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Editorial: Access to Oral Rehabilitative Care in Kenya

Space occupying lesions (SOC) in the oral cavity include tumors, cysts and enlargements of the gingiva and oral mucosa. Odontogenic cysts are more common than odontogenic tumors. Cysts are fluid filled cavities which occupy space which seem to affect both males and females equally. In Kenya, people of all age groups are affected with the most common age of occurrence being 3rd to 4th decade. This age group that is commonly affected is made up of people who are usually concerned with their health and looks.

Cystic lesions cause derangement of the oral tissues and structures leading to poor oral hygiene, interference of all oral functions, often resulting in pain, ulcerations and displacement, impaction, loosening or even loss of teeth and soft tissues. Late presentation is a common occurrence in Kenya further magnifying these effects. When they occur early in life, these lesions are quite debilitating interfering with eruption of teeth and the growth of oral-facial structures. Aesthetic concerns arise due to the derangement of the oral tissues and also some of these cysts like the radicular cysts and calcifying odontogenic cysts, affect the aesthetic zone of the anterior maxilla. Some variants of these odontogenic cysts have been postulated to undergo carcinogenic mutations, hence warranting early diagnosis followed by surgical and prosthetic intervention to fully rehabilitate these patients.

Surgical management of these lesions usually ends up with loss of oral structures which may be massive for those presenting late to the hospital. Late presentation is a common phenomenon in this part of the world due to the challenges faced by patients in accessing facilities which are far and patients have to travel long distances to get to them. Removal of these lesions should therefore be followed by prosthetic rehabilitation of the lost teeth, oral soft and hard tissues damaged by the lesion or lost during the surgical intervention. Most prosthetic reconstructions are done with obturators, removable complete or partial dentures or fixed to fixed "permanent" bridges depending on the extent of the lost tissues. The expertise of the dentist makes a big difference to the type of replacement offered to the patient. The patient desires, expectations and what they can afford also determines the kind of prosthetic reconstruction that is undertaken.

Over the last decade the use of implant and implant supported prostheses sometimes using bone and or soft tissue grafting has gained favor as a means of rehabilitation. This form of rehabilitation goes a long way in restoring both aesthetics and function. This is because when well planned and executed implant-supported replaced teeth look, feel and function like natural teeth especially in the anterior maxilla with superb aesthetics outcomes, whilst also restoring full chewing function. Implants also preserve the integrity of the alveolar bone and facial structures thus preventing facial sagging and appearance of premature aging. Implants are also more durable. A dental fixed to fixed bridge lasts about 15 years, whereas, dental implants may last a life time if well done. Implants also provide a far more superior long-term comfortable experience when compared to dentures. Even well fabricated dentures that originally fit well, will begin to slip and become uncomfortable after a while, due to increasing bone loss which these same dentures accelerate. Diastemas, unrestored abutment teeth, compromised abutment teeth, extensive edentulous spans and replacing a missing canine further favor the use of dental implants

Unfortunately, dental implants are costly, with an estimated cost of a whopping 100,000 to 300,000 Kenyan shillings, depending on the service provider. Most patients are thus unable to afford this state of the art type of rehabilitation. In Kenya, only a few individuals have dental insurance and those who do have a cover, only the surgical component of therapy will be covered. There are very few companies that cover the essential prosthetic component of the patients' rehabilitation. Further, none of them cover aesthetic procedures that replace lost teeth in the anterior maxilla because they categorize this as not being an ailment but being cosmetic in nature.

Therefore, these procedures in the anterior maxilla are excluded from the insurance cover and would have to be covered out of pocket. This is despite the psychological impact of losing upper front teeth on the patient. Apart from the psychological effects, there is a functional component whereby speech and mastication are also affected. Challenges in mastication leads to patients avoiding fruits, vegetables and meat proteins. Instead, preference is given to the softer carbohydrates which subsequently

has an impact on the individual's general health leading to the development of lifestyle non-communicable diseases like obesity, diabetes mellitus and hypertension.

Insurance covers that do not include an oral health component as part of the package, due to the misguided notion that diseases in the mouth are different from those in other parts of the body do a disservice to the patient. It is well known that poor dental health is associated with chronic diseases like diabetes, cardiovascular diseases, cerebrovascular events that have substantial costs to the health system. Poor access to good quality oral health services, due to the heavy financial burden to the patient, renders full rehabilitation of dental patients in Kenya a big challenge leading eventually to systemic diseases. This scenario needs to be changed and insurance companies should consider prosthetic rehabilitation as a condition that is included in the cover no matter which area of the mouth is affected. Prosthetic rehabilitation should be prioritized by the Universal Health Coverage planned by the government as one of the big four agendas for the country.

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Pattern, distribution and anatomical location of occurrence of odontogenic cysts amongst patients seen at a Dental Hospital in Kenya,

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Keywords: odontogenic cyst, age, gender, anatomical position, trends

Abstract

Background: An odontogenic cyst is a cavity containing fluid, semi fluid or gaseous material, which is not pus. The cyst usually arises from odontogenic epithelium and is found in regions associated with dental development. Studies have been done to establish the pattern of distribution of odontogenic cysts in non-African populations but not much has been done in Africa including Kenya.
Objective: To describe the pattern of occurrence and distribution of odontogenic cysts amongst patients seen at a certain Dental Hospital in Kenya, over a 10-year period from 2009 to 2018.
Study Design: A cross sectional audit study of the histopathological reports of patients seen at the Dental Hospital, retrieved from the histopathology laboratory.
Study Population: All patients seen at a certain Dental Hospital in Kenya, who were diagnosed with Odontogenic cysts between 2009 and 2018.
Materials and Methods: Histopathological records of patients seen at the Dental Hospital from the year 2009 to 2018 were retrieved and analysed for the age, gender, histological type of odontogenic cyst and its anatomical location. This information was analysed using SPSS version 25.0.0.0.
Results: The most common odontogenic cyst was the odontogenic keratocyst with 79 cases (37.8%). The trend of occurrence seen was that of a gradual increase in the number of cases over the 10-year period of study. The most common anatomical location for the cyst was the posterior mandible with 91 cases (43.5%). Males were more affected 107 (51.2%) than females 102 (48.8%). The peak age of occurrence was 21-40 years of age whereby 85 cases (40.6%) were identified. The most common clinical presentation was a swelling as seen in 122 cases (58.4%) followed by dental impaction in 44 cases (21.1%), and then those with a history of dental caries or endodontic treatment 26 cases (12.4%).
Conclusion: The most common odontogenic cyst was the odontogenic keratocyst mostly affecting the posterior mandible. The peak age of occurrence was in the 3rd and 4th decade.

Introduction

Odontogenic cysts are fluid filled cavities lined by epithelium that arise from rests of odontogenic epithelium. Cysts, which arise from odontogenic tissues, are encountered more frequently in dentistry than odontogenic tumours. The latter (odontogenic tumours), constitute less than 1% of all specimens received from orofacial lesions [1], [2]. Odontogenic tumours are tissue masses that are derived from ectomesenchymal or epithelial cells of tooth development.

According to the 2017 WHO classification of odontogenic cysts and tumours, odontogenic cysts are either developmental or inflammatory. The cysts classified as developmental include the dentigerous cyst, odontogenic keratocyst, lateral periodontal and botryoid odontogenic cysts, gingival cysts, glandular odontogenic cysts, calcifying odontogenic cysts, and orthokeratinised odontogenic cysts. The odontogenic cysts classified as inflammatory include the radicular cysts, the residual cyst and the collateral inflammatory cysts[3].

There has not been any significant change in the groupings under which odontogenic cysts are classified since 1992. However, in 2017, there were two changes that were made. One was that the calcified odontogenic tumour and the keratocystic

odontogenic tumour were to be classified as cysts as opposed to the earlier method of classifying them as tumours. They were thus renamed as calcified odontogenic cyst and odontogenic keratocyst respectively[3].

Odontogenic cysts are known to be benign lesions. However, it has been suggested by some authors, that neoplasms such as ameloblastomas or carcinomas could arise from their epithelial linings. The evidence showing that ameloblastomas arise from epithelial linings is not equivocal. It is speculated that this data may actually result from incorrect radiographic interpretation or faulty histological diagnosis. There are however, a few well authenticated cases of carcinomas that develop from cystic linings, but they are exceedingly rare[2]. Carcinomatous degeneration of these cysts has been reported and shown to have an incidence that ranges from 0.13% to 3% [4].

Carcinomatous degeneration of the odontogenic cystic lining is likely to be more common than what has been reported. Some of the carcinomas that have been observed in the oral and maxillofacial pathologies have been shown by some studies to possibly originate from the odontogenic cysts [1].
The different types of carcinomatous changes that may arise out of odontogenic cysts have been categorized as subtypes of primary intraosseous carcinomas. Squamous cell carcinomas have also been suggested as being one of the possible sequelae of odontogenic cysts [5,6,7].

