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A RETROSPECTIVE STUDY OF *HISTOPATHOLOGIC PATTERNS OF ODONTOGENIC TUMORS ,CYSTS and MAXILLOFACIAL BONE TUMORS* SUBMITTED TO DEPARTMENT OF PATHOLOGY, A 5 YEAR EXPERIENCE AT TIKUR ANBESSA SPECIALIZED HOSPITAL FROM SEPTEMBER 2013 TO AUGUST OF 2018.

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I. Abstract

Introduction: The objectives of this study were to analyse, compare and contrast the demographic, clinical and pathological data of odontogenic tumours , cysts and maxillofacial bone tumors seen at Tikur Anbesa Hospital, Pathology department and compare with other international data as an aid to clinicians in diagnosing odontogenic and maxillofacial bone lesions.

Materials and Methods: This was a descriptive, retrospective study of odontogenic tumours and cysts and bone lesions diagnosed from Sep 2013 - Oct 2018 at this centre. These were analyzed for age, gender, site of tumor and histopathologic typing. The odontogenic tumours were classified using the 2005 World Health Organization classification system.

Results: From a total of 132 patient cases reviewed , only 107 were having complete records suitable for the study. Of the remaining 107 cases, 59 (55.1%) of the study subjects were males while remaining 48(44.9%) were female. M:F ratio of 1:1.2. Mean age of patients was 27.8years . The commonest age group for both neoplastic and non-neoplastic lesions were in the first and second decades. 60(56.1%) of cases were Benign, 16(15.0%) were Malignant and the rest 31(29%) were non-neoplastic. Most (94.4%)of the biopsy specimen were received from Maxillofacial surgery unit of Yekatit 12 Hospital.
Out of the 31 Non-neoplastic cases, 27(87%) of the cases were Odontogenic cysts. Of these, 17(63%) occurred in males and 10(37%) in females. The mean age of occurrence of Odontogenic cysts was 31.56 years.The most frequently recognized Odontogenic cysts were Benign Odontogenic cyst 9(33.3%), followed by Dentigerous cyst 8(29.6%), Odontogenic keratocyst 5(18.5%)and Radicular cyst 5(18.5%). The most commonly affected location by Odontogenic cysts were Maxilla 17(63%) followed by Mandible 9(33.3%).
From the 60 benign cases, the commonest benign Odontogenic tumor was Ameloblastoma 15(25%). The mean age of occurrence being 28.8years and M:F ratio of 1.14:1. The commonest site of occurrence was the mandible 14(93.3%). The second commonest benign lesion found was Ossifying fibroma 12(20%). The mean age of occurrence was 22.9years . It occurred in 7(58.3%) of males and 5(41.7%) of females & both mandible 6(50%) and maxilla 6(50%) were equally involved.
Malignant lesions were 16(15%) of the total cases. 12(75%) were males and 4(25%) were females. The mean age was 29.6% .7 cases(43.8%)occurred in the maxilla, 6 (37.5%) in the mandible and the rest 3(18.8%) occurred in Jaw(site not specified). Of the total 16 cases, there were 4 cases(25%) of Osteosarcoma and 4 cases (25%) of Primary intraosseous squamous cell carcinoma .

Conclusion: Odontogenic tumors, cysts and maxillofacial bone lesions show a definite geographic variation. In our study, ameloblastomas were the most frequent odontogenic tumor similar to other African studies,but significant variation form studies done in Canada and Brazil. Benign fibro-osseous lesions were the second commonest lesion which was in contrary to most literatures. Dentigerous cyst was the commonest cyst followed by Odontogenic Keratocyst and Radicular cysts. A definitive diagnosis can be made on the basis of clinical radiological, and histological findings. Knowledge of the biological and histological behavior of these lesions is required for their early detection and effective treatment.

1.Introduction

Odontogenic tumors (OT) and cysts are rare and heterogenous group of diseases specifically seated in jaw bones. Odontogenic tumors originate from odontogenic tissue by epithelial or mesenchymal proliferation or both. These tumors have variable clinical and histopathological features.

Despite their rarity there is a great variety of types, with numerous transitional forms. This has resulted in many classification attempts. The WHO had been revising the 1992 and 2005 versions. Recently the 2017 WHO classification of Odontogenic tumors have been published with modifications. But the major categorization of epithelial ,mesenchymal and mixed remains for both benign and malignant tumors.[1,5]

Many retrospective studies have been counducted in different parts of the world to assess the distribution of odontogenic tumors . These studies have shown different distribution rates of odontogenic tumors ranging from 1 to 32%[2]. The overall and relative frequency of individual odontogenic tumors differ from region to region and these variations are attributed to variations in geographic or cultural settings.[2,3,4]

Since, there are very limited data in Ethiopia done on these tumors , the aim of the present study is to determine the frequency as well as histopathological patterns of odontogenic tumors and cysts , in Black Lion Hospital , Addis Ababa, Ethiopia.

1.1 Background of the study

The mandible and maxilla differ in no significant way histologically from those of any other bones in our body. Their peculiarity is derived from their close proximity to the mucosal surface of the oral cavity and the fact that they enclose the odontogenic apparatus, a highly specialized structure that gives rise to a large variety of malformative, inflammatory, and neoplastic conditions.

The odontogenic compartment is unique in the sense that it contains primitive embryonic structures from early fetal development to about 25 years of age. They have a combined ectodermal and mesodermal derivation; the mesodermal component has the added peculiarity that it originates from the neural crest (the so-called *ectomesenchyme*).

Nests of odontogenic epithelium (with or without their associated mesenchymal counterpart) are normally found in the jaw and have the potential to develop into cysts or tumors. Those nests located in the alveolar mucosa and resulting from the breakup of the dental lamina are referred to as *rests of Serres*, whereas those embedded within the periodontium are known as *rests of Malassez*.

Epithelial-lined cysts are quite common in the jaws. The overwhelming majority of these cysts are derived from remnants of odontogenic epithelium present within the jaws. Another source of cysts in this region is related to the breakdown of ectodermal lining cells during the union or fusion of the various embryonic processes of the region, through the formation of entrapped epithelium-lined nests. .

In general, these cysts are subclassified as either inflammatory (eg. Radicular cyst) or developmental (eg. Dentigerous cyst).

A dentigerous cyst (follicular cyst) is a cyst that surrounds the crown of an unerupted tooth and is attached to the neck of this tooth. Dentigerous cysts are quite common. In larger series [6] , they comprise almost 17 % of all cases, only surpassed by radicular cysts. In most instances, they are associated with the maxillary canine or the mandibular third molar tooth. In contrast with the inflammatory cysts, no epithelial proliferation is needed to form this cyst.

Radicular cysts are located at the root tips of teeth in which the pulp has become necrotic, mostly due to advanced tooth caries .They arise

from the epithelial rests of Malassez and develop when pulpal inflammation has led to the formation of a periapical granuloma.

Radicular cysts are lined by non-keratinising squamous epithelium. This epithelial lining may be thin and atrophic, but, especially in case of

inflammatory changes. Radical cysts are the most common cysts in the jaw. A study done on prevalence and distribution of Odontogenic cysts is Sicily showed predominance of radicular cysts (84.5%) over dentigerous cyst(11.4%)[7]. In another study done in Mexico ,on odontogenic cysts based on gender there was a slight male (52.5%)dominance over females(47%).[8]

Odontogenic tumors are neoplasms that develop exclusively in gnathic bones and they tend to develop towards tooth structures. They originate from odontogenic tissue by epithelial or mesenchymal proliferation or both. Most Odontogenic tumors are benign, but some show locally aggressive growth and a high rate of recurrence.

The tumors may be generated at any stage in the life of an individual. Knowledge of basic clinical features such as age, gender, and location can be extremely valuable in developing differential diagnosis of Odontogenic tumors as well as guidance in diagnosis and treatment.

