5	22.86 ±10.4	16 ±0.5	10 ±5.7	26.5 ±16	48.71 ±15.7	28 ± 6.1	
Min - Max	5 - 85	7 - 75	6 - 68	7 - 34	5 - 40	6 - 14	8 - 65	20 - 70	24 - 35	
Groups										
0-10 ^a	1, 1.7	1, 3.2	2, 25.0	1, 14.3	2, 22.2	1, 50.0	1, 10.0	-	-	-
11-20 ^a	5, 8.5	6, 19.4	2, 25.0	2, 28.6	5, 55.6	1, 50.0	4, 40.0	1, 5.9	-	-
21-30 ^a	17, 28.8	9, 29.0	-	1, 14.3	1, 11.1	-	2, 20.0	2, 11.8	2, 66.7	-
31-40 ^a	11, 18.6	7, 22.6	1, 12.5	3, 42.9	1, 11.1	-	2, 20.0	2, 11.8	1, 33.3	1, 20.0
41-50 ^a	15, 25.4	4, 12.9	-	-	-	-	-	3, 17.6	-	1, 20.0
51-60 ^a	3, 5.1	1, 3.2	-	-	-	-	-	5, 29.4	-	1, 20.0
61-70 ^a	4, 6.8	1, 3.2	3, 37.5	-	-	-	1, 10.0	4, 23.5	-	1, 20.0
71-80 ^a	2, 3.4	2, 6.5	-	-	-	-	-	-	-	1, 20.0
81-90 ^a	1, 1.7	-	-	-	-	-	-	-	-	-
P-value *	0.00	0.01	NS	NS	NS	NS	NS	NS	NS	NS
Jaw										
Maxilla ^a	9, 15.3	3, 9.7	2, 25.0	3, 42.9	2, 22.2	2, 100	4, 40.0	9, 52.9	1, 33.3	-
Mandible ^a	50, 84.7	28, 90.3	6, 75.0	4, 57.1	7, 77.8	-	6, 60.0	8, 47.1	2, 66.7	5, 100
P-value *	0.00	0.00	NS	NS	NS		NS	NS	NS	

a: frequency, percentage, **AB:** Ameloblastoma (Solid), **UA:** Unicystic ameloblastoma, **AOT:** Adenomatoid odontogenic tumor, **AF:** Ameloblastic fibroma, **COET:** Calcifying epithelial odontogenic tumor, **OF:** Odontogenic

fibroma, **O**: odontoma, **CB**: Cementoblastoma, **POT**: Primordial odontogenic tumor, **AC**: ameloblastic carcinoma, *: high significant at ≤ 0.01 by chi-square test.

Discussion

Odontogenic tumors account for a significant fraction of the lesions seen in the maxillofacial region that refer to a diverse group of lesions ranging from hamartomas to benign and malignant tumors ⁽⁹⁾. Although these diverse tumors are uncommon, they carry a significant therapeutic as well as diagnostic trial; therefore, awareness of frequency and simple clinical picture is useful for diagnosis and therapy ⁽¹⁰⁾.

The present study showed that OT were rare cases that affected the oral and maxillofacial regions (3.78%). These findings agree with the previous studies ^(11, 12). The statistical analysis showed that the frequency of solid ameloblastoma cases were superior to all other types of OT in the current study. epidemiological studies held in India ⁽¹³⁾, Libya ⁽¹⁴⁾, Turkey ⁽¹⁵⁾, and Italy ⁽¹⁶⁾ also mentioned that the Solid ameloblastoma incidence was in front of all OT.

Some authors reported keratocystic odontogenic tumors as one of the common types of OT. These studies depended on the 3rd WHO classification ^(17, 18). The last updated versions (4th and 5th) of the classifications, reclassify the keratocystic odontogenic tumor from the OT to odontogenic cysts and recall again as odontogenic keratocyst.

The sex factor in current outcomes appeared to have no impact on the incidence of OT in general, although the number of female patients was somewhat more than male, but no significant difference. The present outcome comes in consistency with previous work ^(11, 19). In contrast to the present study, studies conducted in Ethiopia ⁽²⁰⁾ and Iran ⁽²¹⁾ found the incidence of OT was higher in males than females. The number of the studied cases could have had a role in the discrepancy in the results. The association between all types of OT and sex was not significant except for odontogenic fibroma, the data showed that females were affected by this type of neoplasm more than males, in similar to previous studies ⁽²²⁻²⁴⁾. A study conducted in Iran ⁽²⁵⁾ revealed different results. it stated that odontogenic fibroma was found commonly in males.