The incidence of carcinomas which originate from odontogenic cysts have been reported by various authors, as shown in a review by Borrás-Ferreres et al 2016 [4]. They can either be squamous or mucoepidermoid and are less than 1%. However, 70% of primary intraosseous carcinomas develop from previously existing cysts and this makes up to 1 - 2% of overall oral cancers [4]. It has been reported that up to 50% of Central Mucoepidermoid Carcinomas (CMEC) originate from odontogenic cysts or impacted teeth. The pathogenesis is not well understood but the presence of infectious tissue has been associated with it. Long periods of chronic inflammation have been suggested as being a predisposition to the malignant transformation of the cystic epithelium.[7]

However, a case report of malignant transformation from a follicular cyst without chronic inflammation in a very young woman was published which could suggest the existence of other mechanisms of pathogenesis related to the oncogenes [7]. Two of the included case series showed that most of the cases had originated from the two inflammatory cysts, radicular or residual cysts. Studies also suggest that the presence of keratinisation in the epithelial lining could be a risk factor for malignant transformation. Keratinisation in odontogenic cysts has been reported in 15 - 18% of cases whereas most primary intraosseous squamous cell carcinoma (PIOSCC) type 1 are keratinised and well-differentiated.[4] Thus, keratinisation of the odontogenic cyst may not directly contribute to malignant transformations.

Carcinomas arising from odontogenic cysts are uncommon. However, when they occur, squamous cell carcinomas are more common. It is more likely for a dentigerous cyst to undergo malignant transformation compared to a radicular cyst which only very rarely transforms into an intraosseous carcinoma.[8]

The study of odontogenic cysts is important in dentistry since they have effects on the appearance and function of oral structures and may undergo carcinogenic mutations. Currently, the information that is available on odontogenic cysts is mainly from non- African people. Very little information is available in the African population. African people have a different genetic makeup and as such, the information available from the non-African populations may not be a true representation of the nature of these cysts in them. In Kenya, only a few studies have been done to characterize odontogenic cysts and they have shown varying results. Therefore, more information is needed about the occurrence and distribution of odontogenic cysts.

Material and methods

This study was carried out at a certain Dental Hospital Histopathology Laboratory situated in Kenya. The institution is a major hospital specialized in treatment of all dental and maxillofacial conditions in the country, and is a teaching and referral center.
It is equipped with qualified personnel including Oral and Maxillofacial pathologists and histopathology

laboratory technologists. It is also a teaching hospital, where both undergraduate and postgraduate courses are offered.

The records kept at the hospital facility include the clinical information and histopathology reports. This study area is located in Nairobi city, which is the capital city of Kenya, and being a referral center, makes it suitable for research.

The Study population included all patients diagnosed with odontogenic cysts at the Dental Hospital between January 2009 and December 2018.

The study was cross sectional where all the histopathological and medical records of patients seen at the Dental Hospital who had been diagnosed with odontogenic cysts between the years 2009 and 2018 were retrieved and examined. A previous study done in 2011 to determine the pattern of odontogenic cysts between January 2000 and December 2009 got a sample size of 187 [9]. Therefore, the sample size for this study was estimated at 200 Jaw cysts.

The data collected included demographic details, clinical features and histological subtypes of odontogenic cysts. The records were retrieved, histology laboratory numbers and file numbers recorded. The relevant variables were then recorded in a data collection form. The variables collected included age, gender, anatomical site of occurrence of the cyst and the type of odontogenic cyst. The year the diagnosis was made was also recorded. Patient records lacking vital information were disregarded. The Statistical Package for Social Sciences (25.0.0.0) was used for the data analysis.

Ethical approval to carry out the study was obtained from the University of Nairobi / Kenyatta National Hospital Research, Ethics and Standards Committee. Permission was also sought and obtained from the chairman of the department of Oral and Maxillofacial Surgery where the records are stored. The information obtained was handled with utmost confidentiality.

Results

Histopathology records of 209 patients who had been diagnosed with odontogenic cysts were examined. Among the 209 patients who were seen, the majority were found to be male, at 107 (51.2%), compared to females, at 102 (48.8%). The gender distribution by individual types of odontogenic cysts is as shown in table 1. The gender distribution of odontogenic keratocyst was 40(51%) in males and 39(49%) in females showing a more or less similar presentation in both sexes. Whereas there were more cases of dentigerous cyst among males 36 (58%), than females 26 (42%). For the radicular cyst, there were more female patients 30 (55%) compared to males 25 (45%). The other odontogenic cysts were present in very few cases.

	TYPE OF CYST						
GENDER	OKC	DC	COC	EC	RADICULAR	RESIDUAL	LPC
MALE	40	36	4	0	25	2	0
FEMALE	39	26	4	1	30	1	1
TOTAL	79	62	8	1	55	3	1

Key: OKC – odontogenic keratocyst, DC – dentigerous cyst, COC – calicifying odontogenic cyst, EC – eruption cyst, Radicular – radicular cyst, Residual – residual cyst, LPG – lateral periodontal cyst

The odontogenic cysts occurred among all age groups in general from an age of 5 years to 85 years old. The peak age of occurrence was from the 3rd to the 4th decade. Only 3 out of 209 cases were shown to occur beyond the age of 80 years old. The highest number of odontogenic cysts occurred between 21 and 40 years.

The peak age of occurrence of odontogenic keratocyst was between 21 and 40 years, while that of dentigerous cyst was between 0 and 20 years old. The radicular cyst occurred most between 21 and 40 years old. This has been illustrated in table 2.

Table 2: Distribution of the patients by age and type of cyst

AGE GROUP 0 – 85 years	**OKC**	**DC**	**COC**	**EC**	**Radicular**	**Residual**	**LPC**	**Total**
0 - 20	16	30	1	0	11	0	0	58
21-40	34	20	2	0	27	1	1	85
41-60	17	10	1	1	10	1	0	40
61≥	12	2	4	0	7	1	0	26
Total	**79**	**62**	**8**	**1**	**55**	**3**	**1**	**209**

Key: OKC – odontogenic keratocyst, DC – dentigerous cyst, COC – calicifying odontogenic cyst, EC – eruption cyst, Radicular – radicular cyst, Residual – residual cyst, LPG – lateral periodontal cyst

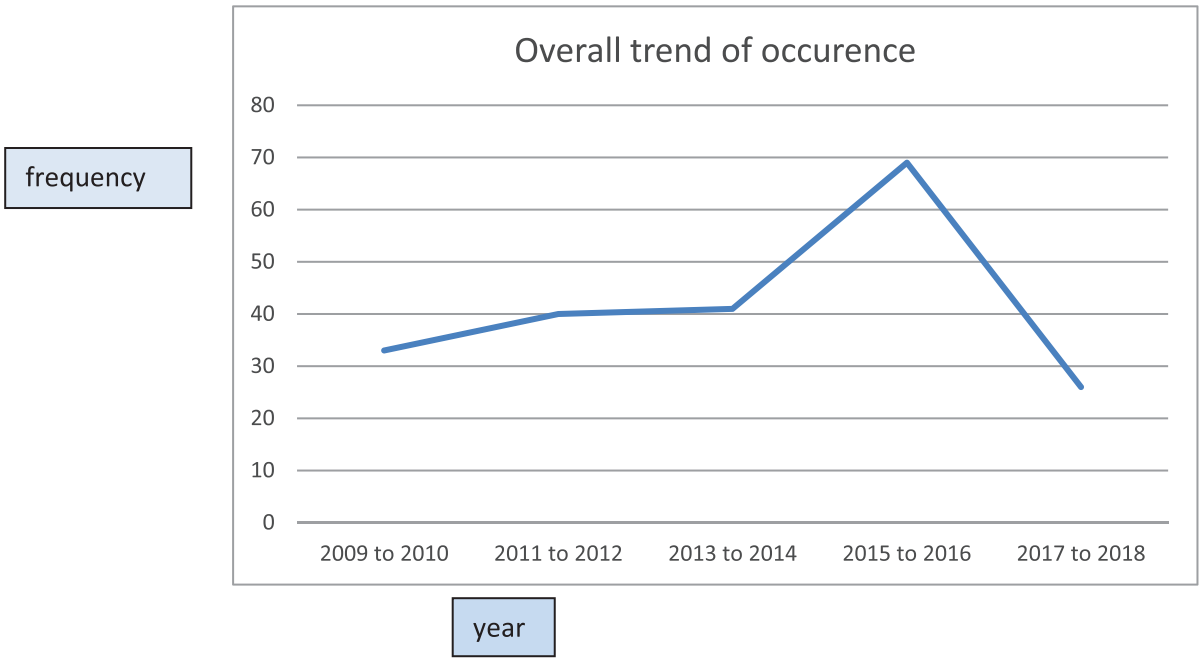
The most common odontogenic cysts to be diagnosed were the odontogenic keratocyst, the dentigerous cyst and the radicular cyst, at 79 (37.8%), 62 (29.7%) and 55 (26.3%) respectively. Only 8(3.8%) cases had the calcifying odontogenic cyst and 3 (1.4%) the residual cyst as shown in Table 3.

Table 3: Distribution of patients by type of odontogenic cysts

TYPE OF CYST	**FREQUENCY**	**PERCENTAGE**
ODONTOGENIC KERATOCYST	79	37.8
DENTIGEROUS CYST	62	29.7
CALCIFYING ODONTOGENC CYST	8	3.8
ERUPTION CYST	1	0.5
RADICULAR CYST	55	26.3
RESIDUAL CYST	3	1.4
LATERAL PERIODONTAL CYST	1	0.5
Total	**209**	**100.0**

The trend observed in the number of patients diagnosed with odontogenic cysts over the ten-year period was that of an increasing nature up to 2016, then there was a decline thereafter. This has been illustrated in Figure 1.