The two most common and clinically significant odontogenic tumors are:

- Ameloblastoma, the most frequent odontogenic neoplasm,[9] occurs most often in the mandible, particularly posteriorly. It may occur at any age, but the peak reported incidence is in the fourth decade. Mandibular tumors are painless, slow-growing swellings, which characteristically produce multicystic or soap-bubble radiolucencies

  Growth is by local expansion and infiltration with destruction of adjacent tissues. Untreated cases may reach a substantial size. Extension of tumor from the bone into adjacent soft tissue is an unfavorable sign. Local recurrence occurs in 15% to 20% of cases.

  Ameloblastomas in the maxilla occur in an older age group and have a poorer prognosis. A higher recurrence rate after surgery exists, probably related to the different bone structure in the maxilla and earlier spread into extraosseous soft tissues and the paranasal sinuses.

The most common type of ameloblastoma is the conventional or solid-multicystic type. [10] Furthermore, distant metastases have been documented in rare instances, especially to the lungs but also to the central nervous system.

Odontoma :By definition, an odontoma has to include all the calcified dental tissues. These are hamartomas and are the most frequent of the odontogenic tumors.[11]

Odontomas are either detected as incidental radiologic findings or, less frequently, as slow-growing swellings in adolescence. They are often associated with unerupted teeth and are a cause of failed eruption of permanent teeth in young people.

Two variants are identified with differing clinical and histologic features.

Complex odontomas are most frequently found in the posterior mandible and are composed of a mixture of dental hard tissues with no resemblance to a tooth.

Compound odontomas are most common in the anterior maxilla and consist of numerous small, often irregularly shaped teeth.

Data from the literature shows differences in the relative frequencies of these Odontogenic tumors. Several reports on series of odontogenic tumors from different countries have documented distinct geographic variations in tumor prevalence, with distinct geographic variations in tumor prevalence, with main difference being the relative incidence of Ameloblastoma and Odontoma.[11,3]

In many literatures including those in Brazil, made on Odontogenic tumors, Analysis of 127cases during a 30 year period showed Odontoma(50.40%) being the commonest followed by Ameloblastoma(30.70%). [11]. There was comparable result in Canadanian study, with Odontomas(51.53%) and being commonest followed by Ameloblastoma(13.52%).[4].

But these results were not in agreement with other studies done in Africa including Ethiopia,with Ameloblastoma being the commonest of all

odontogenic tumors.[3,2,12]

The most common anatomical location involved by odontogenic tumors include the mandible followed by maxilla[11,2].Majority of odontogenic tumors were benign and few cases were malignant. [12,2,3]

Other groups of tumors in the jaw include benign maxillofacial bone and cartilage tumors like (osteoma, chondroblastoma, chondromyxoid fibroma, osteoid osteoma , desmoplastic fibroma) ,malignant maxillofacial bone and cartilage tumors like (chondrosarcoma, osteosarcoma), fibro-osseous and osteochondromatous lesions (ossifying fibroma, fibrous dysplasia, cementa-osseous dysplasia, osteochondroma), Giant cell lesions and bone cysts(central giant cell granuloma, peripheral giant cell granuloma , Aneurysmal bone cyst, simple bone cyst) and hematolymphoid tumors like solitary plasmacytoma of bone.

Ossifying fibroma is the name given to jaw tumors that may have a variety of histologic appearances but are composed of islands/trabeculae/reticulae of bone in a benign fibroblastic proliferation. They arise in various clinical settings and locations. In the usual type of ossifying fibroma, the tumor is well demarcated but may expand the bony cortex of the jaw. It appears radiolucent and/or radiodense depending on the stage of development, amount of hard tissue produced, and degree of calcification.

Ossifying fibromas occur at a mean age of 35 years, with a female predilection, and anywhere in the tooth-bearing regions of the jaws but mostly in the posterior mandible . However, they may also arise in non-tooth-bearing mandibular ramus. The so-called juvenile variant of ossifying fibroma is most commonly encountered in the maxilla and the walls of the paranasal sinuses . Ossifying fibromas, usually multiple, are a common component of the rare hereditary hyperparathyroidism-jaw tumor syndrome[14].

Fibrous dysplasia in the jaws more often affects the maxilla than mandible and presents in children and young adults (223). Clinically, there is usually painless facial swelling and asymmetry that may result in displaced teeth. The radiographic appearance is unlike ossifying fibroma and is characterized by radiodense opacities with a “ground glass” appearance that blend into the

adjacent normal bone. Histologically, there is a fibrocellular stroma with scattered trabeculae of woven bone, without osteoblastic rimming. However, older lesions showing maturation to lamellar bone may exhibit osteoblastic rimming. The etiology of fibrous dysplasia has been shown to be the result of a mutation in the GNAS1 gene affecting proliferation and differentiation of preosteoblasts [14].

Osteosarcoma is a malignant tumor caused by the malignant transformation mesenchymal cells which have capacity to generate osteoid tissue or immature woven bone. The etiology of this tumor is obscure. Moreover, osteosarcoma in the maxillofacial area occupy only 10% of total osteosarcoma. The mean ages of onset in maxillofacial area ranges from the 10s to the 20s, a little later than those of the other body parts and the survival rate is higher In cases of osteosarcoma in long bones, a male is prone to the onset than a female; in the head and neck, however, the sex ratio is similar.

Primary Intraosseous Squamous Cell Carcinoma is central jaw carcinoma is thought to be derived from odontogenic epithelial remnants. Three types are recognized: (a) de novo SCC, and SCC arising from (b) an odontogenic cyst or (c) a benign odontogenic tumor . Because there are no distinguishing features, unless there is clear derivation[14].

1.2 Significance of the study

- As mentioned earlier, data from the literature shows differences in the relative frequencies of these tumors. Several reports on series of odontogenic tumors from different countries have documented distinct geographic variations in tumor prevalence, with distinct geographic variations in tumor prevalence. Since there is limited information in the literature about the prevalence of Odontogenic tumors in Ethiopia ,the objective of the present study is to establish the frequencies and types of odontogenic tumors and cysts diagnosed in Tikur Anbesa Hospital from Sep 2013 - Oct 2018 using the 2005 WHO Histopathological classification of Odontogenic tumors and to compare the results with those found in similar studies from other parts of the world.

- This research will also be important to assess the geographic differences in the incidence of lesion and to allow clinicans to make a realistic judgments in counseling patients before biopsy about the probability of diagnosis and risks associated with nonspecific clinical or radiologic lesions.

1.3 Literature review

There are variety of literatures done all over the over the world about Odontogenic tumors(OT). One such study done was in Brazil with analysis of 127 cases during a 30year period(1970-1991), which showed odontoma(50.40%) to be the commonest Odontogenic tumor followed by Ameloblastoma(30.70%). The prevalence of OT was greater in females(60%) and (36.22%) in males. The peak age of occurrence were in the 2nd and 3rd decades of life. Age of patients ranged from 4-82years. Average 26.6years. The highest incidence was observed in 2nd decade of life(45.31%).The main anatomic location was the mandible (54.33%) and maxilla affected in (40.15%) of cases. 39 cases were identified as Ameloblastoma and these accounted for 30.70% of all tumors. The cases occurred in 22Females and 17males. The 3rd and 5th decades were the most affected. Age ranged from 12-71years. All cases occurred exclusively in the mandible. Of these, 35 cases were solid/multicystic, 3cases were unicystic and 1case were peripheral Ameloblastoma. Histologically , Ameloblastoma were classified in one of the following patterns, follicular 8 cases, plexiform 10cases and follicular-plexiform 12cases.[11]

From the western literature on OT was done by Daley TD, et al. on Relative incidence of Odontogenic tumors and oral and jaw cysts in a Canadian population. From 40,000cases reviewed from oral biopsies from the oral pathology diagnostic service , from a total of 445cases(1.11%)odontogenic tumors , 392(0.98%)were lesions from patients in the usual local drawing area of the biopsy service, 53 were referred from distant centeres. From the local population, Odontomas were by far the most common tumor 51.53%followed by Ameloblastomas 13.52 and Peripheral Odontogenic Fibroma 8.93%. Locally Radicular periapical cyst were the most common Odontogenic cyst 65.15% followed by Dentigerous cysts 24.08% and the Odontogenic keratocyst 4.88%.[4]

Rafael LA et al. Odontogenic tumors : clinical and pathology study of 238 cases ..15 years experience .OT were 4.76%of all biopsied lesion within the studied period . The mean age was 30.7 years , 57% of the patients were male. The Keratocystic Odontogenic tumor was the most prevalent histological type 30%. Followed by the Ameloblastoma 23.7%[13] its frequency was lower compared to published reports adebayo et al. 48%[3].

