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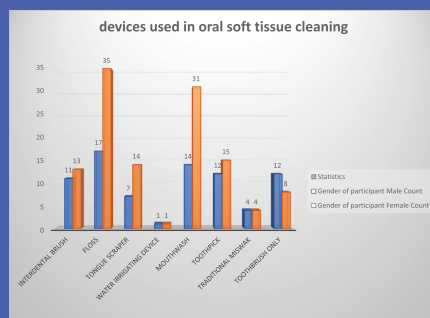
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## Editorial: The Importance of Multidisciplinary Approach to Dental Practice

Multidisciplinary approach has always been an integral part of everyday dentistry. It may either be interpreted in a very narrow sense as the actual fusion of specialties working as a single team, or in a wider sense as an interdisciplinary model in which independent specialties collaborate to resolve an oral health problem.

From a collaborative perspective, multidisciplinary dentistry should now be given priority as early as possible because of the prime importance of diagnosis, medical screening and focused management.

Multidisciplinary dentistry focuses on interaction, not only between the primary dentist and the specialists, but also between the multidisciplinary team and the patient. The ultimate goal is to create and perpetuate an ideal treatment environment in which the patient feels comfortable and dentists can work safely and effectively.

Situations in which multidisciplinary approach to dental care is crucial are numerous and varied. For example, a healthcare worker (not necessarily a Dentist) may encounter a patient with a specific need of management and may be advised to offer emergency care such as a prescription for severe pain and then refer. This scenario is encountered in very many hospitals across the country especially in rural counties because while hospitals may be busy, the dental departments are not very well equipped both in human personal or equipment. This kind of collaboration is necessary to alleviate patient suffering.

From the perspective of a normally functioning care system, where the concerns of equipment and dental personnel are not a hindrance to dental practice, dental professionals have many opportunities to collaborate either as informal or even established teams for best management outcomes. Three examples shall be given to illustrate the importance of multidisciplinary approach to dental practice.

The commonest example involves Periodontics-Restorative interrelationships where Restorative clinicians while understanding the role of biologic width in preserving healthy gingival tissues and controlling the gingival form around restorations will often refer their cases to a Periodontist to ensure

they always operate around a healthy periodontal environment.

Another area of multidisciplinary approach to dental treatment involves dealing with traumatic fractures of the anterior teeth in children which requires immediate attention not only to restore immediate function and esthetics but also because of the psychological impact it has on the patient. The treatment options offered to the patient in such a situation can vary from a simple composite build up to complex restorative intervention depending on the severity of the fracture and its extent. This example very often will require Oral Surgeon-Pediatric Dentist collaboration for ideal outcomes.

The final example and one which is all too familiar to all is the Orthodontist-General Dentist-Periodontal interrelationship. Occasionally, patients require restorative treatment before, during or after orthodontic therapy. Patients with peg-shaped lateral incisors, fractured teeth, multiple edentulous spaces, or other restorative needs may require tooth positioning that is slightly different from a normal completely dentulous dentition.

A healthy periodontium is key to successful orthodontic treatment. Movement of teeth in a diseased periodontium is disastrous and may lead very quickly to tooth loss. With proper planning, orthodontic-restorative-periodontal treatment can be utilized to create excellent outcomes that are functionally and esthetically pleasing. In this era when adult orthodontic treatment has become popular, this orthodontic-general dentist-periodontist relationship is key in ensuring the best management options for the patient.

As the practice of dentistry evolves under these challenging times, the practitioner can provide the best possible care through involvement of other team members. We live in a world where survival depends on mutual interdependence and symbiotic interaction. And the world as we know it, is changing. Information is readily available to all through the internet. Patients' will seek information before attending the dental appointment and challenge the dentist on treatment modalities. It is therefore imperative for the dentist to involve different specialists in patient management for optimum outcome.

Team work in Dentistry will be the best mantra. In the coming days, the patient will demand evidence-based, safe, holistic and multidisciplinary care from us.

**Dr T.J Ochola**

**Consultant Dental & Maxillofacial Radiologist**

# Knowledge, attitude and practices of oral soft tissue hygiene amongst students at University of Nairobi, Dental School, Kenya

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**Keywords:** oral soft tissue hygiene, knowledge, attitude, practices, students

## Abstract

**Background:** Oral soft tissue hygiene is crucial in maintaining oral health. It involves proper cleaning of oral soft tissues (in addition to cleaning the teeth) and reducing the risk factors involved in oral soft tissue disease such as tobacco, alcohol and betel nut chewing.