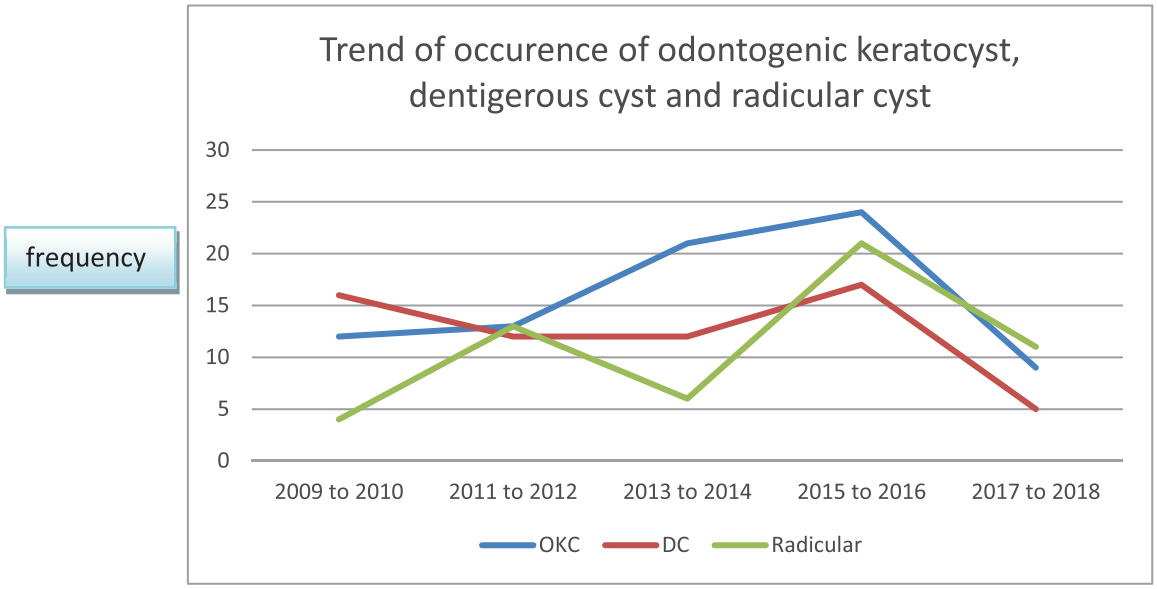
Figure 1: Trend of occurrence of odontogenic cysts



It was observed that the trend of occurrence of the different types of odontogenic cysts was increasing for the odontogenic keratocyst, radicular cyst and the dentigerous cyst.

The trends of occurrence of the most common cyst types, namely, odontogenic keratocyst, dentigerous cyst and radicular cyst, were compared using a line graph as shown in the figure 2.

Figure 2: Annual occurrence trends for the odontogenic keratocyst, dentigerous cyst and radicular cyst from 2009 - 2018. Key: DC: Dentigerous cyst, OKC: Odontogenic Keratocyst



The peak occurrence of all the three odontogenic cysts was observed to be between 2015 to 2016. After this, it was observed that the frequency of occurrence of all the three reduced drastically.

The most common anatomical location for the occurrence of odontogenic cysts was found to be the posterior mandible 91(43.5%) followed by the anterior maxilla 50(23.9%). Cumulatively, the number of cases reported to occur in the mandible 129(61.7%)) was more than the number reported to have occurred in the maxilla 74(35.4%). Only six cases (2.9%) were found to be peripheral, that is, occurring in the soft tissue outside the jaw bone.

The most common anatomical location for the odontogenic keratocyst was found to be the posterior mandible, followed by the posterior maxilla (Table 4). The occurrence of the odontogenic keratocyst in peripheral tissues was also seen to occur most frequently compared to the other types of cysts.

The dentigerous cyst also occurred most frequently in the posterior mandible, followed by the anterior maxilla. There was no record of a dentigerous cyst in the peripheral tissues.

For the radicular cyst, the most common anatomical location of the radicular cyst was found to be the anterior maxilla, followed by the posterior mandible. There was also no record of a radicular cyst in the peripheral tissues.

The calcifying odontogenic cyst occurred mostly in the anterior mandible followed by the posterior mandible. Only 2 out of 8 cases were found to have occurred in the maxilla.

Table 4: Anatomical location of the different types of odontogenic cysts

LOCATION	**OKC**	**DC**	**COC**	**EC**	**Radicular C**	**Residual C**	**LPC**	**Total**
anterior mandible	11	15	4	0	8	0	0	**38**
posterior mandible	41	28	2	0	16	3	1	**91**
anterior maxilla	11	16	0	0	23	0	0	**50**
posterior maxilla	12	3	1	0	8	0	0	**24**
Peripheral	4	0	1	1	0	0	0	**6**
Total	**79**	**62**	**8**	**1**	**55**	**3**	**1**	**209**

Key: OKC – odontogenic keratocyst, DC – dentigerous cyst, COC – calicifying odontogenic cyst, EC – eruption cyst, Radicular C – radicular cyst, Residual C– residual cyst, LPG – lateral periodontal cyst

Majority of the patients presented with swelling of the jaw 122(58.4), which occurred either alone or in association with other signs and symptoms such as pain, impaction of teeth, trauma, a history of dental caries or endodontic treatment.

A few occurred as a recurrence of an odontogenic cyst 8(3.8%) that was previously diagnosed and treated. Some also occurred as an incidental finding and, therefore, there was no record of the history or clinical examination findings that are associated directly to the odontogenic cyst.

Swelling alone was the most common clinical presentation associated with odontogenic cysts (58.4%). Dental Caries (12.4%) and impaction of teeth (21.1%) were also quite common. Most odontogenic cysts did not present with pain. Only four cases (1.9%) were associated with pain. 1.4% of the patients had no symptoms and the cysts were

only discovered incidentally during routine dental treatment.

Impacted teeth were commonly associated with dentigerous cysts. Radicular cysts were associated with a history of either dental caries or endodontic treatment.

Discussion

This study conducted at a certain Dental Hospital was aimed at determining the sociodemographic characteristics (age and gender), anatomical location and the trends of occurrence of the odontogenic cysts that were diagnosed at the hospital in the years 2009 to 2018.

The present study showed that there were more males (51.2%) than females (48.8%) affected by odontogenic cysts. A similar trend was observed in other studies carried out in the same institution although the actual numbers differ. In a study done by Micha et al 2012 9 at the same institution over a study period of 10 years (2000 to 2009), it was shown that males (66%) were more affected than females (34%). Another study done at the institution by Munyao et al 2012 10 (University of Nairobi depository) that covered a study period between 2006 to 2010 also showed that males were more affected (63.7%) than females (36.3%).

The age range of individuals who were diagnosed with odontogenic cysts in this study was from 5 years old to 85 years old. The mode of age of occurrence of odontogenic cysts was found to be the 3rd decade of life. Only 3 out of the 209 cases seen at Dental Hospital had cysts that occurred in individuals beyond the age of 80 years old.

The most common age of occurrence of odontogenic keratocyst was between 21 and 40 years, while that of dentigerous cyst was between 0 and 20 years old. The radicular cyst occurred mostly between 21 and 40 years old. This is different from the findings done in the study by Micha et al,2012 which indicated that the most common age of occurrence of radicular cysts was between 16 to 20 years and 36 to 40 years, as for the dentigerous cyst the common age of occurrence was between 8 and 28 years, and for the odontogenic keratocyst the age range was not reported. The reason for this difference is not known and further studies may be required to investigate this finding.9.

In this study, the most commonly diagnosed odontogenic cyst was the odontogenic keratocyst (37.8%) followed by the dentigerous cyst (29.7%). This differs from a study conducted by Micha et al, 2012 at the same institution that showed that the dentigerous cyst was most common. [9]. A study done by Munyao et al (personal communication) at the same institution covered a study period of five years (2006 – 2010) also showed that dentigerous cysts were most common (28.1%).[10] The reason for this difference observed in the findings is not clear and further study may need to be done to explain it.
The most common anatomical location of the odontogenic cysts was the posterior mandible (43.5%) followed by the anterior maxilla (23.9%). Cumulatively, the mandible was more affected (61.7%) by the odontogenic cysts than the maxilla (35.4%). This finding is similar to the study done by Munyao et al (personal commination) over a period of five years, 2006 to 2010, where the results showed that the mandible was more affected (43.18%) than the maxilla (39.39%)[10].

The most common anatomical location of the odontogenic keratocyst was the posterior mandible (41 out of 79), that of the dentigerous cyst is also the posterior mandible (28 out of 62) and that of the radicular cyst is the anterior maxilla (23 out of 55). The tendency of the occurrence of the odontogenic keratocyst in the posterior mandible is possibly due to the presence of impacted teeth in that region and the fact that these cysts arise from epithelium rests of odontogenic epithelium which may be present around the impacted tooth. In this study, the other types of cysts were very few and therefore it would be inaccurate to characterize the data concerning them with the limited number of cases.