From studies done in Africa , one was done by Adebayo ET et al. A review of 318 cases odontogenic tumors in kaduna , Nigeria. There were 990 tumor and tumor like lesion in the oral and perioral structures, of which 318 were Odontogenic tumors (32%). 12 histopathologic types of OT were found with more benign(n=314;99%) than malignant(n=4;1%). Ameloblastoma made up 233(73%) of the tumors, followed by Odontogenic Myxoma (n=9; 3%)and Adenomatoid Odontogenic tumor (2%). Atleast 8 cases of Ameloblastomas recurred out of 60 follow up. Among 275 surgically treated odontogenic tumors , enucleation was performed in 64 cases(23%), dentoalveolar segment resection with preservation of lower mandible(n=33,12%) ,segmental resection(n=168;61%)and composite resection(n=9;3%)and 1 case was inoperable.[3]

Odukoya O. et al Odontogenic tumors: Analysis of 289 Nigerian cases. Analysis of 289cases of OT in pathology service of the Lagos University teaching Hospital during a period of 21years were analyzed and categorized according to the WHO classification of OT. OT accounted for 19% of jaw tumors. Ameloblastoma accounted for 58.5% of OT. It was most common and showed predilection for males and posterior mandible. 94.8% of OT are benign , while malignant OT accounted for 5.2%.[2]

Mosqeda Taylor et al. Odontogenic cysts. Analysis of 856 cases. There were a total of 856 odontogenic cysts of these, 449(52.5%) occurred in men, 403 in women(47%) and in 4 cases (0.5%)gender was not stated. The most frequently recognized OC were Radicular cys (342)cases ,Dentigerous cyst(283) and Odontogenic keratocyst(184)cases.[8]

A study on Prevalence and distribution of Odontogenic cysts in Sicily Tortoricis et al.: 1986-2005 showed 1,310cysts of jaw were diagnosed in 12,197 individuals. From these 1273 cysts were classified as Odontogenic and only 37 were non odontogenic. In the former group, the most frequent lesions were radicular cysts(84.5%) followed by Dentigerous cyst (11.4%). Infected Radicular cyst were observed in male gender, young age and anterior maxilla. Unlike the Dentigerous cysts, frequency of Radicular cyst decreased from 10.4% in1986-1995 to about 8% in 1996-2005. And concluded that the decreasing trend with time could be attributed to possible improvement oral health behavior.[7

A study done at St. Paul's Hospital, Bruktawit k. et al. Odontogenic tumors in Ethiopia 8 years retrospective study, showed from a total of 448 patients

reviewed, only 163 patient records were complete and suitable for the study. 88(54%)of the study subjects(163)were males and the remaining 75(46%)were female. Mean age of patients was 34years, range between 8 and 80 years. 132(81%)of OT were benign, the rest 31(19.0%)were malignant. 126(77.3%) of OT occurred in the mandible, and the remaining 37(22.3%) were in maxilla. 135(82.8%) had primary surgical treatment. Ameloblastoma 75(46%)was most frequent type followed by Odontogenic Myxoma(8.6%). Primary Intraosseous squamous cell carcinoma (IOSCC) was the most common type of malignant OT.[12]

In a Korean study ,a total of 16 patients were diagnosed as benign fibrousosseous lesion, and age distribution of patients was from the second to seventh decades with little difference in sex. The chief complaints of the patients were facial swelling with occasional jaw pains, and predilection site was mostly the posterior mandible[21].

Most common malignant fibrousosseous lesions in Korea were osteosarcoma and Ewing's sarcoma. The mean ages of onset in maxillofacial area ranges from the 10s to the 20s, a little later than those of the other body parts and the survival rate is higher In cases of osteosarcoma in long bones, a male is prone to the onset than a female; in the head and neck, however, the sex ratio is similar. Similar results were deducted in Korean study. Many other scholars reported a similar onset ratio of osteosarcoma in the maxilla and mandible but this study recorded a ratio of 8 : 1, with higher onset on the mandible. In the histopathological exam, osteosarcoma patients were 5 osteoblastic types and 2 chondroblastic types, and showed pleomorphism of undifferentiated cell and atypical mitosis[21].

1.4 Objectives of the study

1.4.1 General objective

- Is to determine the frequencies and histopathologic patterns of odontogenic tumors and cysts diagnosed in Tikur Anbesa Hospital.

1.4.2 Specific objective

- To describe socio-demographic characterstics of patients with odontogenic tumors.
- Identify distribution of Odontogenic tumor and jaw lesion cases by age and gender.
- To identify the frequent anatomic location of the Odontogenic tumors and maxillofacial bone lesions.
- To determine the frequency of distribution of Odontogenic tumor and maxillofacial bone lesions with their respective histopathology.
- To describe the clinical ,radiologic and macroscopic findings
- To identify the common surgical procedures done.
- To compare and contrast other study findings in the reports from around the world with that of the findings from the present study.

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2.Methodology

2.1 Study Area

The study will be conducted at Tikur Anbessa hospital , pathology department which is found in Addis Ababa, Ethiopia. It is the one of the largest tertiary hospital in the country with vast majority of the cases investigated at this department being patients who are referred from all over the country.

2.2 Study Design and Period

The study will be a cross-sectional retrospective descriptive study where data will be retrieved from the archive of department of pathology that are registered from Sep 2013 up to August 2018.

2.3 study population

All odontogenic tumors and cysts will be included in the study period from September of 2013 up to August of 2018 . So cases will be finally ready for data analysis which met the inclusion criteria .

2.3.1 Inclusion criteria

- Complete medical records of patients.
- Cases with unambiguous histopathological diagnosis.
- Cases of Odontogenic tumors under the 2005 WHO Classification of Tumors will be included in the study.

2.3.2 Exclusion criterias

- Incomplete medical records of patients
- Unclear histopathologic diagnosis

2.4. Data management an Analysis

2.4.1 Data collection procedure

Surgical biopsy request papers will be retrieved from the department archives registered from Sep. 2013 – Aug. 2018 and be subjected for review of the demographic, clinical, gross ,microscopic ,radiologic descriptions and final diagnosis.

2.4.2 study variables and Data Analysis

In the study, the variables included for analysis and interpretation are depicted as the following.

- ✓ Age of the patient
- ✓ Gender of the patient
- ✓ Anatomic site of the lesion
- ✓ Clinical and radiologic description
- ✓ Histopathologic diagnosis

Majority of the information are expected to be attained from the requests paper which is sent along with specimens. These variables will be subjected for data analysis and the data feeding and analysis will be done on computer package SPSS (Statistical Packages of Social Sciences) version 25.0.

3. Ethical considerations

Proposal will be submitted to the department of pathology and approvals will be obtained from the ethical review committee of the department of pathology and the institutional review board and research and publication committee of the medical faculty of Addis Ababa University.