Two-thirds of OT cases were found to occur between 11 and 50 years of age. The third decade of age is marked by occupying the Solid ameloblastoma and unicystic ameloblastoma cases more than the other groups, and the mean age for both tumors was 38.45 and 33.39, respectively. No statistical difference in age had been found among the other tumors. Like the present finding, a study held in China ⁽²⁶⁾, India ⁽¹¹⁾, Korea ⁽²⁷⁾, and Kenya ⁽²⁸⁾ also found that patients with an age range of 21 to 30 years was highlighted as the largest group to experience Solid ameloblastoma and unicystic ameloblastoma. The favorable site for all OT in the current study was the mandible. These results agree with those stated by many authors ^(21, 26, 29-30)

The differences in clinicopathological variables among different studies reflect the variation that may be attributed to socioeconomic and genetic factors as well as most of these studies were based on different WHO classification editions.

The most common microscopic variant for the solid ameloblastoma and the unicystic ameloblastoma were follicular and mural subtype, respectively. These results were in line with other studies ^(31, 32).

Furthermore; similar to previous studies, calcification has been seen in half of adenomatoid odontogenic tumor cases ⁽³³⁾. On the other hand, calcifying epithelial odontogenic tumors were mostly conventional types, with one case without calcification. Amyloid-like material was seen in all cases. These results were similar to recent study ⁽³⁴⁾.

Conclusion

OTs were slightly more prevalent in females than in males, with the majority of cases occurring in the mandible as well as in patients in their third decade of life. The study's findings provide valuable information about the patient's profile and type of odontogenic tumors over an 11-year period. This study

enriches the existing body of epidemiologic studies literature by providing information on the relative frequency of OTs, which has been found to vary greatly across countries. Ethnic and Genetic factors may explain some of the discrepancy. Examiners can learn more about the prevalence of OTs and tumors in different parts of the world by conducting retrospective studies, which could aid in early diagnosis and improve intervention.

Conflict of interest: The authors have disclosed no potential conflicts of interest..

Author contributions

HHA and BHA; study conception and design. HHA; data collection. HHA and SJJ; Methodology, statistical analysis and interpretation of results. HHA and SJJ; original draft manuscript preparation. HHA and BHA; Writing - review & editing. Supervision; BHA and SJJ. All authors reviewed the results and approved the final version of the manuscript to be published.

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تحليل مرضي سريري لـ 151 ورماً سني المنشأ بناءً على تصنيف منظمة الصحة العالمية الجديد 2022: دراسة مقطعية بأثر رجعي

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المستخلص: الخلفية: الأورام السنية المنشأ هي مجموعة متنوعة من الأفات مع مجموعة متنوعة من السلوك السريري وأنواع من الأنسجة المرضية ، متباينة من الإفات العابية والحبيبية إلى الخبيثة. كان الهدف من الدراسة هو فحص السمات السريرية والمرضية للأورام السنية في بغداد على مدى السنوات الإحدى عشرة الماضية (2011-2021). المواد والطرق: حللت الدراسة الحالية بأثر رجعي جميع كتل الأنسجة المثبتة بالفورمالين والمضمنة بالبارافين للمرضى الذين تم تشخيص إصابتهم بورم سني المنشأ والتي تم استخراجها من الارشيف في المستشفى التعليمي / كلية طب الأسنان في جامعة بغداد ، العراق ، بين عامي 2011 و 2021. تم تأكيد تشخيص كل حالة عن طريق فحص المقاطع المصبوغة بالهيموكسيلين والأوسين بواسطة اثنين من أخصائيي علم الأمراض الخبراء. تم جمع البيانات من أوراق حالة المرضى ، بما في ذلك العمر والجنس والموقع والمعلومات النسيجية المرضية. تم تقييم نوع الأورام بناءً على أحدث تصنيف لمنظمة الصحة العالمية (مارس 2022). النتائج: كان هناك 151 أورام سنية المنشأ خلال الفترة. وكان النوع الأكثر شيوعاً (39.1٪) هو الورم الأرومي الصلب. أورام الفك السفلي (76.8٪) كانت أكثر من الفك العلوي (23.2٪). وكانت نسبة الإناث إلى الذكور 1.1:1. وكانت معظم الحالات بين العقيدين الثاني والخامس من العمر. الاستنتاجات: كان الورم الأرومي المينائي الصلب أكثر الأورام السنية شيوعاً ، بينما كان الورم السني البدائي هو الأكثر ندرة ، وكانت الأورام السنية أكثر شيوعاً في الإناث منها عند الذكور ، والحالات الأكثر شيوعاً تحدث في الفك السفلي. الملف الشخصي للمرضى ونوع الأورام السنية على مدى 11 عامًا ، والتي يمكن أن تساعد في التشخيص المبكر وتعزيز التدخل.