**Objective:** To assess the knowledge, attitude and practices of oral soft tissue hygiene amongst students in University of Nairobi, Dental School.

**Methodology:** This was a cross-sectional study carried out at the University of Nairobi, Dental School. A convenient sample of 100 participants was recruited from a total sample size of 200 students attending the University of Nairobi, Dental School. The level of knowledge, attitude and practices of oral soft tissue hygiene was assessed using a self-administered questionnaire. Good knowledge was determined by information obtained from questions that addressed the importance and benefits of oral soft tissue hygiene. Attitude was assessed by information obtained from questions dealing with the perception of oral soft tissue cleaning and its necessity. Practice was determined from information on frequency of oral soft tissue cleaning.

**Results:** A total of 100 students were issued with a questionnaire each. Of these, 61(61%) were female while 31(31%) were male, giving a ratio of 3:2. All the students that participated reported that they practiced tooth brushing. Thirty-seven (37%) of them brushed once daily while 62(62%) brushed twice daily. Only 1(1%) person brushed thrice daily. When asked if they cleaned areas of their mouth other than the teeth, 99(99%) of the students reported that they did. Of the 99 students, all of them reported cleaning the tongue, 61(61%) reported cleaning the gums and interdental areas, 22(22%) cleaned the palate and 15(15%) the cheeks. Seventy-four (74%) of the student reported they cleaned the oral soft tissues every day while 25(25%) reported occasional cleaning. Fifty-two (52%) reported using dental floss to clean oral soft tissues, 45% used mouthwash, 27% used toothpicks, 24(24%) used interdental brushes, 21 (21%) used tongue scrapers/cleaners, 2% used water irrigation devices, none used gum stimulators, 8% used traditional miswaks while 20% of the students reported only using toothbrushes when cleaning oral soft tissues. Ninety-one (91%) of the students reported that they knew the importance of oral soft tissue hygiene. When asked if they knew of any diseases or infections prevented by cleaning oral soft tissues, 81% of the students reported that they are aware while 19% reported that they did not know.

On cleaning of oral soft tissues, 70(70%) of the students reported it to be easy and comfortable, 21(21%) that it was time consuming and 8(8%) that it was painful. When asked on whether they would recommend practice of oral soft tissue cleaning, 98% of the students reported that they would and that it was necessary. Cross tabulation showed a significant association between knowledge of importance of oral soft tissue hygiene and practices of oral soft tissue cleaning  $p < 0.001$ .

**Conclusion:** Majority of the students who had knowledge on oral soft tissue hygiene also practiced good oral hygiene which includes soft tissue cleaning ( $p = 0.001$ ). Most had knowledge of the diseases/infections that can affect oral soft tissues as well as their risk factors. The devices used during oral soft tissue cleaning were floss, interdental brushes, tongue scrapers, mouthwash, water irrigating devices and traditional miswaks.

## Introduction

Oral soft tissue hygiene involves practices that aid in maintenance of oral health thus, preventing spread of diseases, mainly by eliminating some of the risk factors, in the oral soft tissues. Oral health

maintenance involves proper cleaning of the oral soft tissues using proper tools and techniques. Soft tooth brushes, tongue scrapers, interdental brushes, gum stimulators and water irrigating devices are some of the tools in use for maintenance of good



oral health. The oral cavity harbours a large number of micro-biota and thus it is important to maintain good hygiene to prevent a shift in the balance of the microorganisms from one that supports health to a disease-causing flora. Risk factors of oral diseases such as tobacco, alcohol, diet, diabetes mellitus and betel nut chewing should also be controlled so as maintain oral soft tissue hygiene. These factors contribute to many of the oral diseases manifested in the oral cavity such as necrotizing ulcerative gingivitis, melanosis, periodontitis, angular cheilitis, oral cancer and many others. In addition to oral soft tissue hygiene and minimizing exposure to risk factors, there is also a need for members of the community to visit dentists every six month so that their oral health status can be assessed and advice given accordingly.

In the world today, it is assumed that oral health only involves dental health. For example, a study done in China researching oral health knowledge, attitudes and behaviour only focussed on tooth brushing yet the research was on oral hygiene<sup>1</sup>. It is a common misconception that cleaning teeth results in a clean mouth yet there are many other surfaces in the oral cavity that require cleaning like the tongue. It is known that conditions such as halitosis may be a result of periodontitis or an unclean tongue<sup>2</sup>. It is therefore important to approach oral health in a holistic manner in order to achieve overall good oral hygiene.