The number of odontogenic cysts was observed to be increasing initially from 2009 to 2016. From 2017 to 2018, the number of odontogenic cysts drastically reduced. This trend of occurrence is however not an accurate representation of the actual frequency of occurrence of the odontogenic cysts over the study period. This is because of the prolonged periods of health workers strikes that took place in the years of 2013 and 2017, which may have led to a drastic

reduction in the number of patients visiting public hospitals, this Dental Hospital being one of them and thus the cases diagnosed in this hospital dropped. This reduction in cases brought about by other external forces may affect the trend of occurrence seen and should be put into consideration. That considered, it appears that the rate of occurrence of the odontogenic cysts over the study period was generally increasing in number. [11, 12]

It was observed that majority of the patients diagnosed with odontogenic cysts presented with just a swelling alone (58.4%). For the odontogenic keratocyst however, the presentation was associated with the presence of impacted teeth or as a result of recurrence of a previously diagnosed case. Only a few presented as an incidental finding. This is because in a few cases, the odontogenic keratocyst spreads in an anteroposterior direction without causing buccolingual cortical expansion and is only discovered later when it has enlarged significantly. 36 cases out of the 62 diagnosed with dentigerous cysts (58.1%) were associated with an impacted tooth, and therefore impaction of teeth may be associated with the occurrence of dentigerous cysts. 23 out of 28 cases (82%) of radicular cyst were associated with a history of either dental caries or endodontic treatment, making these factors possible risk factors. Trauma was only implicated in two of the cases, and is therefore not a possible major risk factor[1, 2].

Since the study was done at a hospital, the findings were biased towards the presentation of patients who have sought medical attention. As a result, it may not accurately represent the general picture in the population. This is possibly only a fraction of all the individuals in the community who have odontogenic cysts. The study relied on examination of biopsy slides stored in the histopathology laboratory and not the actual patient.

However, in this study, there were cases (9 in total) that were excluded because their records lacked vital information. This meant that the percentages represented here are not inclusive of all cases.

More extensive and community based studies are required to assess the prevalence in the country of odontogenic cysts.

Conclusion

From this study, it has been established that the most common odontogenic cyst that was diagnosed in the Dental Hospital in Kenya, in the years of 2009 to 2018 was the odontogenic keratocyst, followed by the dentigerous cyst, then the radicular cyst. People of all age groups were affected with the most common age of occurrence being 3rd to 4th decade.

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The State of Dental Insurance Coverage in Nairobi, Kenya

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Keywords: Dental, insurance, policy holder, annual limit, co-payment, exclusions, premium, pre-authorization

Abstract

Objectives: The use of insurance to finance dental treatment has greatly increased. There are certain logistical issues that are a source of frustration among policy holders and clinicians. These include; the pre-authorization process, annual limit, exclusion of selected treatment modalities and the duration taken to pay dentists after service provision. The objective of the study was to explore the state of dental insurance coverage in Nairobi, Kenya.

Methods: This is a descriptive cross-sectional study carried out in Nairobi, Kenya among health insurance companies using structured questionnaires.

Results: Of the 18 companies from which a response was recorded, 17 are privately owned and one a public institution. Sixteen companies (16) offered dental insurance. All companies covered surgical and restorative procedures. However, only 37.5%, 68.8% and 25% covered prosthetic, preventive and orthodontic procedures respectively. None of the insurance companies covered cosmetic procedures. Eleven (61.1%) companies had a pre-authorization prerequisite prior to service access. Majority of the companies, (68.8%), took less than 2 weeks to reimburse members who made 'out of pocket' payments. In contrast, it took up to 2 months for 87.5% of the companies to make payments to dentists upon service provision. Seventy-five percent (75%) of the companies reported that their clients were satisfied with their products. Most companies viewed dental insurance as a non-profitable market.

Conclusion: This study highlights the need for further evaluation and alignment of the interests of all stakeholders to maximize benefits in insurance coverage, especially at this juncture where achieving universal health coverage (UHC) is in Kenya's national agenda, with oral health being one of the identified primary health care goals.

Introduction

The first-ever United Nations (UN) High-level meeting on Universal Health Coverage (UHC) took place in September 2019. During this meeting, the governments of UN member states declared their political commitment to the goal of UHC. For the first time, oral health was included in this agenda1. UHC is defined as access to all essential health services of sufficient quality without an individual having to incur financial hardship[2].

The impact of compromised oral health on overall health is no longer in question. Unfortunately, oral health continues to be neglected because of the associated high costs of treatment. This is even more pronounced in emerging economies such as Kenya3. In developing countries, oral health has traditionally been segregated from the general health and there is lack of appreciation of the relationship between the two. This is generally due to the priority given to general health problems hence relegating oral health as a low priority area in health financing programs. In Kenya, this gross under-funding of the sector was evident when the oral health department of the Ministry of Health (MOH) received an operational budget of Kenya shillings 392,400 (approximately US$3900) in the 2014/2015 financial year[4]. Other factors contributing to the low funding of this sector are the huge development projects that take precedence over health care needs, high poverty levels among the citizens and the limited knowledge of the individuals on the importance of oral health.

Kaimenyi JT (2004), while discussing oral health in Kenya, stated that the limited funding options

in Kenya are due to the fact that an increase in budgetary allotment to the MOH would likely lead to an increase in taxation, cost sharing of services in the public health facilities, and cost of health care to individuals[5]. It is against this background that insurance companies can come in and fill in the gap. Insurance can be viewed as an important pillar in offsetting dental care costs and promoting access to care. The role of insurance has been investigated quite extensively in other countries thus demonstrating its significance[6,7]. However, the state of dental insurance coverage in Kenya has not been widely explored and therefore, this survey sought to identify how oral health insurance is structured in Kenya, coverage of specific dental procedures and the challenges faced by policy holders and dental service providers.

Materials and methods

This was a descriptive cross-sectional study carried out in Nairobi County, where the headquarters of majority of the insurance companies are based. Consecutive sampling was done. All the insurance companies that met the inclusion criteria and offered dental insurance either solely or as part of a health insurance package and consented to the study in writing were recruited while those that failed to give consent were excluded.

Data collection was done between January 10th and February 20th, 2017 using a self-administered questionnaire which was filled by the head of the dental health department in each insurance company. Data on market share of companies was obtained from Insurance Regulatory Authority.

The questionnaires sought to explore the following; whether a company was in the private or public sector, how long the company has been in service, if the company offers dental insurance and if it does, is it an independent package or part of a medical cover, dental procedures covered and those excluded, whether a pre-authorization is to be sought prior to treatment, if members are required to make a co-payment, duration taken to reimburse members if out of pocket payments are made compared to the duration taken to pay clinicians for services delivered, whether packages offered have an annual limit, if insured members are satisfied with the benefits accorded and if the insurers considered dental insurance profitable.

Statistical package for social sciences (SPSS) version 21.0 and Microsoft office excel+ 2007 were used in data analysis. The frequency of occurrence of the various variables across the companies studied was determined.

This study was carried out after approval was sought and granted by the Kenyatta National Hospital and University of Nairobi Research Ethics and Standards Committee. The companies being studied were informed about the study and signed consent sought prior to their participation. All information collected was handled with utmost confidentiality and has only been used for purposes of the research.

Results

Self-administered questionnaires were issued to officers in charge of the health department in 22 of the major insurance companies with headquarters in Nairobi Kenya. Eighteen questionnaires were satisfactorily filled giving a response rate of 81.8%. Of the four companies that failed to respond, two were international insurers with restrictive data protection policies while the other two did not cite reasons why.

Of the 18 companies from which a response was recorded, 17 (94.4%) were in the private sector and one (5.6%) the public sector. Majority (66.7%), of the companies had been in service for more than 15 years. Of the 18 companies, 16 (88.9%) offered dental insurance covers. The other two companies were general insurance companies, which only covered dental procedures as part of a personal accident claim. The market shares of the companies ranged from 0.1% to 23.5% with a mean percentage market share of 6.7% as obtained from the Insurance Regulatory Authority (IRA) website. Of the 16 companies offering dental insurance, eight (50%) had been offering dental insurance for more than 15 years. A quarter had been offering dental insurance for five years or less.

Figure 1 shows that out of the 16 companies, 12 (75%), offered dental insurance as part of the medical cover.