4.Results

From a total of 132 patient cases reviewed, only 107 were having complete records suitable for the study. The other 25 cases were excluded due to incomplete relevant demographic and clinical data as well as histopathologic reports such as "see description". Of the remaining 107 cases, 59 (55.1%) of the study subjects were males while remaining 48(44.9%) were female(Table 1). M:F ratio of 1:1.2. The minimum age was 2 years and maximum was 67 years . Mean age of patients was 27.8years (table 2). The commonest age group for both neoplastic and non-neoplastic lesions were in the first and second decades (table 3& fig 1). 60(56.1%) of cases were Benign, 16(15.0%) were Malignant and the rest 31(29%) were non-neoplastic(table 4). 55(51.4%) of all cases occurred in the mandible, 46(43.0%) in maxilla, 4(3.7%) in jaw(exact site not specified) and the rest 2(1.9%) were in other site like the palate (table 5).

49(45.8%) of the patients had clinical symptom of painless swelling , 9(8.4%) had painful swelling and most 43(40.2%)had no clinical history recorded on the request paper(table 6). 32(29.9%) of patients had duration of symptoms of less than 24months , 16(15%) had symptoms between 25month-10years, 2(1.9%) had symptoms for >10years and the majority 57(53.3%) had no record of the duration of the lesion on the request form(table 7). 83(77.6%) had incisional biopsy taken and the remaining 24(22.4%) had Excisional biopsy(fig. 2). 101(94.4%)of the biopsy specimen were received from Maxillofacial surgery unit of Yekatit 12 Hospital, 5(4.7%) from Tikur Anbesa Hospital and the remaining 1(0.92%) of the case was from Addis Ababa University Dental School (fig.3). Radiologic report was missing in 84(78.5%)of the request forms but was present in only 23(21.5%) of all request papers included in the study(fig.4).

Out of the 31 Non-neoplastic cases, 27(87%) of the cases were Odontogenic cysts. Of these, 17(63%) occurred in males and 10(37%) in females(table 8). The mean age of occurrence of Odontogenic cysts was 31.56 years.The most frequently recognized Odontogenic cysts were Benign Odontogenic cyst 9(33.3%), followed by Dentigerous cyst 8(29.6%), Odontogenic keratocyst 5(18.5%)and Radicular cyst 5(18.5%)(fig5). The most commonly affected location by Odontogenic cysts were Maxilla 17(63%) followed by Mandible 9(33.3%).

From the 60 benign cases, the most commonest benign Odontogenic tumor was Ameloblastoma 15(25%). The mean age of occurrence being 28.8years. The

minimum age identified was 16 and maximum was 60years of age. It occurred in 8(53.3%) of males and 7(46.7%) of females(table 9). M:F ratio of 1.14:1. The commonest site of occurrence was the mandible 14(93.3%) and 1(6.7%) case of intranasal Ameloblastoma was identified(fig.6). The second commonest benign lesion found was Ossifying fibroma 12(20%). The mean age of occurrence was 22.9years . The minimum age was 8 years and the maximum was 47years. It occurred in 7(58.3%) of males and 5(41.7%) of females(table 10). Both mandible 6(50%) and maxilla 6(50%) were equally involved.

The other less common benign conditions include Fibrous Dysplasia 8(13.3%),Central and peripheral giant cell granuloma 4(6.7%), Odontogenic myxoma 3(5%) and Odontoma 2(3.3%) of all benign cases(table 11,Fig 7).

Malignant lesions were 16(15%) of the total cases(table 4). 12(75%) were males and 4(25%) were females. The mean age was 29.6% with minimum age of 8years and maximum age of 65years.7 cases(43.8%)occurred in the maxilla, 6 (37.5%) in the mandible and the rest 3(18.8%) occurred in Jaw(site not specified).

Of the total 16 cases, there were 4 cases(25%) of Osteosarcoma and 4 cases (25%) of Primary intraosseous squamous cell carcinoma (fig 8). The remaining 8 cases (50%) included Rhabdomyosarcoma (4 cases), Alveolar soft part sarcoma, low grade fibromyxoid sarcoma, High grade sarcoma & Kaposi sarcoma, 1 case each.

From the 31 Non-neoplastic cases present , 3 cases(9.7%) were cases of Chronic Osteomyelitis and 1case(3.2%) was Tuberculosis (table 12). All 4cases(100%) occurred in the mandible. There was equal sex distribution. M:F ratio of 1:1. The mean age of occurrence was 22.25years , minimum age being 6years and the maximum age 37Years.

Table 1. Distribution of general category by gender

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Male	59	55.1	55.1	55.1
	Female	48	44.9	44.9	100.0
	Total	107	100.0	100.0	

Table 2. Distribution of general category by age

Age

N	Valid	107
	Missing	0
Mean		27.83
Minimum		2
Maximum		67

Table 3. Distribution of general category by age in decades.

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	0-10	8	7.5	7.5	7.5
	11-20	31	29.0	29.0	36.4
	21-30	32	29.9	29.9	66.4
	31-40	19	17.8	17.8	84.1
	41-50	8	7.5	7.5	91.6
	51-60	5	4.7	4.7	96.3
	>60	4	3.7	3.7	100.0
	Total	107	100.0	100.0	

Figure 1. Distribution of general category by age in decades.

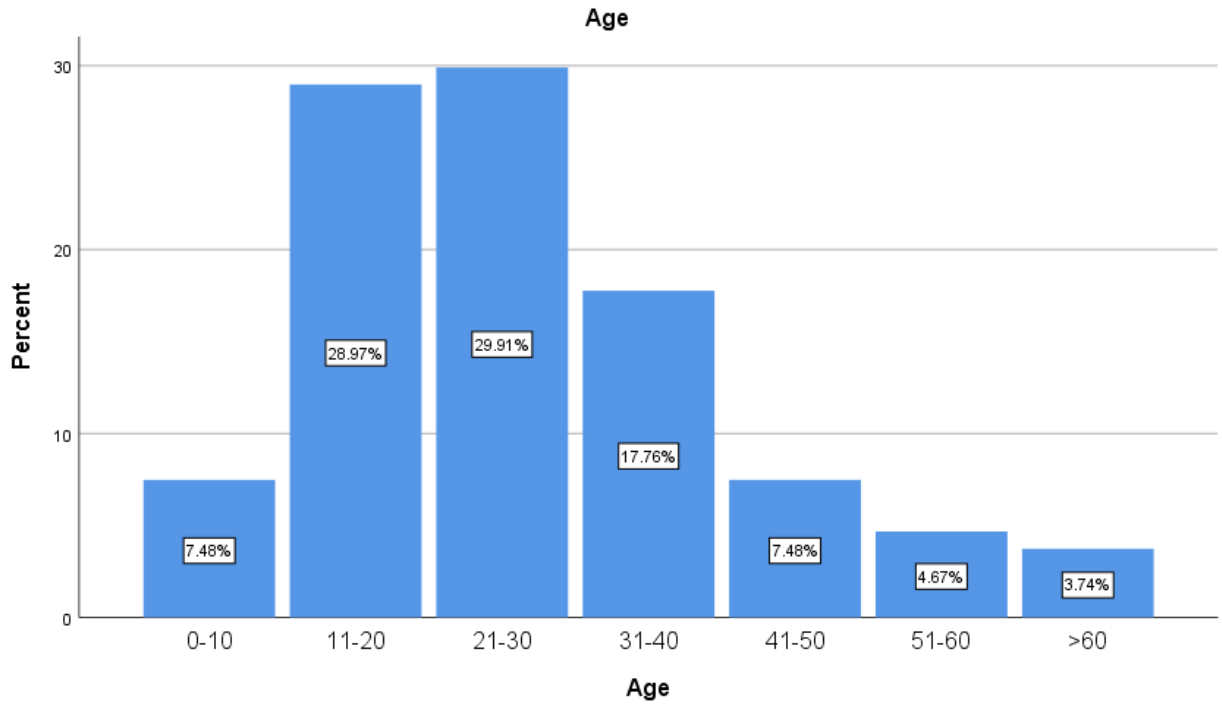

Table 4. Patterns of distribution of behavior of the lesion

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Benign	60	56.1	56.1	56.1
	Malignant	16	15.0	15.0	71.0
	Non-neoplastic	31	29.0	29.0	100.0
	Total	107	100.0	100.0	

Table 5. Distribution of general category by Anatomic location.

