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Clinico-Radiographic Presentation of Ameloblastoma: A Pathway to Provisional Diagnosis

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ABSTRACT

Background: Ameloblastoma is a rare, slow-growing odontogenic tumor predominantly affecting the mandible. Despite its benign nature, its locally invasive behavior and high recurrence rate present significant clinical challenges.

Objective: This study aimed to evaluate the demographic, clinical, radiographic, and management profiles of patients presenting with ameloblastoma at Muhimbili National Hospital (MNH).

Methods: A retrospective review was conducted among 19 patients (10 males and 9 females). Data on age, lesion duration, clinical presentation, tumor location, radiographic features, and treatment outcomes were analyzed.

Results: The mean age of male patients was 31.6 years, and female patients averaged 33.1 years. The duration of lesions before seeking specialized care ranged from 15 to 276 months, with mean delays of 60.4 months for males and 76.3 months for females. Most patients (84.2%) presented with slow-growing, painless lesions, predominantly affecting the mandible's body (78.6%). Radiographically, multilocular radiolucency with corticated margins was observed in 78.9% of cases. Treatments at primary care facilities, including medication, tooth extraction, and incision, were largely ineffective, with persistent tumor progression noted. Recurrence was reported in cases treated with tumor excision.

Conclusion: Ameloblastoma predominantly affects young adults, often presenting without significant symptoms, leading to diagnostic and treatment delays. Ineffective management at primary care levels highlights the need for improved diagnostic capabilities and timely referrals to specialized centers. Radiographic features and lesion location remain crucial for diagnosis and treatment planning. Enhancing primary healthcare awareness and access to specialized care can mitigate delays and improve patient outcomes.

Keyword: Ameloblastoma, odontogenic tumor, mandibular lesions, clinical presentation, radiographic features, treatment outcomes, recurrence, Muhimbili National Hospital, diagnosis delay, primary healthcare.

INTRODUCTION

Ameloblastoma is a rare but clinically significant tumor of the head and neck, with a global annual incidence of approximately 0.9 cases per million people [1][2]. Representing about 1% of all jaw-related tumors and cysts and roughly 10% of odontogenic tumors worldwide, ameloblastomas arise from the epithelial lining of odontogenic cysts, enamel organs, dental lamina, stratified oral epithelium, or displaced epithelial remnants [3][4]. These tumors predominantly affect adults in their third and fourth decades of life, with no observed gender predilection. The mandible is the most common site of occurrence, particularly the angle, body, and ascending ramus, accounting for approximately 80% of cases [5]. Although benign, ameloblastomas are locally invasive, and without timely intervention, they can cause extensive tissue destruction, often requiring radical surgical procedures [6].

In Africa, the management of ameloblastomas is particularly challenging due to delayed diagnosis and treatment. Limited access to specialized diagnostic and surgical facilities often leads to advanced presentations

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and higher recurrence rates . The unicystic variant, more frequently observed in younger individuals aged 20–30 years, often mimics other odontogenic cysts, complicating early detection and treatment planning [6]. In this context, tertiary hospitals typically handle ameloblastomas, as they are equipped with advanced diagnostic modalities such as computed tomography (CT) scans, magnetic resonance imaging (MRI), and histopathological confirmation [3]. However, many patients initially present at primary healthcare facilities, where diagnostic expertise and resources are inadequate [7].

In Tanzania, ameloblastomas pose a significant burden in head and neck pathology. Delayed diagnosis is influenced by several factors, including low levels of awareness, health-seeking behaviors, and inadequate diagnostic radiographic capabilities at the primary healthcare level. Although the Tanzanian government is actively upgrading diagnostic services to enhance early detection, significant gaps remain. Histopathological evaluation, the gold standard for definitive diagnosis, is crucial for guiding treatment planning and reducing recurrence rates [4, 7]. Early and accurate diagnosis plays a pivotal role in preventing extensive tissue destruction, preserving jaw functionality, and improving overall patient outcomes [6].

The clinical and radiographic similarity between ameloblastomas, particularly the unicystic variant, and other odontogenic cysts further complicates diagnosis. Misdiagnosis often results in inappropriate surgical interventions, such as cystectomy, increasing the risk of tumor recurrence [7–9]. Advanced diagnostic tools, including panoramic radiographs, CT scans, MRI, and biopsy, are indispensable for accurate evaluation and treatment planning [5]. Additionally, emerging technologies such as fluorodeoxyglucose (FDG) positron emission tomography (PET) have improved diagnostic precision and can assist in identifying metastases [10–12].