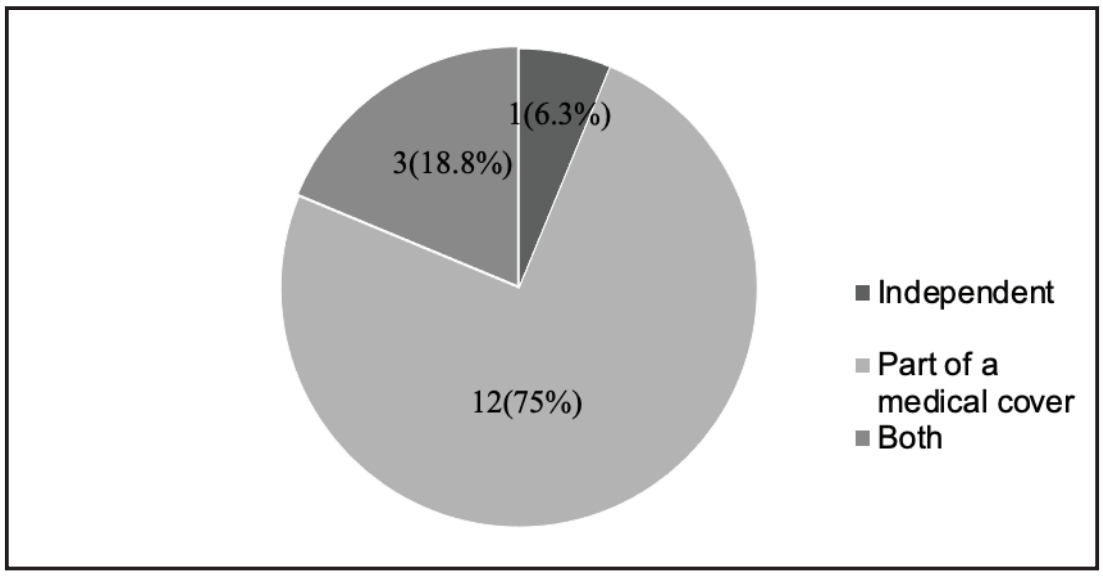

Figure 1: Distribution of companies according to whether they offer dental insurance independently or as part of a medical cover

Only one company offered dental insurance as an independent cover while the other three (18.8%), offered it either independently or as part of a medical cover depending on patient preference.

All 16 companies reported that the largest percentage of consumers for dental packages, are employers who purchase the policies for their employees.

Dental treatments/procedures covered by major health insurance companies are shown in Table 1.

Table 1: Dental procedures insured

Dental procedures	Number of companies (n)	Percentage of companies covering the procedure (%)
Surgical	16	100
Restorative	16	100
Prosthetic	6	37.5
Cosmetic	0	0
Preventive	11	68.8
Orthodontic	4	25
All procedures	0	0

Surgical and restorative procedures are covered by all the insurance companies, prosthetic procedures by 6(37.5%), preventive treatments by 11(68.8%), and orthodontic treatment by 4(25%) of the companies. Cosmetic procedures were not covered by any of the companies.

Pre-authorization is a process carried out prior to administration of treatment to a policy holder in order to pre-certify any service a policy holder is to receive. The essence is to ensure that the client does not exceed the limit provided by the policy and to ensure that the treatment proposed is included in the policy agreement. Eleven (68.8%) out of the 16 companies offering dental insurance, required policy holders to go through a pre-authorization process. Of these companies, 10 (90.9%) carried out the pre-authorization process on the same day while one (9.1%) took 1-2 days.

Five (31.3%) of the companies required members to pay a percentage of the cost of treatment while 11(68.7%) did not. The percentage of co-payment was dependent on the policy agreement.

Figure 2 shows that for more than half of the companies, it took less than two weeks to reimburse members who paid for services using 'out of pocket payment' and then submit claims for the payments made to the insurance companies.

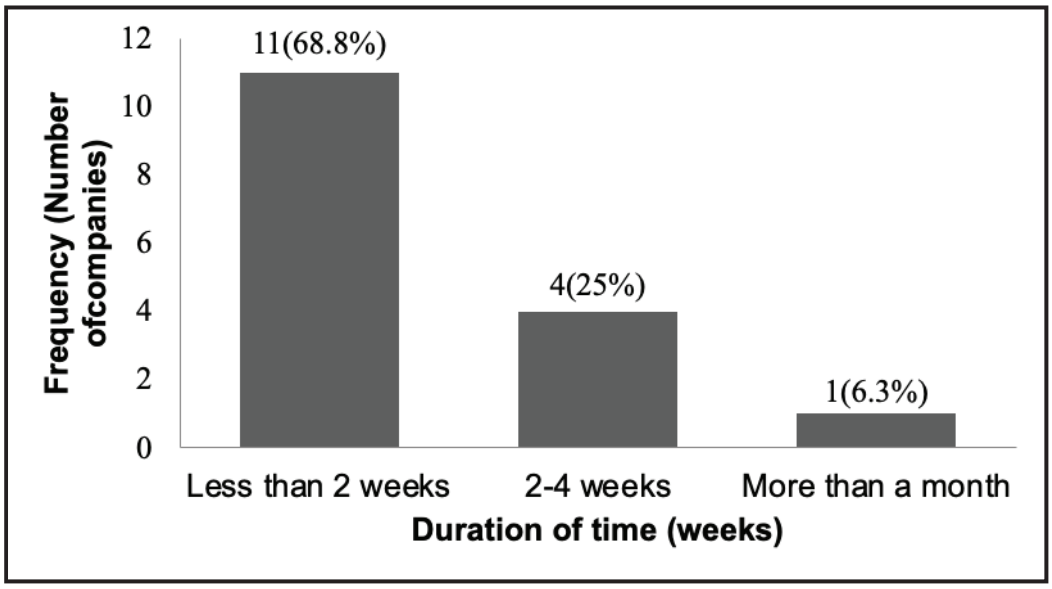

Figure 2: Duration of time taken by insurance companies to reimburse an insured member

Figure 3 illustrates that for 14 (87.5%) of the companies, it took up to two months to pay the dentists on their panel upon service delivery. Two (12.5%) companies, made payments within two to four months.

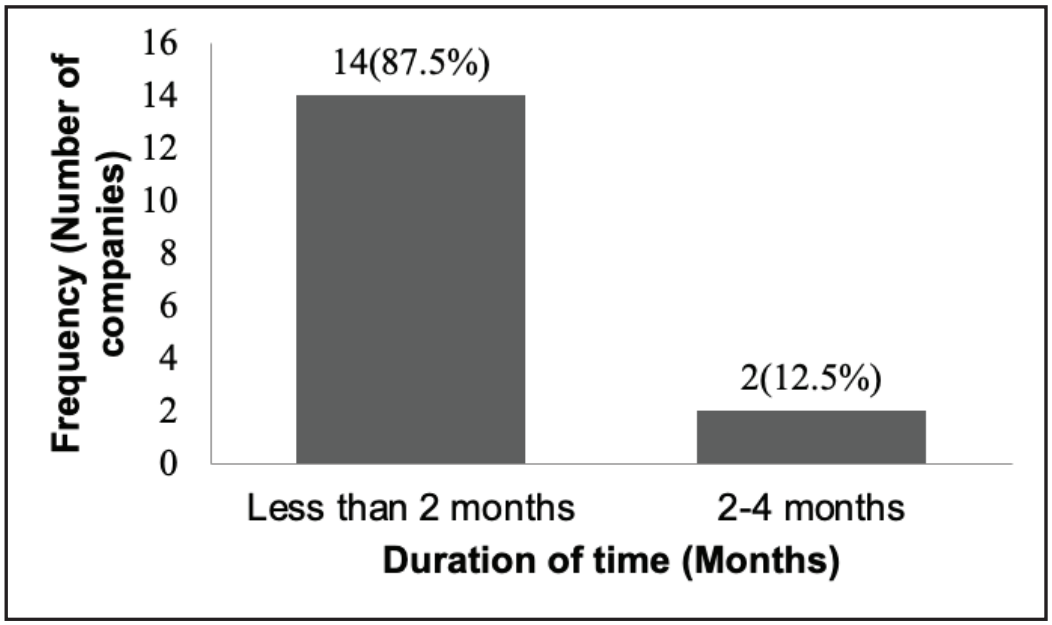

Figure 3: Duration of time taken to pay dentists upon service provision

All the insurance companies had an annual limit cap on the amount of money a policy holder can spend in a given year when receiving dental treatment. The annual limit depended on the policy agreement.

12 companies (75%), claimed that their clients were satisfied with the policies offered. Three (18.8%) viewed the policies they offer as meeting the needs of their members very well.

Seven companies (43.8%) viewed dental insurance as being profitable and 9(56.3%) viewed dental insurance as being non-profitable.

Discussion

The main objective of the study was to describe the state of the dental health insurance sector in Kenya with the aim of filling the information gap and enabling the formulation of recommendations and guidelines to inform policy changes to help improve the sector.

The ratio of public to private companies is 1:17 despite a majority of the Kenyan population being unable to afford packages offered by private companies and relying solely on packages offered by the National Health Insurance Fund which is a public company. This pattern of greater dependence by citizens on public dental insurance is quite different from certain countries of the European Union, such as Italy. However, the dominance of private insurers providing dental coverage as compared to the public insurer, seems to be similar in the two countries[8].

Sixteen of the 18 insurance companies offered dental insurance. Fifty percent of these companies had been doing so for more than 15 years. Despite this presence and ability to provide dental insurance, only 12.8% of the Kenyan population have dental insurance covers[3].

Twelve companies offered dental insurance covers as part of a medical cover. This illustrates that dental insurance and in turn oral health is not given much priority and is limited to an added benefit to medical insurance packages. The Kenya National Oral Health Survey, 2015, documented that medical insurance covers were more common among the participants at 20.6% compared to dental insurance covers including NHIF at 12.8%3. This is similarly demonstrated in India, where a study by Singh and Saxena revealed that no company exclusively covers dental insurance and for those that include it as part of a medical cover, dental treatment is limited to repair of damages incurred in accidents[9].