As stated in the Kenya National Oral Health Survey report (2015)<sup>3</sup>, there is a high prevalence of gingival diseases among the adults' due to poor oral hygiene practices. It also reports that there is a high level of drug and substance abuse in the same population. Some of these drugs and substances are alcohol, tobacco, khat and bhang smoking which are risk factors for oral soft tissue diseases. It is imperative that the population is made aware of the importance of good oral hygiene as well as the avoidance of the risk factors of oral diseases.

The report <sup>3</sup> also states that very few people visit the dentist despite there being a high unmet treatment need. Most of the surveyed individuals reported to only visit the dentist when in pain or discomfort. This study investigated the knowledge, attitude and practices of oral soft tissue hygiene amongst students at University of Nairobi, Dental School. It

is believed that if dental students have knowledge, the correct attitude and do practice oral soft tissue hygiene, then they will pass on this information to their patients while they are still in training as well as in the future when they are qualified dentists.

## Methodology

The study was carried out in Nairobi, the Capital City of Kenya. The study center was the University of Nairobi, Dental School (UONDS). It is situated along the Argwings Kodhek road about two kilometers from the city center. The UONDS is where training for the Bachelor of Dental Surgery takes place. There are five levels of study. The students' numbers are approximately 40 at each level and thus a total of approximately 200 students. The Kish formula of sample size calculation yielded a sample of 92.

A convenience sampling method was used to recruit 100 participants aged 18 and above.

Data collection was done using self-administered close-ended questionnaires. Information collected included participants' knowledge on oral soft tissue hygiene, as well as information on the participants' attitude and practices. The collected data was analysed using the Statistical Package for Social Sciences (SPSS Statistic 24.0) and excel program from Microsoft (Windows 10).

Ethical approval number UP896/11/2019 was obtained from Kenyatta National Hospital and University of Nairobi Ethics and Research Committee (KNH-ERC). Prior to the study, The Dean of the School gave approval for the study to take place, participants gave signed informed consent. Participants were allowed to withdraw from the study at any stage. The data was collected anonymously for confidentiality. Only serial numbers were used for identification purposes. The study did not have any social bias for example age, gender, race, ethnicity or religion.

## Results

One hundred students, 108% of the calculated sample size of 92 students, were issued with a questionnaire to assess their knowledge, attitude and practices of oral soft tissue hygiene. Of these, 61(61%) were female while 31(31%) were male, giving a ratio of 3:2. The age of the participants ranged from 18 to

25 years with the modal age being 20 years overall. The mean age was  $21.4 \pm 2.04$  years. The modal age for females was 23 years while in males, it was 20 years. Females were more than males in all age

groups except the 20 years age group. These figures were not statistically significant. ( $p=0.952$ ,  $t = -0.06$ ) (table 1)

Table 1. Distribution of participants by age and gender

Age of participants	Male	Female	Total
18 years	2	7	9
19 years	6	6	12
20 years	10	8	18
21 years	2	9	11
22 years	5	9	14
23 years	6	11	17
24 years	6	9	15
25 years	2	2	4
<b>Total</b>	<b>39</b>	<b>61</b>	<b>100</b>

$t$  value = -0.06  
df = 98  
 $p$  value = 0.952

All the students that participated reported that they practiced tooth brushing. 37(37%) students brushed once daily while 62(62%) students brushed twice daily. Only 1(1%) student brushed thrice daily.

In terms of cleaning areas of the mouth other than the teeth, 99(99%) students reported that they did

while only one (1%) reported otherwise. Of the 99 students, all of them cleaned the tongue, 22(22%) cleaned the palate, 15(15%) cleaning the cheeks while 61(61%) reported cleaning the gums and interdental areas (Table 2).

Table 2. Oral soft tissues cleaned by the participants

Gender	Tongue	Palate	Cheek	Gums and interdental areas	Total
<b>Male</b>	38	7	5	18	38
<b>Female</b>	61	15	10	42	61
<b>Total</b>	99	22	15	60	99

Most of the students 74(74%) reported that they clean every day while 25(25%) of the students reported occasional cleaning. Only 1(1%) student, who had already reported that they do not clean oral soft tissues, reported that cleaning devices are costly thus unable to practice oral soft tissue hygiene.

The tools that were used to clean soft tissues were; 52(52%) students used dental floss, 45(45%) used mouthwash, 27(27%) used toothpicks, 24(24%) reported using interdental brushes, 21(21%) used tongue scrapers/cleaners, 20(20%) reported using toothbrushes, 8(8%) used traditional miswaks and 2(2%) used water irrigation devices. None of the students used gum stimulators (Figure 1).