To mitigate these challenges, targeted efforts are required to improve the management of ameloblastomas in Tanzania. These include expanding access to advanced diagnostic technologies at primary and secondary healthcare levels, strengthening histopathological services, and raising awareness among healthcare providers and communities. Such initiatives are vital for reducing the burden of this locally invasive tumor and improving treatment outcomes [13].

The study highlighted significant gaps in diagnosis and treatment at primary healthcare levels. These deficiencies were attributed to inadequate clinical evaluations, limited expertise in interpreting radiographic findings, and delays in referring patients for specialized care. Strengthening diagnostic skills and improving healthcare worker training at the primary level are essential for the early detection and effective management of ameloblastoma, which could lead to better outcomes and reduced morbidity.

MATERIALS AND METHODS

This study was conducted to analyze the clinico-radiographic features of ameloblastoma at Muhimbili National Hospital (MNH) and to provide insights for improving early diagnosis and treatment planning. Accurate and timely diagnosis is vital to minimizing tissue damage, reducing the need for radical surgery, and lowering the risk of recurrence following treatment.

One of the key challenges in diagnosing ameloblastoma is its similarity in clinical and radiographic presentation to other odontogenic cysts, particularly unicystic ameloblastoma. This resemblance often leads to misdiagnosis, resulting in inappropriate treatments, such as cystectomy for aggressive lesions, thereby increasing the likelihood of recurrence. In this study, all ameloblastoma cases occurred in the mandible, with multilocular radiolucency being the most common radiographic feature. Symptoms frequently observed included pain, dysesthesia, ulceration, and tooth mobility. Most patients presented with advanced disease, necessitating radical surgical procedures like tumor resection with a safe margin.

This prospective study was conducted over a two-year period, from January 2007 to December 2008, at MNH, a tertiary referral hospital in Tanzania. MNH serves as a central hub for specialized care, receiving patients referred from primary and secondary healthcare facilities across the country.

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Data Collection and Clinical Examination

Upon referral, each patient underwent a detailed clinical assessment performed by experienced clinicians. Data collection followed a structured protocol. A comprehensive medical history was recorded, which focused on presenting symptoms, the duration of swelling, associated pain or discomfort, the rapidity of growth, and the impact on daily activities. The history also included details of any previous interventions, such as biopsies or surgeries, and family or personal history of similar conditions or other systemic diseases.

Clinical examinations were performed to evaluate both extraoral and intraoral findings. Extraoral assessments included inspection and palpation of the affected jaw to identify asymmetry, swelling extent, skin involvement, and lymphadenopathy. Intraoral examinations assessed mucosal involvement, ulcerations, and the displacement or mobility of teeth.

Radiographic Evaluation and Histopathological Diagnosis

Radiographic evaluation was integral to the diagnostic process. Orthopantomography (OPG), or panoramic radiography, was performed for all patients to provide a comprehensive view of the jaws. The radiographic findings were analyzed for the size, location, and characteristics of the lesion, including radiolucent or radiopaque appearances, the presence of septations, and cortical bone expansion. In complex cases, computed tomography (CT) scans were employed to assess soft tissue involvement and the extent of bone destruction.

For patients with clinical and radiographic suspicion of ameloblastoma, biopsy procedures were conducted to confirm the diagnosis. Tissue samples were collected under sterile conditions in the operating room or outpatient clinic, depending on the lesion's accessibility. These specimens were submitted to the Department of Histopathology and Morbid Anatomy at MNH for processing and analysis by experienced pathologists. Diagnoses were based on the 1992 World Health Organization (WHO) classification of odontogenic tumors, with attention given to identifying histological subtypes such as conventional ameloblastoma, unicystic ameloblastoma, and peripheral ameloblastoma. The histopathological findings guided subsequent treatment planning and surgical interventions.

