Odontogenic tumors: A review of 319 cases in a Nigerian teaching hospital

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Objective. This study sought to determine the relative frequency of odontogenic tumors in a Nigerian population and to compare these data with previous reports.

Study design. Records of patients seen at the Lagos University Teaching Hospital between January 1980 and December 2003, with histologic diagnosis of odontogenic tumors (based on World Health Organisation classification, 1992), were analyzed.

Results. Odontogenic tumors constituted 9.6% of all the biopsies of oral and jaw lesions seen within the period under study. Three hundred and eight (96.6%) were intraosseous, and 11 (3.4%) were peripheral (peripheral odontogenic fibroma = 7; peripheral myxoma = 3; peripheral ameloblastoma = 1). The mean age of patients was 29.9 ± 15.6 years (range, 4-85 years). Among these cases, 96.6% of the tumors were benign and 3.4% were malignant. Ameloblastoma with predilection for the mandible was the most frequent odontogenic tumor (63%), followed by adenomatoid odontogenic tumor (AOT) (7.5%), myxoma (6.5%), calcifying epithelial odontogenic cyst (5.3%), and odontogenic fibroma (5.3%). More cases of malignant odontogenic tumors were seen than cases of calcifying epithelial odontogenic tumor and odontomas. The mean ages of patients with AOT, ameloblastic fibroma, and odontoma were significantly lower than those with ameloblastoma (P < .05). No significant difference was found between the mean ages of patients with benign odontogenic tumors and those with malignant odontogenic tumors (P = .058).

Conclusions. Odontogenic tumors, especially ameloblastoma, are not considered rare among Nigerians, whereas odontoma, regarded as the most frequent odontogenic tumor in North and South America, is rare.


Odontogenic tumors (OT) are a group of heterogenous lesions derived from epithelial and/or mesenchymal elements that are part of the tooth-forming apparatus.1 They range from hamartomatous or nonneoplastic tissue proliferations to malignant neoplasms with metastatic capacity.2 A review of the literature revealed that odontogenic tumors accounted for between 1.0% and 30.0% of oral lesions.3-5

The first major attempt to classify this group of lesions was published in 1971 after a 5-year collaborative effort, organized by the World Health Organization (WHO).6 An updated second edition of the WHO classification was published in 1992.7 Due to advances in immunohistochemistry and molecular biology during the last decade, a revision of the 1992 edition of the WHO classification has been proposed by Philipsen and Reichart.2

Available literature on the relative frequency of OT are mostly in non-Africans.3,8-14 However, a few reports4,5,15,16 can be found in the international literature on the prevalence of odontogenic tumors in African
populations. The aim of this study was to determine the relative frequency of this heterogenous group of lesions seen at the Lagos University Teaching Hospital, Nigeria, over a period of 24 years (1980-2003), and to compare these data with previous reports.

MATERIAL AND METHODS

The histopathology records of the Department of Oral and Maxillofacial Surgery and the Department of Oral Pathology and Biology of the Lagos University Teaching Hospital were reviewed retrospectively for all the lesions of the oral cavity and the jaws seen from January 1980 to December 2003. A total of 339 lesions classified as odontogenic tumors during the period were reviewed. One investigator re-evaluated the hematoxylin and eosin—stained sections, and the diagnosis in each case was confirmed or modified in accordance with the second edition of the WHO classification. These were analyzed for age, gender, site of tumor, and histopathologic typing. For ease of reference, odontogenic tumors were divided into 2 major groups based on WHO classification: benign (group 1) and malignant (group 2) groups, with the benign group further subdivided into 1a (odontogenic epithelium without odontogenic ectomesenchyme), 1b (odontogenic epithelium with odontogenic ectomesenchyme, with or without dental hard tissue formation), and 1c (odontogenic ectomesenchyme with or without included odontogenic epithelium).

Data was analyzed using the SPSS for Windows (version 11.5; SPSS, Chicago, Ill) statistical software package. Descriptive statistics and test of significance were used as appropriate. The critical level of significance was set at $P < .05$.