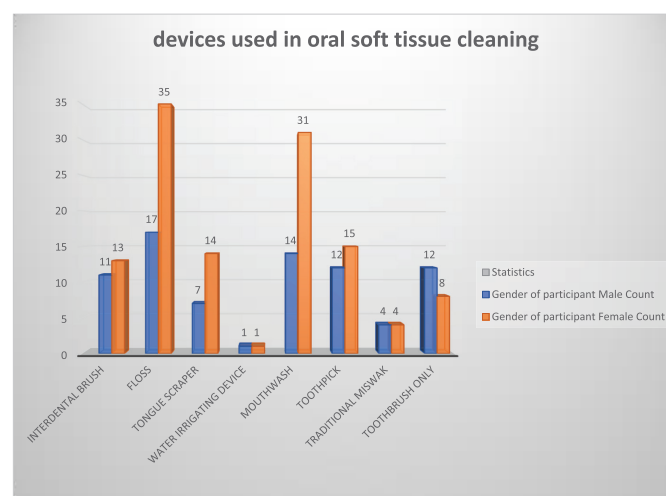


Fig 1. Devices used by the participants

Ninety-one (91%) students reported that they knew the importance of oral soft tissue hygiene while 4(4%) of the students reported they did not. 5(5%) of the students were not sure. Of the 91 students who are aware, 30(32.97%) of them claimed their source was from a dentist, 23(25.27%) claimed it was from the media, 23(25.27%) claimed they read the information from books and pamphlets while 70(76.92%) of them reported to have learnt the information in dental school. Other unspecified responses 3(3.3%) were information was obtained from parents, community or self.

When asked if they knew of any diseases or infections prevented by cleaning oral soft tissues, 81(81%) students reported that they are aware while 19(19%) reported that they did not know. Those who were aware gave examples such as gingivitis and periodontitis.

When asked whether they were aware of risk factors that make one susceptible to oral soft tissue diseases, 65(65%) students reported they were aware while 35(35%) students reported otherwise. Examples of risk factors given by the students who were aware include poor oral hygiene, diabetes mellitus, cariogenic diets, immunodeficiency and nutritional deficits.

Experiences on cleaning oral soft tissues were varied with 8(8%) students reported that it was a painful experience while 21(21%) students reported that it was time consuming. However, 70(70%) students reported that it is easy and comfortable while the remaining student one (1%) gave an unspecified response stating that it was okay.

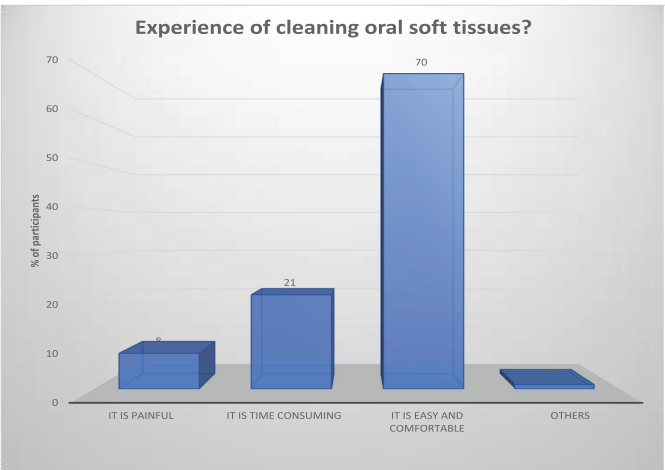


Fig 2. Participants’ experience of oral soft tissue cleaning

Most students 98(98%) reported that they would recommend soft tissue cleaning to others while 2(2%) students reported otherwise. Majority of the students, 99(99%) said that it was necessary to clean the oral soft tissues and only one (1%) reported otherwise. Regarding who should spearhead the awareness creation, amongst those who said it is necessary, 39(39.39%) students thought dentists should carry out the awareness creation, 24(24.24%) students said it’s the community health providers, 8(8.08%) students said it’s the manufacturers through media while 28(28.28%) students gave unspecified responses such as anyone who has knowledge on oral soft tissue hygiene.

Cross tabulation done showed that there was a significant association  $p<0.001$  present in those with knowledge of the importance of oral soft tissue hygiene and practices of oral soft tissue cleaning as shown in table 3.

**Table 3. Relationship between knowledge of importance of soft tissue hygiene and practices of oral soft tissue hygiene**

Participants’ knowledge of importance of oral soft tissue hygiene	Participants’ practices of oral soft tissue cleaning			
		Yes	No	Total
	Yes	91	0	91
	No	3	1	4
	Maybe	5	0	5
Total		99	1	100

X2 = 24.242  
P value = < 0.001  
df = 2



Knowledge of importance of oral soft tissue hygiene and the experience of oral soft tissue cleaning were compared and the results showed that there was no

association between the two variables as shown in table 4.