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Mandible	55	51.4	51.4	51.4
	Maxilla	46	43.0	43.0	94.4
	Jaw	4	3.7	3.7	98.1
	other	2	1.9	1.9	100.0
	Total	107	100.0	100.0	

Table 6. Distribution of general category by clinical symptoms.

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	painless swelling	49	45.8	45.8	45.8
	painful swelling	9	8.4	8.4	54.2
	cystic mass	3	2.8	2.8	57.0
	swelling & pus discharge	3	2.8	2.8	59.8
	No clinical history	43	40.2	40.2	100.0
	Total	107	100.0	100.0	

Table 7. Distribution of general category by duration of symptoms

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	0-24month	32	29.9	29.9	29.9
	25month-10years	16	15.0	15.0	44.9
	>10years	2	1.9	1.9	46.7
	Not mentioned	57	53.3	53.3	100.0
	Total	107	100.0	100.0	

Figure 2 Frequency of surgical procedure of the general category

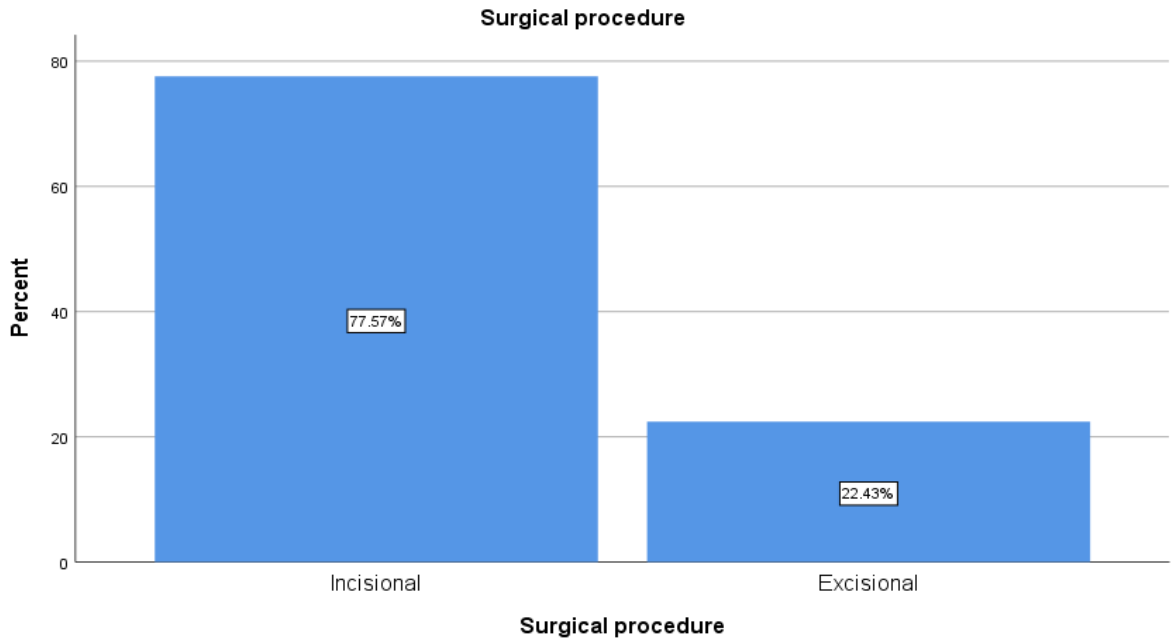

Figure 3 Frequency of hospitals submitting the biopsy specimens

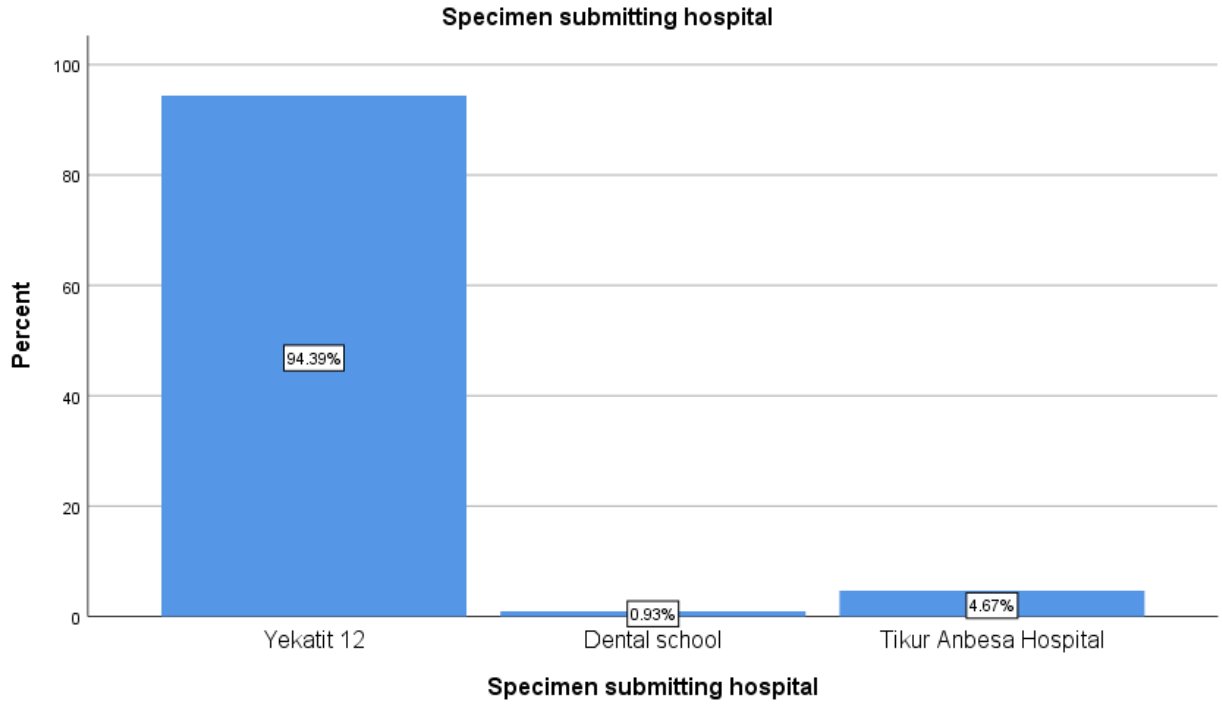

Figure 4 . The frequency of radiology report in biopsy specimen

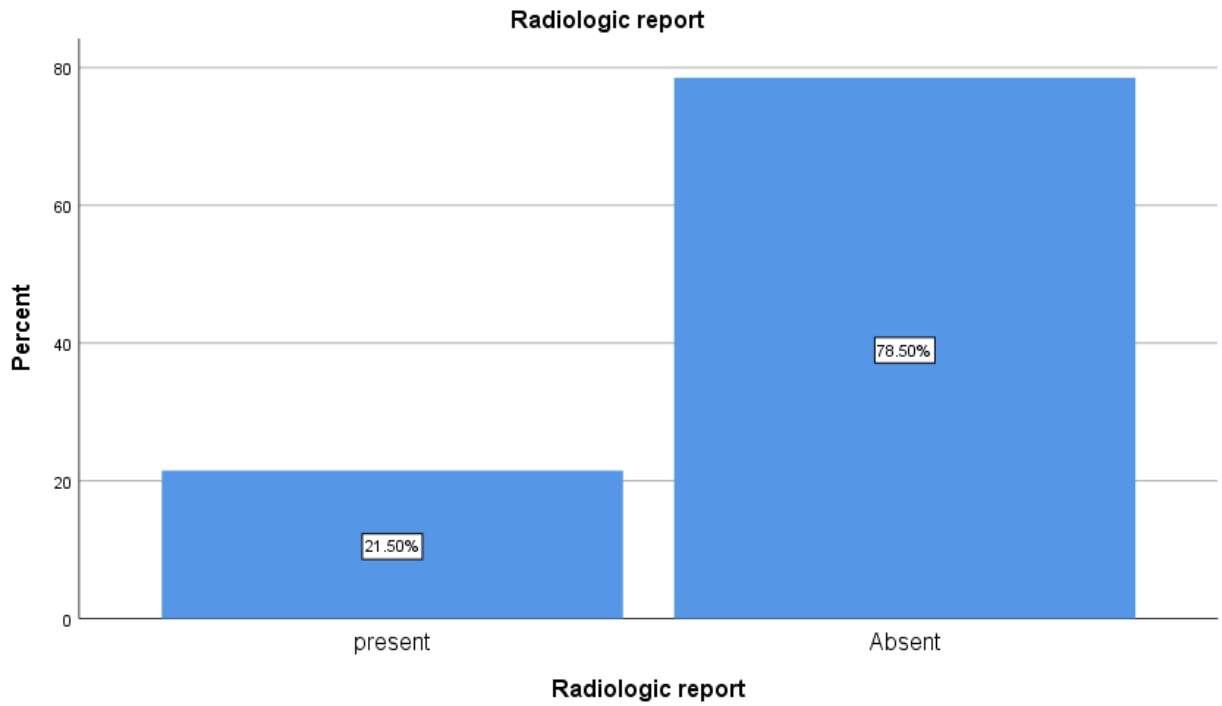

Table 8. Distribution of Odontogenic cysts by gender