The largest percentage of consumers are employers who purchase insurance covers for their employees as part of an employee benefit package. Individuals possibly find the high cost of private insurance covers unaffordable.

The exception to this is the National Health Insurance Fund where anyone on a salary is mandated to make a monthly contribution to the fund through salary deductions made by the employer. The contributions made are income rated with an aim of making it affordable for the population thus increasing the number of people having some insurance cover which may lead to better health seeking behavior among them and decreasing the need for private insurance covers[10].

Restoring and maintaining oral health entails an array of procedures, some of which are not included in the insurance policies. Surgical and restorative procedures are the only treatments covered by all the insurance companies. Despite the fact that a preventive approach is less costly than curative management, preventive procedures are covered by 68.8% of the companies. This was highlighted in a survey by the FDI World Dental Federation on oral health worldwide that established that dental conditions are the fourth most expensive conditions to treat where a curative rather than preventive approach is pursued11. Prosthetic rehabilitation is covered by 37.5% of companies, orthodontic treatment by 25% and cosmetic treatment by none of the companies.

The main reasons given by the companies that do not cover prosthetic, cosmetic or orthodontic procedures was these conditions are not ailments and also are very costly. Omission of certain treatments means some of the needs patients may have cannot be met because they are considered to be only for aesthetic reasons. This is despite many of these conditions having a psychological impact on a patient and an impact on their oral health related quality of life (OHRQoL). In a review on the impact of malocclusion and its treatment, it was found

that patients with severe malocclusion have poorer OHRQoL than patients with less critical treatment needs[12].

In addition to dissatisfied patients, dental practitioners are also not satisfied with the treatment modalities covered by the insurance schemes. In a study by Lodhi T (2016), the author established that 82.3% of dentists felt that dental insurance covers did not adequately meet the needs of their patients. 76.9% of dentists were dissatisfied with the process of pre-authorization13. Thirteen of the 16 companies offering dental insurance required policy holders to go through the pre-authorization process. Eleven of these companies give the authorization within the same day while two companies take 1-2 days.

This raises an ethical question of whether it is right to keep a patient, who requires prompt treatment, waiting for a day or 2 prior to receiving treatment.
The use of biometric smart cards has been embraced by many insurance companies. These cards have many benefits one of which is shortening the duration taken for pre-authorization. They eliminate the need for writing letters or emails seeking authority to administer treatment but instead requirements are stored and managed using the card.

Eleven, (68.8%) companies took less than two weeks to reimburse policy holders who paid for dental services using 'out of pocket payment' and later sought a refund from their insurance providers. Paradoxically, it takes up to two months for 14 (87.5%) companies to pay dentists on their panel upon service delivery.

A publication by Lodhi T (2016) reports that 92.3% of dentists were dissatisfied with the duration of time taken by insurance companies to pay for services given.

Only 18.8% of the companies reported that they feel the packages they offer meet the needs of their consumers very well. A majority, (75%) feel the packages they offer are satisfactory. There is therefore room for reforms and improvements in the sector.

A barrier to this may be that a greater percentage of the companies (56.3%) view dental insurance as being non-profitable. The reasons for this include: the high cost of dental treatment, escalating health costs and lack of regulation in the health industry thus increasing dental claims some of these claims being fraudulent. This has led to some of the reasons why all 16 companies had an annual limit in place which depends on the policy agreement.

Co-payment is a requirement where the policy holder is expected to make payment of a certain percentage in order to access services. Five, (31.3%) of the insurance companies offering dental insurance require members to pay a percentage of the cost. The specific percentage depends on the policy agreement. In a study by the Research and Development Corporation (RAND) between 1971 and 1982 on cost-sharing and its effects on service use and quality of care, it was reported that cost-sharing reduced the use of health services but this did not adversely affect the patient's health[14].

Conclusions

The state of dental insurance in Kenya is marked by the following; challenges encountered by policy holders; annual limits, co-payment, delay in reimbursement of claims and preauthorization of procedures. When placed in context, these present a source of dissatisfaction for the policy holders and dental service providers alike.

Within the limits of this study findings, we recommend that insurance companies, patient representatives, dental service personnel and other health policy stakeholders be involved in the formulation of insurance guidelines in order to fulfill the needs of all stakeholders.

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Single Implant Restoration in the Aesthetic Zone: A case report

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Keywords: single implant, aesthetic zone

Abstract

Introduction: Implant-borne prosthesis have been shown to have predictable short and long-term survival rates in clinical studies. Whilst implant-borne prostheses have good survival rates, the achievement of predictable success in the aesthetic zone is complex. Proper diagnosis and treatment planning applying a multi-disciplinary approach enables the clinician to offer a predictable outcome in the aesthetic zone.
Case report: A 21-year old male patient presented with a missing 11 (FDI nomenclature) as a result of a traumatic injury two years prior to the visit. He reported poor tolerance to removable prostheses and requested for a fixed prosthesis. Examination of the patient revealed a high smile line, hard and soft-tissue deficiencies in both the horizontal and vertical dimensions in the edentulous site. He also had a midline diastema, of approximately two millimetres that he desired to maintain. The 12 (FDI nomenclature) was unrestored while 21 was minimally restored with a composite filling. According to the ITI's SAC classification tool (10), the case was classified as complex. A treatment plan that involved hard and soft tissue augmentation followed by restoration with an implant-supported single crown was selected and executed. At the definitive implant-crown delivery stage, there was a minor soft-tissue discrepancy on the distal aspect of the implant crown that was expected to fill-in with continued soft-tissue remodeling around the ceramic implant-crown.
Conclusion: Overall, the well-planned treatment using a multi-speciality team approach achieved a high pink and white aesthetic score and a satisfactory outcome for the patient.

Introduction

Missing teeth can be replaced by removable or fixed prostheses. When patients present with a single missing tooth in the aesthetic zone, and express the need to have a fixed prosthesis, the options for treatment include a resin-bonded bridge, a conventional three-unit bridge or an implant-supported single crown. The patient factors and site-specific conditions will determine the choice of treatment (1).

In patients with open interdental spaces including diastemas and one or more missing teeth to be replaced, a conventional fixed approach may not achieve optimum results and thus, an implant-supported reconstruction becomes the treatment of choice. Besides diastemata, other situations which favour the inclusion of implants in the treatment plan are: unrestored, healthy neighbouring teeth; compromised risky abutments; and extended edentulous areas where strategically important abutment teeth are missing. These criteria together with other risk factors related to the bone, soft tissue, and tooth (clinical crown) level have to be carefully evaluated and considered in the decision-making process (2).

Implant-borne prosthesis have been shown to have predictable short and long-term survival rates in clinical studies (3). Whilst implant-borne prostheses have good survival rates, the achievement of predictable success in the aesthetic zone is complex (2). The SAC classification developed by the International Team for Implantology (ITI), aids in objectively classifying implant cases depending on their difficulty index ranging from 'straightforward' (S), 'advanced'(A) to 'complex' (C) –SAC. This classification not only helps clinicians to have a check-list of items to help in treatment planning and classification, but also enables them to anticipate difficult situations and advise their patients accordingly. The advice may include management of patient expectation or a decision not to go ahead with the treatment if patient's expectations cannot be met in the face of predictable unfavourable clinical outcome (4).

The treatment planning for the implant-borne prosthesis should be "restoratively-driven". In cases where there are soft and hard tissue-deficiencies according to the pre-determined implant position, strategies aimed at improving the implant sites prior to placing the implant must be considered. These may include hard and soft tissue augmentation with different materials and techniques (5,6).

When soft tissues augmentation is planned, then it is important to use provisional restorations that do not interfere with the healing process. Essix-type retainers with tooth replacements may be used with success (7). The use of provisional crowns allows shaping of the peri- implant soft tissues (8). Once the desired soft tissue contour is achieved on the provisional crown, this is then replicated in the definitive prosthesis by copying the emergence profile (9).

Case Report

Presenting Complaint and Clinical Examination:
A 21-year old male patient presented with a missing 11 (FDI nomenclature). The patient lost the tooth as a result of trauma two years prior to the visit. He could not tolerate the partial denture that was provided. His expectation was to receive a fixed prosthesis. He also expressed the desire to retain his midline diastema. The patient was medically healthy- ASA I. He was a non-smoker.

Extra-oral examination did not reveal any abnormalities. The significant findings on smile appraisal were that the patient had a high smile line –"gummy smile". The patient exhibited adequate oral hygiene. Site-specific examination in the area of missing 11 showed hard and soft tissue deficiency in both height and width. The distal papilla was collapsed. There was an adequate (>2mm) width of keratinized tissue. The 12 was sound while the 21 was restored with a composite restoration on the distal aspect. The patient had a 2mm midline diastema (Figure 1).

Figure 1: Hard tissue deficiency visible on the buccal aspect of 11

Diagnosis and Treatment Plan
A diagnosis of missing 11 was made. The SAC classification for the surgical and restorative components of the case placed the case at complex and advanced level respectively.