Treatment Planning and Management

Treatment plans were individualized based on the histological diagnosis, tumor size, location, and clinical presentation. Radical surgical approaches, including segmental or marginal mandibulectomy, were utilized for extensive or recurrent tumors to achieve clear surgical margins and minimize recurrence risks. Conservative surgical options, such as enucleation and curettage, were reserved for smaller or less invasive lesions, particularly unicystic ameloblastomas. In cases with significant tissue loss, reconstruction procedures such as bone grafting or prosthetic rehabilitation were planned to restore function and aesthetics.

Ethical Considerations

The study adhered to ethical principles for medical research involving human participants. Informed consent was obtained from all participants after explaining the purpose, procedures, and potential risks of the study. Ethical approval was obtained from the Muhimbili National Hospital Ethics Committee prior to the study's commencement. Patient confidentiality and privacy were maintained through secure data storage and anonymized reporting.

Statistical Analysis

Data collected during the study were systematically recorded and analyzed using statistical software. The analysis included demographic data, clinical presentations, radiographic findings, histopathological subtypes, and treatment outcomes. Recurrence rates and post-treatment complications were also assessed to evaluate the effectiveness of the management strategies employed. Descriptive statistics summarized patient characteristics, while inferential analyses were used to identify factors associated with recurrence and treatment outcomes.

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This systematic and comprehensive methodology ensured accurate diagnosis and effective management of ameloblastoma cases referred to MNH, contributing to improved diagnostic precision and treatment outcomes in resource-limited settings.

RESULTS

Nineteen patients were included in this study, comprising 10 males (52.6%) and 9 females (47.4%). The age of the male patients ranged from 18 to 60 years, with an average age of 31.6 years. Female patients ranged in age from 12 to 48 years, with an average age of 33.1 years (Table 1).

Table 1: Age Distribution of Patients by Sex (in ascending order)

Number	Age of Male Patients (Years)	Age of Female Patients (Years)
1	18	12
2	21	19
3	23	27
4	25	31
5	30	35
6	30	37
7	33	41
8	38	48
9	38	48
10	60	
Average Age	**31.6**	**33.1**

Among the 19 patients, 4 (1 male and 3 females) presented with coexisting diseases. This group of patients sought initial treatment at primary health care facilities after varying durations of lesion development. The duration of lesions for males ranged from 1 to 36 months, with an average of 11 months. For females, the duration ranged from 15 days to 8 months, with an average of 3 months.

The patients attended Muhimbili National Hospital (MNH) for treatment after varying durations of tumor progression. For male patients, the duration ranged from 15 to 180 months, with an average of 60.4 months (5.0 years). Female patients presented with durations ranging from 2 to 276 months, with an average of 76.3 months (6.4 years). At local health facilities, males sought treatment after durations ranging from 1 to 36 months, with an average of 10.1 months (0.8 years), while females reported after durations of 0.5 to 8 months, with an average of 2.9 months (0.2 years). Detailed data is summarized in Table 2.

Table 2: Duration of Lesions Before Treatment at Local Health Facilities and Muhimbili National Hospital (Months)

S/No.	Male MNH (Months)	Male Local HF (Months)	Female MNH (Months)	Female Local HF (Months)
1	15	12	180	0.5
2	84	6	12	1
3	22	3	4	3
4	48	12	2	1
5	48	1	36	6
6	180	14	120	8
7	96	36	9	4
8	24	6	48	2
9	27	6	276	1
10	60	5		
Average (Months)	**60.4**	**10.1**	**76.3**	**2.9**
Average (Years)	**5.0**	**0.8**	**6.4**	**0.2**

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The mean delays in seeking specialized care at Muhimbili National Hospital (MNH) did not demonstrate a statistically significant difference between male and female patients at the 5% significance level (p=0.65p = 0.65). This suggests that the duration of delay before attending MNH was comparable across genders, implying that factors other than gender may influence the timing of seeking specialized treatment.

Conversely, the findings indicate a potential difference in delays at local health facilities, with males tending to experience longer delays before seeking care (p=0.053p = 0.053). However, this result is marginally not significant at the 5% level, warranting further analysis to validate the robustness of this observation and explore underlying factors contributing to this trend.