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Male	17	63.0	63.0	63.0
	Female	10	37.0	37.0	100.0
	Total	27	100.0	100.0	

Figure 5. Frequency of Histopathologic patterns of Odontogenic cysts

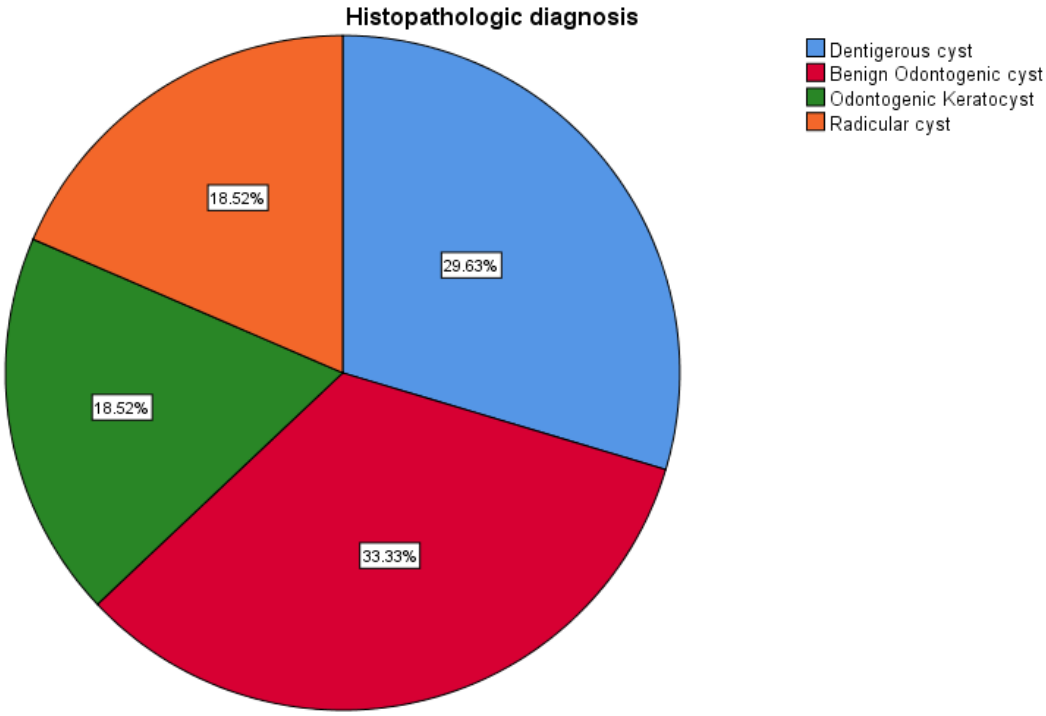

Table 9. Gender distribution of Ameloblastoma

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Male	8	53.3	53.3	53.3
	Female	7	46.7	46.7	100.0
	Total	15	100.0	100.0	

Figure 6 Anatomic distribution of Ameloblastoma

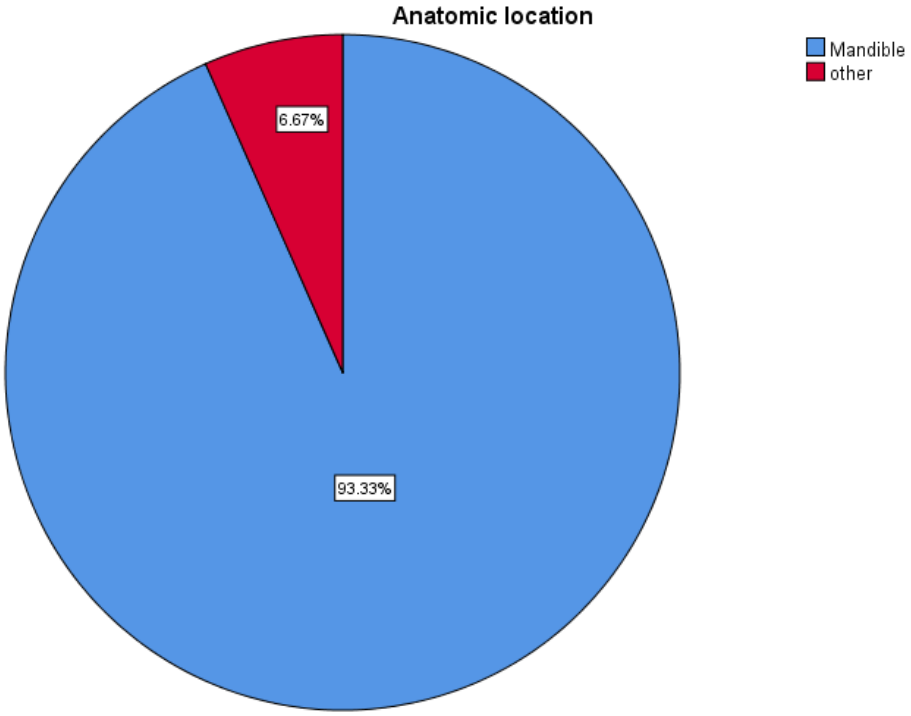

Table 10. Gender distribution in Ossifying Fibroma

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Male	7	58.3	58.3	58.3
	Female	5	41.7	41.7	100.0
	Total	12	100.0	100.0	

Table 11. Distribution of histopathologic patterns of benign lesions.

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Fibrous dysplasia	8	13.3	13.3	13.3
	Ameloblastoma	15	25.0	25.0	38.3
	Odontoma	2	3.3	3.3	41.7
	Ossifying fibroma	12	20.0	20.0	61.7
	Giant cell granuloma	4	6.7	6.7	68.3
	Odontogenic Myxoma	3	5.0	5.0	73.3
	Others	16	26.7	26.7	100.0
	Total	60	100.0	100.0	

Figure 7. Histopathologic distribution of benign tumors of the jaw.