The treatment objectives were to replace the missing 11 with a functional prosthesis and to improve aesthetic. The modifying factors that were considered while selecting the treatment option for providing the prosthesis were that the patient was only keen on having a fixed prosthesis and the medium sized midline diastema (2mm) that the patient was keen on retaining. The patient did not want the teeth adjacent to the gap interfered with. These conditions limited the treatment options to an implant-supported single crown.

After the initial records (study models, wax-up and plain radiographs) and evaluation, a plan of treatment that involved hard and soft tissue grafting for implant-site preparation was selected. After integration of the graft the implant placement would be done with additional simultaneous grafting done if necessary.
An interim fixed restoration would be used to shape and allow healing of the peri-implant soft tissue followed by a definitive restoration.

Clinical Procedures
An overlay autogenous bone graft harvested from the ramus of the mandible was used to augment the site and was secured in place with titanium pins (Figure 2). Eight months post operatively, a CBCT scan revealed sufficient bone healing with the graft having integrated with the native bone (Figure 3).

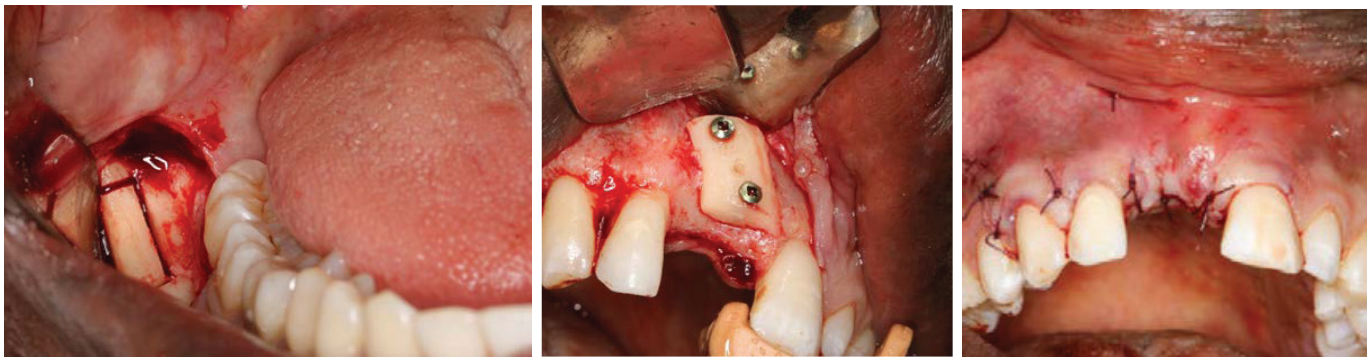


Figure 2: Hard-tissue grafting procedure using a bone block harvested from the ascending ramus

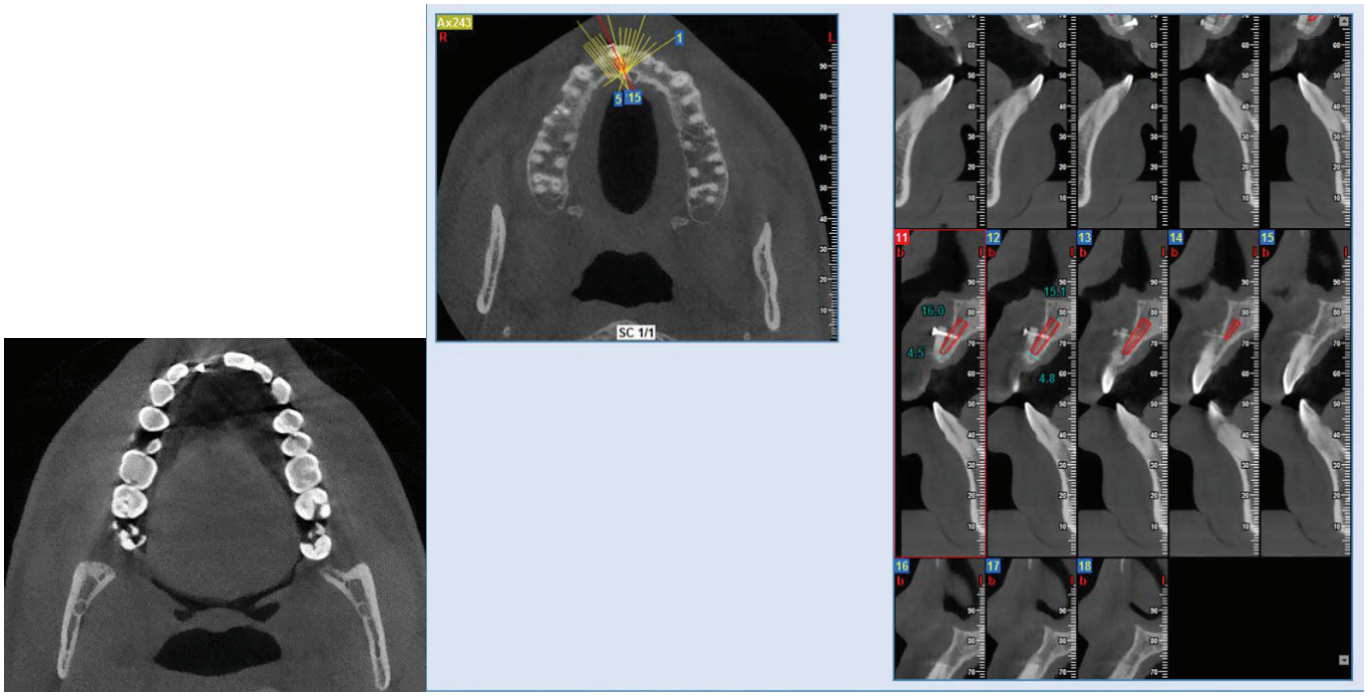


Figure 3: CBCT studies eight months after grafting for implant planning.

A connective tissue grafting procedure on the implant site was declined by the patient siting prolonged discomfort and healing duration of both the grafted and donor sites after the initial surgery. With the informed consent of the patient, this procedure was abandoned.

A 4.0 X 10 mm Dentium Superline (Dentium, America) implant, an internal-hexed, platform switched, double threaded tapered titanium implant was selected for placement. The dimensions of the implant selected were based on the bone volume available. The implant was placed using a surgical stent whose fabrication was guided by the expected final position of the restoration (Figure 4). A non-submerged healing approach was selected. A 5mm stock healing abutment was used.

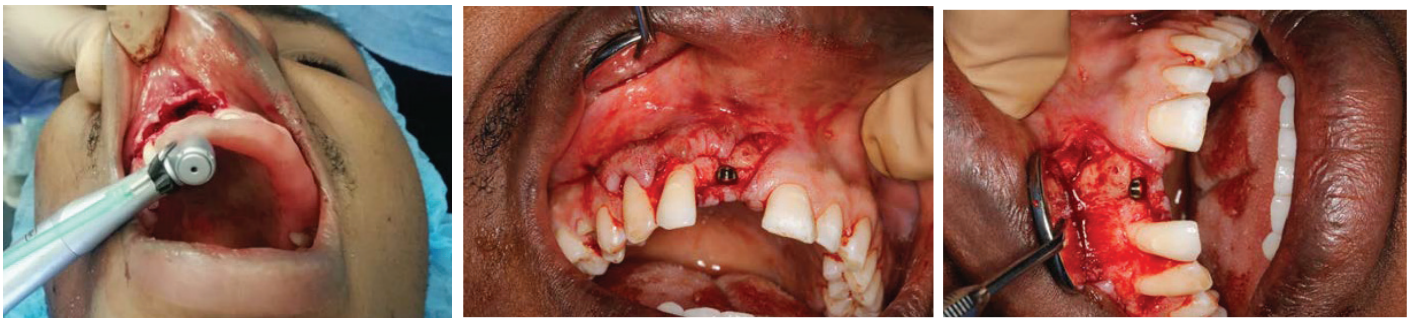


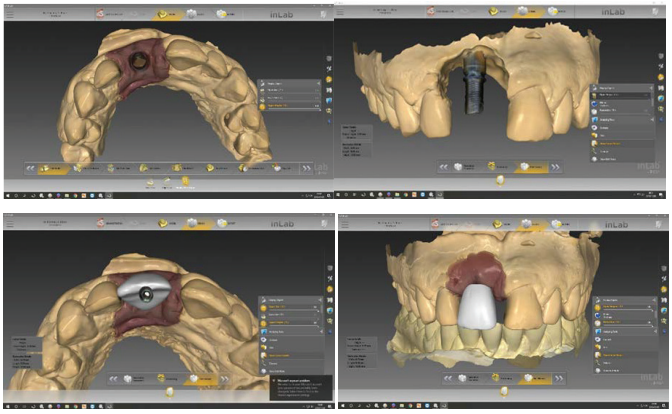
Figure 4: Implant placement surgery.

An Essix-type retainer with a pontic in 11 was used by the patient during the healing period. The prosthetic phase was started 8 weeks after the implant placement surgery. Good trans-mucosal healing was achieved (Figure 5).

Figure 5: Patient 10 weeks after surgery (trans-mucosal healing with a stock healing abutment).

An open tray impression technique was used to make the impressions for the provisional fixed implant-supported restoration.