**Table 4. Relationship between knowledge of importance of soft tissue hygiene and participants' experience**

participants' knowledge on importance of oral soft tissue hygiene	Experience of cleaning oral soft tissues					
		It is painful	It is time consuming	It is easy and comfortable	others	Total
	Yes	7	20	63	1	91
	No	1	1	2	0	4
	Maybe	0	0	5	0	5
	Total	8	21	70	1	100

$X^2 = 3.956$   
P value = 0.683  
df = 6

Cross tabulation done of knowledge of importance of oral soft tissue hygiene and participants' recommendation of oral soft tissue hygiene to others

showed that there was no association between the two variables as shown in table 8 below.

**Table 5. Relationship between knowledge on importance of oral soft tissue hygiene and recommendation to others**

participants' knowledge on importance of oral soft tissue hygiene	Recommendation of oral soft tissue hygiene to others			
		Yes	No	Total
	Yes	89	2	91
	No	4	0	4
	Maybe	5	0	5
	Total	98	2	100

$X^2 = 0.202$   
P value = 0.904  
df = 2

## Discussion

In this study, females were more than males with a female to male ratio of 3:2. This was different from a similar study conducted in India<sup>4</sup> where the ratio of males to females was 4: 2. Another study conducted in University of Nairobi<sup>5</sup> had similar results with a female to male ratio of 3:2. This similar trend in Kenya is attributed to the fact that there are more females than males studying to become dentists at the University of Nairobi Dental School.

Regarding oral hygiene practices, all participants practiced tooth brushing, a confirmation that tooth brushing is the most common basic oral hygiene practice among the Kenyan population, even according to the Kenyan National Oral Health Survey 2015<sup>3</sup>. Contrary to the findings of the Oral Health Survey where majority of the Kenyan participants brushed once daily<sup>3</sup>, more than 62% of the students comply with the recommended brushing frequency

of at least twice daily. Ninety-nine (99%) participants reported to practice oral soft tissue hygiene, with 75% of them reporting doing so on a daily basis. Most of the participants claimed that they cleaned the tongue and interdental areas while less than 25% clean the cheeks and palate. Floss and mouthwash are the devices used by most of the participants that practice oral soft tissue cleaning while 20% of the students use the conventional toothbrush for cleaning the soft tissues.

A similar study conducted in India<sup>4</sup> showed conflicting results as it reported that only 20% of the participants use interdental aids. Most students who participated in the study practice good oral hygiene due to the knowledge and exposure they acquired while learning in lectures and clinical sessions in dental school.

With regard to importance of oral soft tissue hygiene, 91% of the participants reported to be aware. 81%

reported to be aware of diseases and infections prevented by maintaining good oral soft tissue hygiene while giving examples such as gingivitis and periodontitis. 65% reported to have knowledge on risk factors that make one susceptible to oral soft tissue diseases such as diabetes mellitus, cariogenic diets, immunosuppression, and nutritional deficits, which correspond to examples given in previous research <sup>6,7,8</sup>.

There were conflicting results in a similar study conducted in India<sup>4</sup> which reported that 56.8% of the participants did not have any idea that there may be a relationship between oral health and systemic health. Most participants have good knowledge of oral soft tissue hygiene as well as the diseases and the risk factors associated with it. The main source of awareness for the participants was learning in dental school. Dentists, electronic media and books (and pamphlets) were also major sources of awareness.

Regarding their attitude towards oral soft tissue cleaning, 70% of the students described it as easy and comfortable. 8% reported that it was a painful experience, indicating improper techniques were probably employed by the participants. Thus, proper use of the tools, instructions and skills training should be offered when education is being given on oral soft tissue hygiene. Ninety-eight percent (98%) of the participants reported that they would recommend oral soft tissue hygiene to other people in the community. The main reasons being to prevent infections and halitosis as well as to instill confidence in individuals.

Ninety-nine percent (99%) of the students believe that awareness should be created and should be done by dentists during clinical visits, community health workers and manufacturers of dental product through media and instructional pamphlets. These results conflict with a study done in the USA concerning oral health and diabetics<sup>9</sup>, which showed that there was poor attitude towards oral health with 51% of the participants reporting that care of their oral hygiene was not as important as their medical health. The participants of the current study have good attitude towards oral soft tissue hygiene mainly because of their exposure and learning in dental school.