RESULTS

A total of 3,337 lesions of the oral cavity and the jaws were seen and diagnosed between January 1980 and December 2003. Of these, 319 (9.6%) satisfied the criteria to be included as odontogenic tumors. Three hundred and eight (96.6%) were intraosseous, and 11 (3.4%) were peripheral (peripheral odontogenic fibroma = 7; peripheral myxoma = 3; peripheral ameloblastoma = 1). The mean age of patients was 29.9 ± 15.6 years (range, 4-85 years). Odontogenic tumors were most frequent in the second to fifth decade, 88.1% of patients being between 11 and 50 years (Table I). There was an overall male to female ratio of 1:1. Mandible to maxilla ratio was 4:1:1. All histologic types of OT occurred more in males except ameloblastic fibroma, adenomatoid odontogenic tumor (AOT), squamous odontogenic tumor (SOT), and myxoma. The age, gender, and site of tumor occurrence for different histologic types of odontogenic tumors are shown in Table II.

Group 1 (benign) tumors constituted 96.6% (1a, 66.6%; 1b, 17.6%; 1c, 12.4%) and group 2 (malignant) tumors constituted 3.4% of the odontogenic tumors. Ameloblastoma was the most frequent of group 1a tumors (94.8%), AOT was the most frequent of group 1b tumors (43%), and myxoma was the most frequent of group 1c tumors (52.5%). Ameloblastic carcinoma was the most common of malignant odontogenic tumors (Table I).

The most frequent odontogenic tumor was ameloblastoma (63%), followed by AOT (7.5%), myxoma (6.5%), calcifying odontogenic cyst (COC) (5.3%), odontogenic fibroma (OF) (5.3%), odontoma (2.5%), and ameloblastic carcinoma (2.2%). Other less common lesions are shown in Tables I and II.

The mean age ($±$ SD) of patients with ameloblastoma was 31.7 ± 15.3 years (range, 4-82 years) with a peak incidence in the third decade (Tables I and II). Male to female ratio and mandible to maxilla ratios of 1:1:1 and 8:1:1, respectively, were found. The mean age ($±$ SD) of patients with AOT (16.6 ± 5.7), ameloblastic fibroma (15.7 ± 3.0), and odontoma (22.3 ± 11.2) were significantly lower than those with ameloblastoma ($P < .05$). Table III compares the mean ages of ameloblastoma patients with those of other common histologic types.

Malignant odontogenic tumors occurred more in males than in females (7:4) and in the mandible more than the maxilla (8:3). Although the mean ages of patients with malignant odontogenic tumors (43.7 ± 22.4 years) and ameloblastic carcinoma (51.7 ± 24.9 years) were higher than those with benign odontogenic tumors (29.3 ± 14.9), no statistically significant difference was found ($P = .058$ and .055, respectively).

DISCUSSION

Available studies on the relative frequency of odontogenic tumors are mostly in non-Africans. Odontogenic tumors are reported to be rare and it takes considerable time for any center to collect representative cases in sufficient numbers. This may be the reason for relatively few reports on this heterogenous group of tumors, especially from Africa, with the exception of ameloblastoma. This report represents the largest series from an African environment.

Odontogenic tumors represented 9.6% of all the lesions of the oral cavity and the jaws seen in the present study. This is lower than a range of 15%-31% reported from the west African environment but similar to that reported from South Africa (8.6%). The similarity with the latter may be due to the fact that odontogenic tumors were considered as a percentage of all the biopsies, as done in the present study; whereas, the former considered the odontogenic tumors as a percentage of all tumor and tumor-like lesions. Reports from North and South America, however,
suggest that odontogenic tumors are less frequently seen. The geographic variation in the incidence of these tumors may need further investigation.

Odontogenic tumors were most frequent in the second to fifth decade of life in this present series. This is similar to previous reports.4,19 Malignant odontogenic tumors were seen as early as second decade of life in our series as previously reported.5,19 This is in contrast to reports4,10 that found malignant odontogenic tumors in the third decade of life and beyond.