The majority of patients in this study (84.2%) presented with a slow-growing and painless lesion, consistent with the classic clinical presentation of ameloblastoma. A small proportion of patients exhibited other symptoms, including toothache (5.3%), loosening of teeth (5.3%), and mild pain (5.3%). Notably, none of the patients reported fast-growing or painful lesions, nor symptoms such as discharge or paraesthesia. These findings underline the predominantly indolent nature of ameloblastoma and highlight the potential for delayed diagnosis due to the absence of significant pain or rapid growth, which might otherwise prompt earlier medical evaluation.

Table 4: Clinical Presentation of the Lesion

Clinical Presentation	Male	Female	Total	Percentage (%)
Slow-growing and painless	9	7	16	84.2
Fast-growing and painless	0	0	0	0.0
Slow-growing with pain	0	0	0	0.0
Fast-growing with pain	0	0	0	0.0
Toothache	0	1	1	5.3
Loosening of teeth	1	0	1	5.3
Discharge	0	0	0	0.0
Paraesthesia	0	0	0	0.0
Mild pain	0	1	1	5.3

The data suggests that ameloblastoma often progresses unnoticed by patients, as its initial presentation may lack significant symptoms like pain or discomfort. This highlights the importance of improving awareness and diagnostic capabilities at the primary healthcare level to reduce delays in identifying and managing the condition effectively.

The majority of patients in this study presented with the tumor located in the right body of the mandible (52.6%), which was the most commonly affected site. Overall, the body of the mandible was involved in 78.6% of cases, underscoring its predilection as a site for ameloblastoma. Tumors affecting other areas, such as the left mandible body and regions extending to the ascending ramus or crossing the midline, were less frequent.

Table 5: Location of the Tumor

Location	Male	Female	Total	Percentage (%)
Right mandible body	4	6	10	52.6
Left mandible body	2	3	5	26.3
Right body and ascending ramus	2	0	2	10.5
Both mandible through midline	2	0	2	10.5

These findings indicate a strong predilection for the mandible, particularly its body, in the manifestation of ameloblastoma. This information can aid in guiding clinicians during diagnostic evaluations, as well as in planning surgical and reconstructive interventions. Additionally, the lower frequency of cases involving bilateral or extensive spread across the mandible highlights the need for early detection to limit tumor progression.

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Radiographic evaluation revealed that 78.9% of the lesions were characterized by well-defined multilocular radiolucency with corticated margins, making this the predominant radiographic feature observed. A smaller proportion, 21.1%, exhibited well-defined unilocular radiolucency with corticated margins. Notably, no cases were identified with ill-defined radiolucency, either multilocular or unilocular, underscoring the diagnostic clarity provided by the radiographic margins.

Table 6: Radiographic Features

Radiographic Features	Male	Female	Total	Percentage (%)
Well-defined multilocular radiolucency with corticated margins	8	7	15	78.9
Well-defined unilocular radiolucency with corticated margins	2	2	4	21.1
Ill-defined multilocular radiolucency with corticated margins	0	0	0	0.0
Ill-defined unilocular radiolucency with corticated margins	0	0	0	0.0

These findings highlight the characteristic multilocular appearance of ameloblastoma on radiographs, often with well-demarcated corticated margins, which serves as a crucial diagnostic feature. The unilocular variant, though less common, also demonstrates defined corticated margins, distinguishing it from other potential mandibular lesions. This radiographic profile is valuable for provisional diagnosis and treatment planning.

The patients in this study received various treatments at primary healthcare facilities before being referred to Muhimbili National Hospital (MNH) for specialized care. Despite these interventions, the tumours continued to grow, indicating that the treatments provided at the primary level were largely ineffective.

A total of 21.1% of the patients received no treatment at all during their initial visits, and their tumours continued to grow untreated. Similarly, 15.8% of patients were prescribed medication, but this also failed to halt tumour progression. Tooth extraction was performed in 21.1% of cases, but instead of resolving the issue, the tumour size increased within two months following the procedure.

Incision and drainage (I&D) were carried out in another 15.8% of cases, but this intervention similarly resulted in tumour enlargement. Tumour excision, performed on 15.8% of patients, showed a recurrence of the tumour within 15 years, suggesting incomplete removal or residual disease. Additionally, 10.5% of patients resorted to traditional medicine, which also failed to control tumour growth, leading to further enlargement.

Overall, these findings highlight the inadequacy of treatments offered at the primary healthcare level for managing ameloblastoma. The persistence and progression of tumours after these interventions emphasize the critical need for timely referral to specialized care to ensure appropriate management and to prevent further complications.