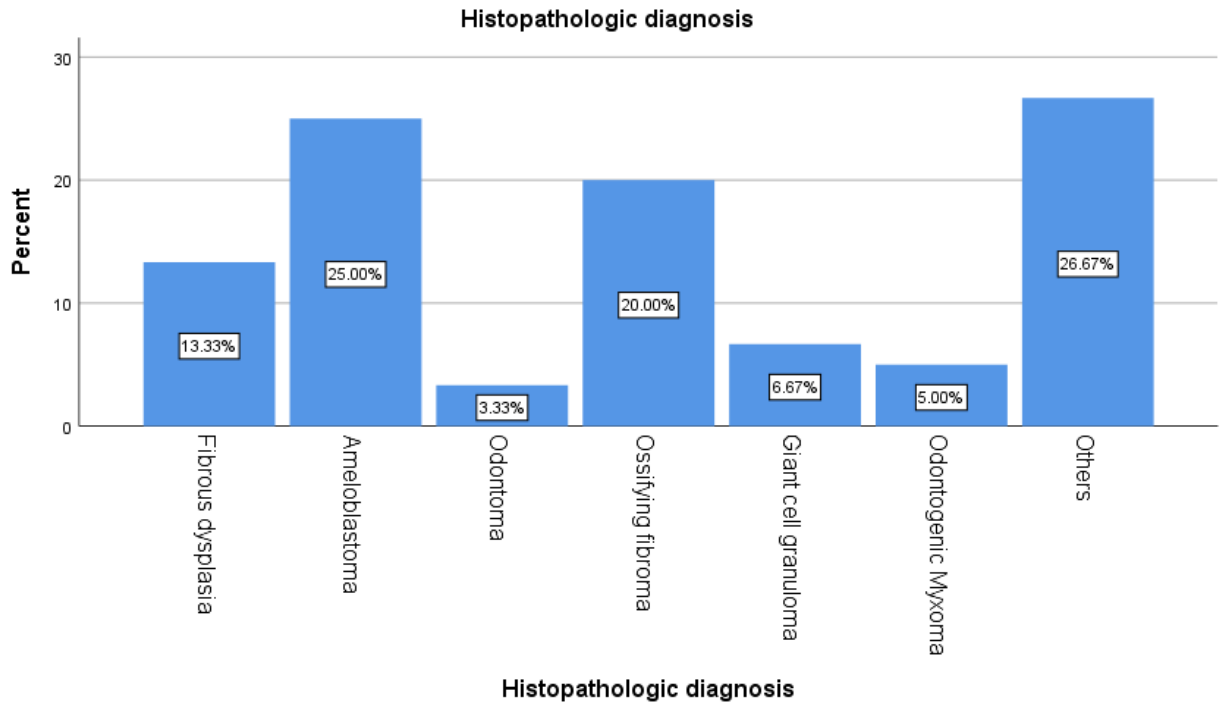

Figure 8.Histopathologic distribution of malignant tumors.

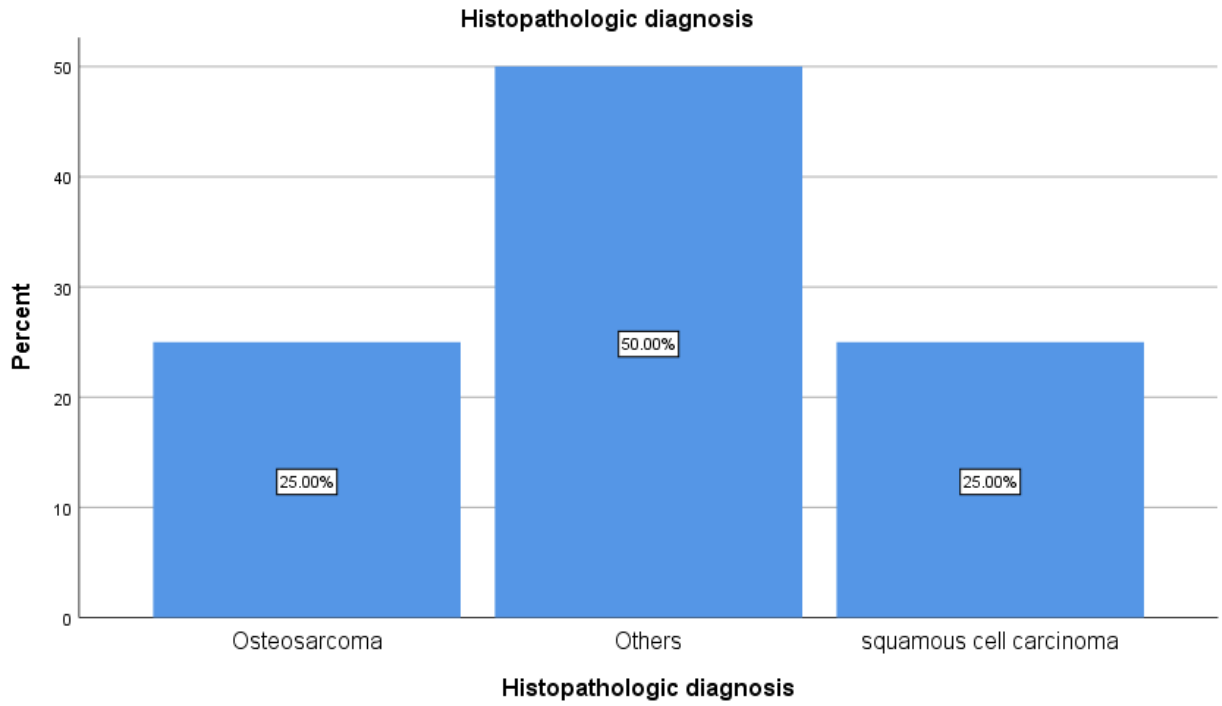

Table 12. Histopathologic pattern of non-neoplastic lesions

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Dentigerous cyst	8	25.8	25.8	25.8
	Benign Odontogenic cyst	9	29.0	29.0	54.8
	Odontogenic Keratocyst	5	16.1	16.1	71.0
	Radicular cyst	5	16.1	16.1	87.1
	Osteomyelitis	3	9.7	9.7	96.8
	Others	1	3.2	3.2	100.0
	Total	31	100.0	100.0	

5.Discussion

In this current study Odontogenic cysts accounted for 27cases(87%) of the Non-neoplastic lesions of the jaw. The cysts were categorized based on the 2005 WHO classification of Odontogenic cysts and Tumors[5]. Overall these Odontogenic cysts occurred more in Males 17cases(63%) than Females 10cases(37%). This result was comparable to a study done in Brazil Males(57.6%)[13] and Mexico (50.9%)[24].

The mean age of occurrence of Odontogenic cysts in the present study was 31.56years, which was a little higher than previous literatures in Iran (27.6Years)[19,23],Brazil (28.9years)[13] and Indian study (28years)[22]. The Most commonly affected location of Odontogenic cysts in the current study were Maxilla 17(63%) followed by mandible 9(33.3%) which is in conflict with findings described by Meningaud et al[18] and Rafeal et al[13] where the mandible was the commonest sites in these reports. But our finding was consistent with other studies[16,17].

In the present study, Benign Odontogenic cyst 9cases(33.3%) was the commonest Odontogenic cyst followed by Dentigerous cyst 8cases(29.6%) and Odontogenic Keratocyst 5cases(18.5%) with Radicular cyst 5cases(18.5%) in the third position. However, the problem with this classification is that there is no classification as Benign Odontogenic cyst in the WHO classification system[1,5] so far. So, we would be able to compare the remaining Odontogenic cysts only. Therefore, Dentigerous cyst (27.2%)becomes the commonest cyst followed by Radicular cyst(18.6%) as well as Odontogenic Keratocyst(18.6%). These findings are in accordance with that of the Iranian study [19]. Nevertheless, other studies like Mosqueda et al.[8] considered the periapical(Radicular) cyst (52%) as the commonest Odontogenic cyst followed by Dentigerous cyst . This was also true for reports done in Sicily[7] where Radicular cyst(84.5%) were the commonest followed by Dentigerous cyst(11.4%).