This study confirms that benign tumors (96.6%) are the most frequently seen odontogenic tumor in agreement with most other reports.3-5,16-18,19 Although some authors have reported that malignant odontogenic tumors are rare (0%-1.6%),4,8-10 Odukoya5 and Lu et al19 have reported incidences of 5.2% and 6.1%, respectively. An incidence of 3.4% was found in the present study. Group 1a tumors constituted the most commonly seen tumors in the present series, in agreement with other reports.4,5,19

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Our finding that AOT is the second most frequent odontogenic tumor after ameloblastoma is in contrast with reports from Africa,4,5,18 which reported that myxoma occurs more commonly than AOT. However, Asamoa et al23 reported AOT as the most frequent pediatric odontogenic tumor in Nigeria. Studies from America also reported myxoma to be more frequent than AOT.8,10,14 AOT showed predilection for the maxilla, unlike other histologic types of odontogenic tumors in this study, in agreement with other reports.4,13,24,25 More females were affected than males in this study, in support of previous reports.5,10,11,19,25 whereas
Ochsenius et al\textsuperscript{14} reported otherwise. Arotiba et al.\textsuperscript{4} however, reported no sex predilection in their study. AOT occurred in relatively younger age group in conformity with previous studies.\textsuperscript{5,10} Although attempt was recently made by Philipsen and Reichart\textsuperscript{2} to reclassify AOT as a group 1a rather than group 1b (WHO classification) OT based on immunohistochemical reaction, this has not been universally accepted.

Myxoma has been reported to affect more females than males,\textsuperscript{4,5,10,14} as confirmed in this series. An equal sex predilection was, however, reported by Lu et al.\textsuperscript{19} Mandibular lesions were more frequent in the present study, unlike those reported elsewhere.\textsuperscript{4}

Calcifying odontogenic cyst and odontogenic fibroma are relatively frequent lesions in this series, each accounting for 5.3\% of OT. This is similar to reports by Daley et al.,\textsuperscript{8} Mosqueda-Taylor et al.,\textsuperscript{10} and Ochsenius et al.\textsuperscript{14} Regarding gender distribution, males were affected more than females in this study, whereas others\textsuperscript{10,14} reported that COC and OF have almost equal sex distribution.

Although odontomas are classified as group 1b tumors, many pathologists do not consider them as true odontogenic neoplasms but rather developmental malformations (hamartomas) of dental tissues.\textsuperscript{26,27} Odontoma is a relatively rare lesion in the African environment,\textsuperscript{4,5,15,16,18} as corroborated by the present series, unlike in America,\textsuperscript{8,10,11,14} where it accounts for the majority of odontogenic tumors. Most odontomas are discovered on routine radiograph and do not produce clinical symptoms.\textsuperscript{10} This may be responsible for the low incidence observed in African population, because

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**Table II.** Distribution of different histologic types of odontogenic tumors according to age, gender, and site of tumor