Digitation of the models allowed the use of milled PMMA crown 11 whose design was a mirror image of 21 as a provisional crown. This was fabricated as a screw-retained prosthesis cemented onto the straight temporary titanium abutment (Figure 6).



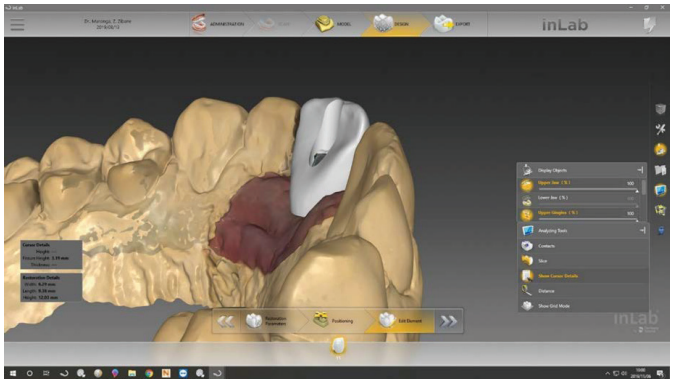


Figure 6: Digitation of the implant crown model and design in the laboratory

The provisional crown was received in the clinic and delivered after appropriate modifications using flowable composite. The modifications were done to achieve the desired soft tissue maturation of the peri-implant tissues. The emergence profile of the provisional crown was adjusted over a 6 week period and the peri-implant tissue allowed to mature (Figure 7)

Figure 7 :Maturing peri-implant tissue after 6 weeks of a fixed provisional restoration.

A final impression was done using a customized impression post to copy the emergence profile of the provisional restoration. An open impression technique was used (Figure 8).

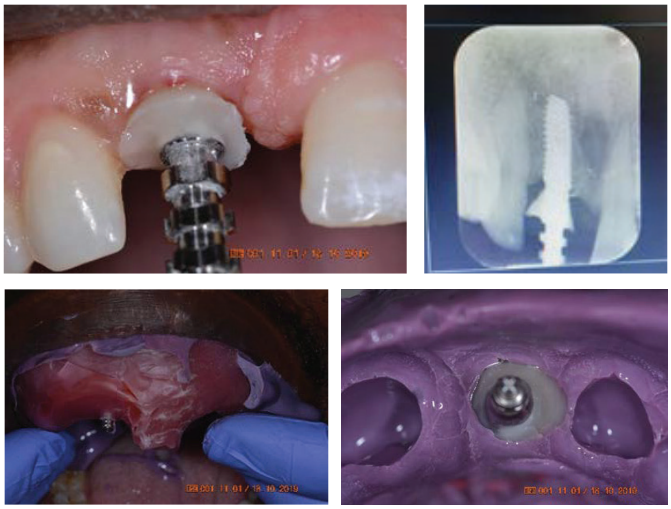


Figure 8: Final implant crown impressions.

Based on the position of the screw-access hole on the provisional restoration, an angled abutment was selected to compensate for the angulation and allow for the screw-access hole to be postioned on the palatal aspect of the prosthesis.

The completed screw- retained prosthesis, made of partial contour low-translucency zirconia cut back to allow layering of porcelain for characterization, was delivered and the screw torqued to 35 Ncm. The screw access hole was sealed with composite material (Figure 9).

Figure 9a: Smile view of the completed restoration and 9b: Intra-oral views of the completed restoration.

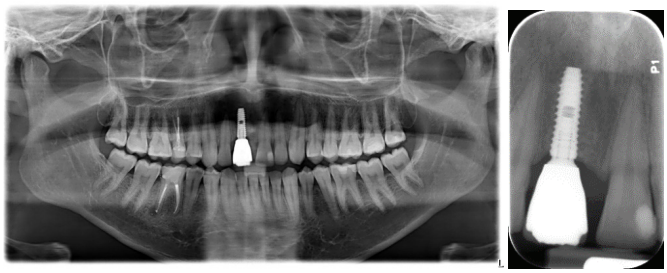


Figure 10: Radiographs of the implant restoration

Figure 11: Before and after implant placment

Discussion

A Dentium Superline implant (4.0 X 10 mm) with surface characteristics, that is –SLA-Active for improved osseointegration was selected. A trans-mucosal healing protocol was selected with a conventional loading protocol after 3 months. The decision to use conventional loading was as a result of consideration of the fact that most of the implant body was anchored in augmented bone. This protocol was selected as a safe option for a more predictable healing.

Since the patient expressed the need for a prosthesis during the healing period for social reasons, an essix-type retainer was made with a pontic on missing 11 for the patient to use as an interim restoration. Clearance was provided over the surgical site.

After provision of the provisional implant-supported crown, multiple appointmentss to shape the emergence profile and peri-implant soft tissue contour using flowable composite and selective reduction with soflex discs resulted in acceptable soft tissue contours. The contour of the papilla on the distal aspect of the implant crown improved remarkably in respect of filling the interdental space but never fully filled the space.

The final posthesis was a partial contour Zirconia that was cut-back and layered with porcelain to replicate the enamel characteristics of the contra-lateral tooth. The patient considered the crown contour and shade pleasant and was satisfied. The soft tissue contour mesially was acceptable and less than ideal distally. The gingival height buccally of the implant crown was observed to be about 0.5 -1 mm apical to that of the contra-lateral tooth. With the improved biocompatibility of ceramic materials compared to polymers, it is hoped that there will be continued improvement of the peri-implant soft tissue contour with time.

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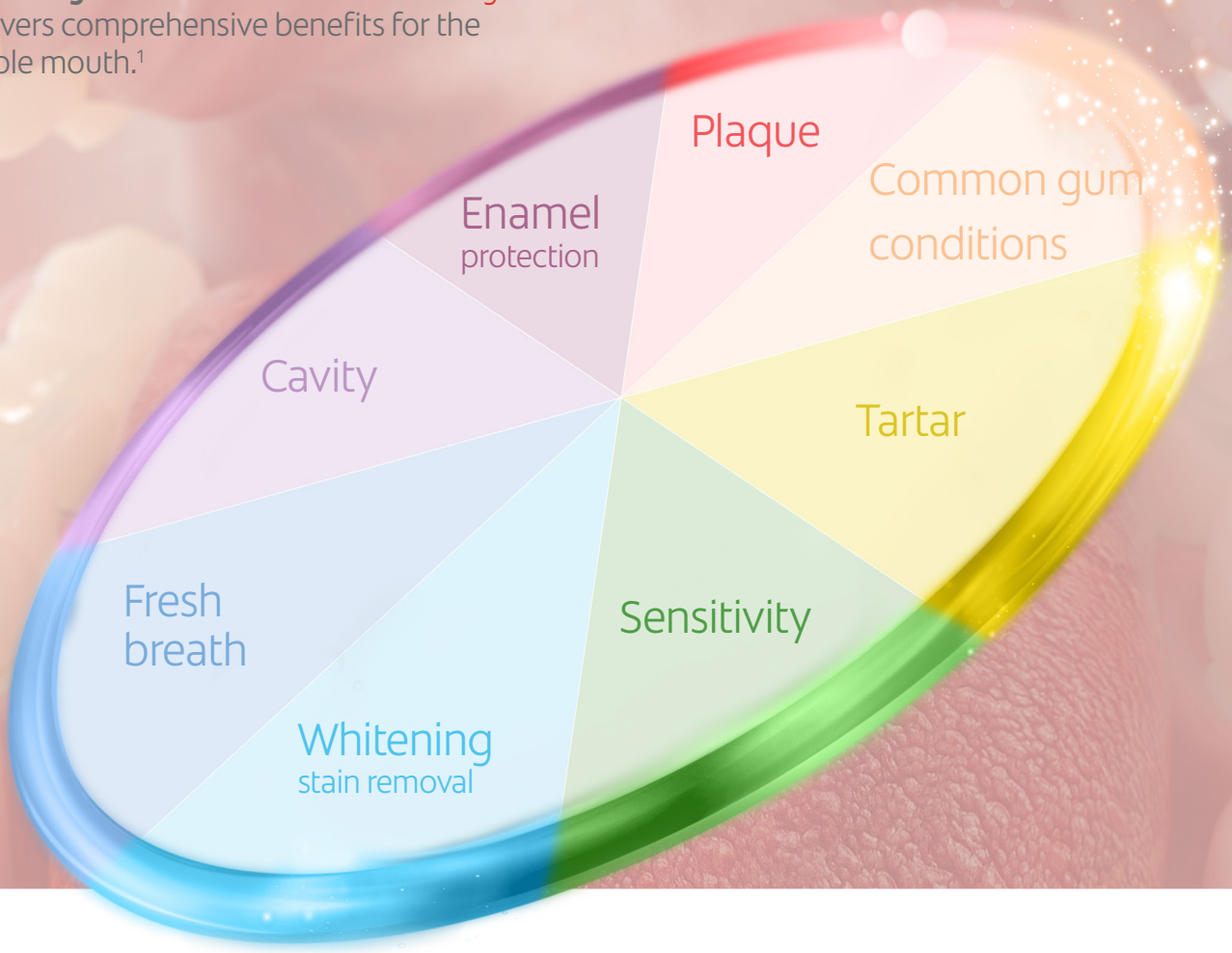

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