Odontogenic Keratocyst and Radicular cysts occurred in equal frequency in our study, which was also similar to Iranian study[19]. Odontogenic Keratocyst arises from the remnants of the dental lamina . It is known for its uniquely aggressive clinical behavior and marked tendency to recur. In the WHO 2005 Classification of Odontogenic tumors[5] Odontogenic Keratocyst was renamed as Keratocystic Odontogenic tumor(KCOT) but in the new 2017 Classification[1], KCOT was re-categorized as a cyst.

In our study , the commonest clinical presentation was painless swelling followed by painful swelling . This was similar to that of Indian study[22].

In the current study, 60 cases (56.1%)of the total cases were Benign than Malignant 16cases(15.0%). This was in agreement to a study by Adebyo et al.[3] Benign

314(99%), Malignant 4(1%) and Bruktawit et al.[12] 132(81%)Benign and 31(19%) Malignant. Only few reports have stressed upon the symptomatology of Odontogenic tumors. In the report published by Deepak et al [25], most patients presented with painless swelling followed by painful swelling , which is in accordance to our study.

The commonest odontogenic tumor in our study was Ameloblastoma 15cases(25%) which is in contrast to a study done in Brazil[11] where Odontoma (50.40%) was the commonest followed by Ameloblastoma (30.70%). In Canadian study[4] Odontoma accounted for (51.53%) followed by Ameloblastoma (13.52%). Study in Brazil [13] showed Keratocystic Odontogenic tumor (30%)to be the commonest tumor followed by Ameloblastoma (23.7%). In African continent , study done by Adebayo et al[3] , Odukoya et al[2] and Mamabolol[26] et al. showed Ameloblastoma to be the commonest tumor from the benign odontogenic tumors (73%, 58.5% and 43%)respectively. This was also true for study done here in Ethiopia, at St. Paul's hospital by Bruktawit et al.[12] where Ameloblastoma constituted for 46% followed by Odontogenic Myxoma (8.6%).

The discrepancy in the frequency of Odontomas , which in our study constituted for only 2(3.3%) of the cases, when compared with the western countries could be a result of geographic variation as well as the incidence of Odontomas was likely underestimated due to the clinical feature of the tumor having a self limited growth and don't cause clinical symptoms. Many patients including our country don't think it is necessary to have a regular dental follow up . And most of all , treatment in many cases would be carried out in dental office and the cases will not be sent for histopathologic confirmation. As is seen in this study where only 1case was received from Addis Ababa University ,Dental school.

The mean age of occurrence of Ameloblastoma in the present study was 28.8years with age range of 16-60years. This was lower than the mean age in the Indian study (36.02Years)[25] and western literatures[14] (39years). But comparable results are found in Nigerian study[2,3]. In an extensive review of 3,677 cases of Ameloblastoma, Reichart et al[9] reported the average age of initial diagnosis in developed countries was 39.1years compared with 27.7years form developing countries and hypothesized that persons form developing countries develop Ameloblastoma 10 to 15years earlier than developed countries and proposed that this variation could be due to accelerated aging process in developing countries owing to poor nutrition and health care.

In our study, there is slight predominace of Ameloblastoma in Males (53.3%) over Females which is in agreement with other studies done in Nigeria[2,3] and Ethiopia[12].

The commonest site of occurrence of Ameloblastoma in the present study was the mandible 14(93.3%) and 1case(6.7%)of Intranasal Ameloblastoma. Similar studies were found in textbooks[14],Ethiopian [12]and Nigerian[2,3,20] studies where the mandible was the commonest site followed by maxilla. Most cases of Ameloblastomas were not histologically subtyped, so we couldn't compare results with other literatures.

In our study the second and third commonest benign lesions were Benign Fibrosseous Lesions of Bone which was in contrary to most literatures done all over the world including Canadian[4], Iranian[19],Indian[25,27] ,Nigerian[2,3,20] and Ethiopian[12] study. Ossifying fibroma 12(20%) was the second commonest tumor with mean age of occurrence of 22.9years, which was a little lower than those reported in Taiwan(34year)[15] and textbooks(35years)[14]. There were two cases of Juvenile Psammomatoid Ossifying fibroma in an 8year and 10years old female and male patients respectively. Both mandible and maxilla were equally affected in our study which was in contrary to Taiwan study[15]and other studies[14], where the mandible was the commonest site affected. But our study was in agreement with Korean study[21].

The third commonest lesion was Fibrous dysplasia 8cases(13.3%). It occurred in 6(75%) females and 2(25%) males. Both maxilla and mandible were equally affected in our study in contrary to other studies[14] where the maxilla was the commonly affected site.

The commonest malignant lesions were Primary intraosseous squamous cell carcinoma (PIOSCC)4cases(25%) and Osteosarcoma 4cases(25%). In our study,the mean age for Osteosarcoma patients was 27 years with age range of 14-40years, which was similar to most literatures like study done in Korea[21] , mean age being in the 20's , a little latter than those in other body parts. Most cases of Osteosarcoma occurred in the mandible in our study which is in contrary to Korean study[21] . In the current study the mean age of occurrence of PIOSCC was 47 years with age range of 22-65years . PIOSCC were seen among patients which are 40years and older. This finding is in line with reports from China[28]. Prediliection of maxilla was observed among PIOSCC which was in contrary to studies done in Ethiopia[12] and China[28] , where the commonest site being the mandible.

6. Conclusion

- Different patterns of Odontogenic tumors and cysts with their distribution among different age groups and genders were observed.

- In our study, ameloblastomas were the most frequent odontogenic tumors with mean age of occurrence of 28.8years similar to other African studies,but significant variation form studies done in Canada and Brazil.

- Benign fibro-osseous lesions were the second commonest lesion which was in contrary to most literatures.

- Dentigerous cyst was the commonest cyst followed by Odontogenic Keratocyst and Radicular cysts.

- Primary intraosseous squamous cell carcinoma and Osteosarcoma are the commonest malignant tumors on the maxillofacial skeleton.

- A definitive diagnosis can be made on the basis of clinical,radiological and histological findings, which makes a good interdepartmental relationship between the clinicians and pathologists essential.

- Knowledge of the biological and histological behavior of these lesions is required for their early detection and effective treatment.

II. Recommendation

- Most of the reported cases of Odontogenic cysts in our department were reported as Benign Odontogenic cysts , but according to the WHO Classification of tumors(2005,2017) and other literatures , this classification doesn't exist. So such terminologies ought to be avoided. Although,the major reason for this classification is mainly attributed by the deficient clinical history and radiology report missing in almost all of the biopsy requests sent to the Pathologist.

- Odontogenic keratocyst (Keratinizing Odontogenic Tumor) is not a rare entity in our setup. Since this cyst has an aggressive behavior with high risk of recurrence it shouldn't be overlooked.

- Most cases of Ameloblastoma cases weren't subtyped , which would pose a problem if further research on this area is to be carried out. The other reason is that although most of the Ameloblastoma subtypes have similar biologic behavior, Unicystic Ameloblastoma and Peripheral Ameloblastoma exhibit less aggressive course than the solid types. Therefore, identifying the subtypes will be helpful for the patient in avoiding unnecessary extensive surgery.

- Most of the data sent to the Pathologist are incomplete , especially Radiology reports are missing. This would create a great problem in giving accurate histopathologic diagnosis especially in the maxillofacial area where there are a lot of overlapping morphologic features. So, it would be helpful to have interdepartmental relations between the clinicians, Radiologists and Pathologists to minimize such problems.

- The majority of patient's medical records were incomplete and handled inappropriately. Therefore, the record archiving of the hospital needs to be improved, implementing a sustainable digital data archiving system, and providing continuous training and audit.

- The community has to bring behavioral changes in having habit of regular visit to dentists.

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