With regard to relationship between knowledge and practices of oral soft tissue hygiene, cross tabulation

was done and an association found between the two. Since most students in University of Nairobi Dental School are knowledgeable in oral soft tissue hygiene, it was not surprising to discover that most of them also practice oral soft tissue hygiene.

Cross tabulation was done to find if there is a relationship between knowledge and experience of oral soft tissue cleaning. There was no association between the two variables. Cross tabulation between knowledge of oral soft tissue hygiene and recommendation of oral soft tissue hygiene to others also yielded the same results. This might be due to the fact that different individuals have different perceptions of oral soft tissue hygiene regardless of the level of knowledge.

## Conclusion

All the participants practice tooth brushing with most of them doing it at least twice a day. Ninety-nine percent (99%) of Kenyan Dental students practice oral soft tissue cleaning, most of them doing it on a daily basis, using various oral soft tissue cleaning devices such as floss, interdental brushes, water irrigating devices and traditional miswaks.

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# Gingival enlargement amongst high school students in Makueni County, Eastern Kenya

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**Keywords:** gingival enlargement, high school students, teenagers

## Abstract

**Background:** Several studies have demonstrated that inflammatory gingival enlargement (GE) is common and affects different populations. Gingival enlargement could be attributed to effects of plaque, atmospheric air, suppurative infections, hormones, and some medications. It is therefore important to identify gingival enlargement in different situations/populations to identify the associated risk factors that can then be addressed.

**Objective:** This study was carried out to determine the prevalence of inflammatory gingival enlargement amongst teenagers in two rural secondary schools in Eastern Kenya.

**Methodology:** 218 students aged between 11 to 19 years and comprising of 106(48.6%) males and 112(51.4%) females were recruited from two rural secondary schools in Makueni County East of Kenya. Bio-data was obtained using an examiner administered questionnaire and examination was done under natural light by the Principal investigator (KEW) after obtaining informed consent from the students, the Principals of the two Schools and their parents. Presence or absence of plaque and calculus was recorded. Gingival enlargement (GE) was recorded according to Bokenkamp 1994 index<sup>3</sup>. Plaque and calculus were recorded after visual examination and only presence or absence noted.

**Results:** 218 students were examined and the male to female ratio was 1:1.06. The prevalence of gingival enlargement amongst the 218 recruited pubertal students was 141(64.7%) and they either had generalized or localized gingival enlargements. Generalized enlargements was more common with 95(43.6%) of them exhibiting it. Majority of the enlargements were marginal, 125(57.3%), 89(40.8%) were papillary and 38(17.4%) were diffuse. Sixty-two, 62(65.3%). of those with generalized enlargements had a grade 2 severity while 33(43.7%) had grade 1 severity.

One hundred and eighteen, (54.1%) students had dental plaque, while 100(45.9%) did not have visible plaque. 22(10.1%) had visible supragingival calculus while 196(89.9%) did not have calculus. With regards to plaque assessment, the 118(54.2%) students who had plaque, 74(62.7%) had generalized enlargement while 35(29.7%) had localized enlargement. Eight, 8(6.8%), of the students with plaque did not show signs of gingival enlargement. Those with plaque presented with 56(47.5%) having grade 2 severity and 54(45.8%) with grade 1. Of the 100(45.9%) students who did not have plaque, 18(18%) had grade 1 enlargements and 15(15%) had grade 2 enlargements. Chi square test to investigate the correlation between plaque and GE severity, showed that there was a significant association between plaque and the degree of GE ( $\chi^2 = 87.198$ ,  $df = 2$ ,  $p = 0.001$ ).

**Conclusion:** The prevalence of gingival enlargement (GE) among the rural high school students examined was 64.7%. Plaque appears to significantly ( $p=0.001$ ) increase the extent and severity of gingival enlargement.

## Introduction:

Gingival enlargement is the increase in size of the gingiva. It is also referred to as gingival overgrowth or gingival hyperplasia. It could be inflammatory in nature, hereditary or due to nutritional deficiencies. The inflammatory type is common in teenagers aged between 11 and 19 years and is attributed to the circulating sex hormones<sup>1</sup>. Gingival enlargement can be classified according to location and distribution. It is considered to be localized, when limited to the adjacent single tooth or group of teeth;

generalized, when involving the gingiva throughout the mouth; marginal, confined to the marginal gingiva; papillary, confined to the interdental papilla; diffuse, when it involves the marginal, attached and papillary gingivae and discrete, when it is an isolated sessile or pedunculated tumor-like enlargement<sup>2</sup>. The degree of gingival enlargement can be scored according to Bokenkamp (1994)<sup>3</sup> as grade 0, with no signs of overgrowth; grade 1, enlargement of the interdental papilla; grade 2, involving both the papilla and marginal gingiva and grade 3 where the

enlarged gingiva covers three quarters or more of the tooth crown<sup>4</sup>.