<table>
<thead>
<tr>
<th>Histologic type</th>
<th>Number (%)</th>
<th>Gender</th>
<th>Age range (years)</th>
<th>Mean ± SD (age)</th>
<th>Site</th>
<th>Man</th>
<th>Max</th>
<th>NS*</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ameloblastoma</td>
<td>201 (63)</td>
<td>M 106</td>
<td>F 95</td>
<td>4-82</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>SOT</td>
<td>6 (2)</td>
<td>0 6</td>
<td>20-46</td>
<td>38.2 ± 9.7</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Calcifying epithelial odontogenic tumor</td>
<td>5 (1.6)</td>
<td>5 0</td>
<td>14-28</td>
<td>21.3 ± 5.7</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Ameloblastic fibroma</td>
<td>6 (2)</td>
<td>1 5</td>
<td>10-18</td>
<td>15.7 ± 3.0</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Odontoameloblastoma</td>
<td>1 (0.3)</td>
<td>1 50</td>
<td></td>
<td>50</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Adenomatoid odontogenic Tumor</td>
<td>24 (7.5)</td>
<td>7 17</td>
<td>8-35</td>
<td>16.6 ± 5.7</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Calcifying odontogenic cyst</td>
<td>17 (5.3)</td>
<td>11 6</td>
<td>14-50</td>
<td>28 ± 10.2</td>
<td></td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>Odontoma</td>
<td>8 (2.5)</td>
<td>4 4</td>
<td>10-45</td>
<td>22.3 ± 11.2</td>
<td></td>
<td></td>
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<tr>
<td>Odontogenic fibroma</td>
<td>17 (5.3)</td>
<td>12 5</td>
<td>5-75</td>
<td>29.6 ± 17.2</td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>Myxoma</td>
<td>21 (6.5)</td>
<td>7 14</td>
<td>10-70</td>
<td>26.9 ± 16.4</td>
<td></td>
<td></td>
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<tr>
<td>Cementoblastoma</td>
<td>2 (0.6)</td>
<td>2 0</td>
<td></td>
<td>27</td>
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<td></td>
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</tr>
<tr>
<td>Ameloblastic carcinoma</td>
<td>7 (2.2)</td>
<td>3 4</td>
<td>16-85</td>
<td>51.7 ± 24.9</td>
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<tr>
<td>Malignant ameloblastoma</td>
<td>1 (0.3)</td>
<td>1 31</td>
<td></td>
<td>31</td>
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<td></td>
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<tr>
<td>Odontogenic fibrodentinosarcoma</td>
<td>1 (0.3)</td>
<td>1 28</td>
<td></td>
<td>28</td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>Ameloblastic fibro-odontosarcoma</td>
<td>1 (0.3)</td>
<td>1 35</td>
<td></td>
<td>35</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Odontogenic carcinosarcoma</td>
<td>1 (0.3)</td>
<td>1 25</td>
<td></td>
<td>25</td>
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</tr>
</tbody>
</table>

*NS, not specified.

**Table III.** Comparison of mean age of patients with ameloblastoma with other common odontogenic tumors

<table>
<thead>
<tr>
<th>Test value = 31.67 (mean age of ameloblastoma)</th>
<th>95% confidence interval of the difference</th>
</tr>
</thead>
<tbody>
<tr>
<td>$t$</td>
<td>df</td>
</tr>
<tr>
<td>------------------------------------------------</td>
<td>----</td>
</tr>
<tr>
<td>AOT</td>
<td>-12.808</td>
</tr>
<tr>
<td>SOT</td>
<td>1.633</td>
</tr>
<tr>
<td>OF</td>
<td>-500</td>
</tr>
<tr>
<td>Myxoma</td>
<td>-1.343</td>
</tr>
<tr>
<td>Ameloblastic fibroma</td>
<td>-13.019</td>
</tr>
<tr>
<td>Ameloblastic carcinoma</td>
<td>2.125</td>
</tr>
<tr>
<td>Odontoma</td>
<td>-2.380</td>
</tr>
<tr>
<td>COC</td>
<td>-1.432</td>
</tr>
</tbody>
</table>

*Statistical significance.
most patients in our environment do not seek medical consultation unless there are symptoms suggesting an obvious pathology. Genetic and/or environmental influences have also been suggested for the geographic variations. Mandibular lesions were more commonly seen, with equal sex predilection, in the present study.

SOT and calcifying epithelial odontogenic cyst (CEOT) were exclusively diagnosed in females and males, respectively, with both having predilection for the mandible in this study. They represented 2% and 1.6% of all OT, respectively. The frequency of these neoplasms in other series was even lower, confirming the rarity of these tumors.

Additional knowledge about malignant odontogenic tumors has accumulated after the second edition (1992) of the WHO classification, which prompted Eversole to refine the classification. The tumor that retains features of ameloblastic differentiation and exhibits cytologic features of malignancy is termed ameloblastic carcinoma in Eversole's classification and malignant ameloblastoma in the WHO classification.

Malignant OT in our study represented 3.4% of the total OT, more cases of which were seen than odontomas and CEOT. Odukoya and Lu et al had earlier reported a higher frequency from Africa and Asia, respectively. However, reports from America showed that they are very rare.

In conclusion, we observed some similarities between our studies and previous studies from Africa and Asia and some differences with the reports from the Americas. Ameloblastoma remains the most frequent odontogenic tumors in our environment, whereas odontoma is relative rare. Malignant odontogenic tumors are not uncommon lesions in our environment.

REFERENCES