Other medical condition(s) or comorbidity:

In this study, comorbidities were noted among four patients. One male patient had asthma, while three female patients presented with comorbid conditions: one had typhoid, another had an allergy, and the third also had asthma.

The lesions were primarily self-detected by the patients themselves, accounting for 68.4% (13 out of 19) of the cases. In other instances, lesions were identified by health personnel (1 patient), mothers (3 patients), or other relatives (2 patients).

Older lesions demonstrated both buccal and lingual expansion in 15.8% (3 out of 19) of the cases, while the remaining 84.2% (16 out of 19) exhibited only buccal expansion. The criteria for classifying buccal and lingual expansion included radiographic and clinical evidence of symmetrical growth extending into both the buccal and lingual cortical plates.

Regarding potential contributing factors such as trauma or surgical history at the lesion site, the majority of patients (78.9%, 15 out of 19) reported no history of traumatic injury or surgical procedures before the lesion's onset. However, two patients reported a history of falling and sustaining an injury at the site, and two others

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had undergone tooth extractions at the lesion site before its development. These findings suggest that prior trauma or surgical intervention might play a role in a minority of cases.

DISCUSSION

This study provides valuable insights into the clinical and radiographic presentation, delays in seeking care, and treatment outcomes of patients presenting with ameloblastoma. The findings align with previous studies highlighting the indolent nature of ameloblastoma, often characterized by slow-growing, painless lesions[14–17]. However, this clinical feature frequently contributes to delayed health-seeking behavior, as patients may not perceive the lesion as significant until it becomes symptomatic or causes functional impairment. In this study, the average delay before seeking specialized care at Muhimbili National Hospital (MNH) was prolonged, with males experiencing slightly shorter delays (60.4 months) compared to females (76.3 months), though the difference was not statistically significant ($p = 0.65$). Such delays may reflect a combination of factors, including low awareness, accessibility challenges, and potential mismanagement at primary health care levels [18].

Interestingly, males experienced longer delays in seeking care at local health facilities than females ($p = 0.053$). While this finding is marginally significant, it raises questions about gender-specific health-seeking behaviors, sociocultural influences, and resource accessibility. Similar studies have indicated that sociocultural norms and economic barriers can delay male participation in healthcare, emphasizing the need for targeted interventions [19].

Radiographic findings in this study were consistent with the classic presentation of ameloblastoma, with most lesions presenting as well-defined multilocular radiolucencies with corticated margins (78.9%). This radiographic pattern is a hallmark of ameloblastoma and aids in provisional diagnosis [2]. Early and accurate radiographic interpretation is critical for prompt referral and effective treatment planning.

The treatment history at primary health care facilities revealed that inappropriate management strategies, such as incision and drainage (I&D), tooth extractions, and partial excisions, often resulted in lesion progression or recurrence. Recurrence within 15 years after excision highlights the importance of surgical interventions with clear margins, as partial excision is inadequate for controlling the tumor's aggressive and infiltrative behavior [20]. This underscores the urgent need for enhanced training and resources for primary healthcare providers to prevent interventions that exacerbate the condition and delay referral to specialized centers.

The study also observed that 78.9% of patients reported no history of prior trauma or surgical procedures at the lesion site, suggesting that such factors play a minimal role in the pathogenesis of most cases. However, the few cases involving trauma or tooth extractions before lesion detection indicate that these events might occasionally contribute to lesion initiation or progression, as suggested by other studies [21].

Comorbidities were present in 21.1% of patients, with asthma, typhoid, and allergies being the most common conditions. While these comorbidities did not appear to directly influence ameloblastoma presentation or progression, addressing concurrent health conditions is essential for comprehensive patient care. Similar findings have been reported in the literature, emphasizing the need for multidisciplinary approaches to patient management [22].

In conclusion, this study highlights the need for early detection, appropriate management, and public education to minimize delays in seeking specialized care. Strengthening primary health care systems, improving referral pathways, and promoting awareness could help reduce the burden of ameloblastoma and improve outcomes. Further research should focus on identifying sociocultural and systemic barriers to timely care, as well as interventions to enhance diagnostic and treatment capabilities at all levels of the healthcare system.

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