Inflammatory gingival enlargement can either be chronic or acute. Chronic inflammatory enlargement is characterized by a bulge around the tooth/teeth. The enlargement increases to cover the crown either on one tooth (localized) or the whole mouth (generalized). It is slow in progression and painless, unless complicated by bacterial infection or trauma.

Prolonged exposure to dental plaque, as a result of poor oral hygiene, irritation of the gingival tissues by anatomic abnormalities, irritation by improper restorations and orthodontic appliances, are some of the associated risk factors of chronic inflammatory enlargement. However, mouth breathers and those with incompetent lips suffer from gingivitis and chronic inflammatory enlargement due to irritation from surface dehydration<sup>5,6</sup>. Acute inflammatory enlargements, include gingival abscesses, which are localized, painful, rapidly expanding and of sudden onset. The adjacent teeth are also affected and become sensitive to percussion<sup>7</sup>.

Gingival enlargement is also associated with systemic conditions such as hormonal changes during puberty and pregnancy, nutritional deficiencies mainly vitamin C deficiency and allergies<sup>7,8</sup>. The hormones seen in puberty and pregnancy act as growth hormones on the gingival tissue receptors leading to gingival hyperplasia<sup>7,8</sup>.

Systemic diseases such as leukemia, granulomatous diseases (Wegener's granulomatosis and sarcoidosis) also cause gingival enlargement<sup>9</sup>. Neoplastic gingival enlargement, benign or malignant account for a small proportion of gingival enlargement cases<sup>9,10</sup>. Idiopathic fibromatosis, presenting with gingival overgrowth is a rare condition of undetermined cause but some cases are associated with heredity and mechanism is unknown<sup>11,12,13</sup>.

Enlargement of gingiva is widely seen at puberty. It occurs both in male and female adolescents and appears to favor areas of plaque accumulation. Pubertal and pregnancy gingival enlargement are associated with the increased in circulating sex steroid hormones. These hormones act as growth factors and amplify the effect of inflammatory mediators in response to plaque accumulation<sup>14</sup>. The size of the gingival enlargement may reduce after

puberty but does not disappear until adequate plaque removal is achieved<sup>15</sup>.

The surge of progesterone and estrogen in blood during puberty and pregnancy causes a shift in the microbial flora in the oral environment from a normal flora to a more virulent and destructive or pathogenic one. *Prevotella Intermedia* has been shown in research to correlate to progesterone and estrogen levels in the blood<sup>16</sup>. This gram-negative bacterium is associated with virulent factors (exotoxins and endotoxins).

The body's immune system responds to this bacterium by induction of inflammation of the gingival tissues and exacerbation of the inflammatory response leading to an overgrowth<sup>15</sup>. A longitudinal study of children, showed a high initial prevalence of gingival enlargement that tended to decline with age<sup>17</sup>.

The current study investigated the prevalence of gingival enlargement in a group of teenagers in two rural high schools in Eastern Kenya.

## Materials and methods.

This was a cross sectional study carried out in two rural secondary schools in Makueni County, situated along Nairobi-Mombasa road in Eastern Kenya.

The objective of this study was to determine the prevalence and associated risk factors of gingival enlargement among secondary school students aged 11 to 19 years at Kitonguni and Kiketi high schools in Makueni County, Eastern Kenya. The Kish formula for sample size determination was used and the sample size obtained was 218. A convenient sample of 218 students from the two schools (109 students per school) were recruited to participate in the study.

Bio-data was obtained using an examiner administered questionnaire and examination was done under natural light by the Principal investigator (KEW). The investigator (KEW) was calibrated by a periodontist (WV). Intra-examiner variability was assessed and was found acceptable. An assistant was available to record findings. A set of disposable gloves, masks and tongue depressors were used for each individual student examined and disposed of to prevent cross infection. The gingival size was scored according to Bokenkamp 1994 index<sup>3</sup>. The



oral hygiene practices and medical history (to rule out underlying conditions that may predispose to gingival enlargement like granulomatous diseases, leukemia and neoplasia) were recorded. Plaque and calculus were scored as either present or absent on visual examination. All information was recorded on a designed form.

Ethical approval was given by Kenyatta National Hospital/University of Nairobi (KNH/UON) Ethics, Research and Standards committee. The Schools' board of governors, students' parents also gave consent and finally each student gave informed consent before commencement of the study. Confidentiality of each participant's information was ensured. Collected data was analyzed using SPSS version 17.0 and Microsoft excel 2010.

## Results

The total number of students in the study were 218. Out of these, 106(48.6%) were males and 112(51.4%) were females a ratio of 1:1.06

All the 218 students reported brushing their teeth, 59(27.1%) brushed their teeth once a day, 139(63.8%) brushed twice while 20(9.2%) brushed thrice. Two hundred and fifteen students (98.6%) reported brushing their teeth in the morning of whom 43(19.7%) brushed before breakfast and 172(78.9%) brushed after breakfast. 3(1.4%) students did not brush in the morning.

A total of 28(12.8%) students brushed their teeth at lunch time of whom 1(0.5%) brushed before the meal and 27(12.4%) brushed after the lunchtime meal. The majority, 190(87.2%) did not brush their teeth at lunch time. Students who brushed in the evening were 152(69.7%) and this was done after supper before going to bed. 66(30.3%) students did not brush in evening (table 1).

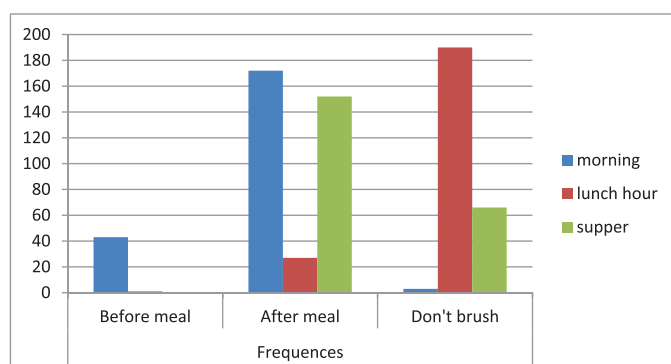


Figure 1: Frequency of tooth brushing

Presence of plaque and calculus were assessed without using disclosing agents. 118(54.1%) students had dental plaque, while 100(45.9%) did not have plaque. 22(10.1%) had visible supragingival calculus while 196(89.9%) did not have calculus.

None of the 218(100%) students reported any medical conditions and none of them used any medications. The medications of interest were those used to treat hypertension, epilepsy or immunosuppression. None of them reported ever being diagnosed with leukemia. None of the female students reported to be pregnant. The 218(100%) students were in their puberty (teenage) years.

The prevalence of gingival enlargement among the pubertal students was 141(64.7%) amongst the 218 recruited and they either had generalized or localized gingival enlargements. Generalized enlargements was more common with 95(43.6%) of them exhibiting it. Majority of the enlargements were marginal, 125(57.3%), 89(40.8%) were papillary and 38(17.4%) were diffuse (figure 1). Sixty-two, 62(65.3%), of those with generalized enlargements had a grade 2 severity while 33(43.7%) had grade 1 severity (figure 2).

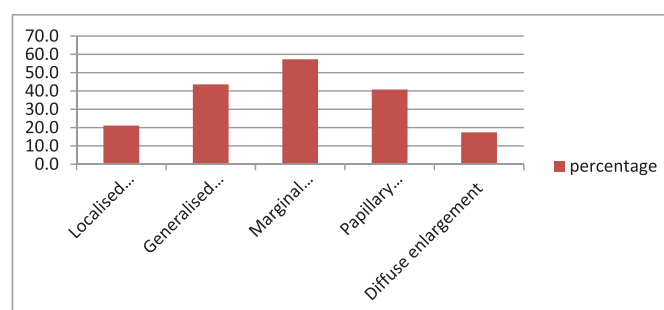


Figure 2: Distribution of Gingival Enlargement

With regards to plaque assessment, 118(54.2%) teenagers had plaque, of whom 74(62.7%) had generalized enlargement while 35(29.7%) had localized enlargement. Eight, 8(6.8%), of the students with plaque did not show signs of gingival enlargement. Those with plaque presented with 56(47.5%) having grade 2 severity and 54(45.8%) with grade 1 (Figure 3). Chi square test to investigate the correlation between plaque and GE severity, showed that there was a significant association between plaque and the degree of GE ( $\chi^2 = 87.198$ ,  $df = 2$ ,  $p = 0.001$ ).

Of the 100(45.9%) students who did not have plaque, 18(18%) had grade 1 enlargements and 15(15%) had grade 2 enlargements.

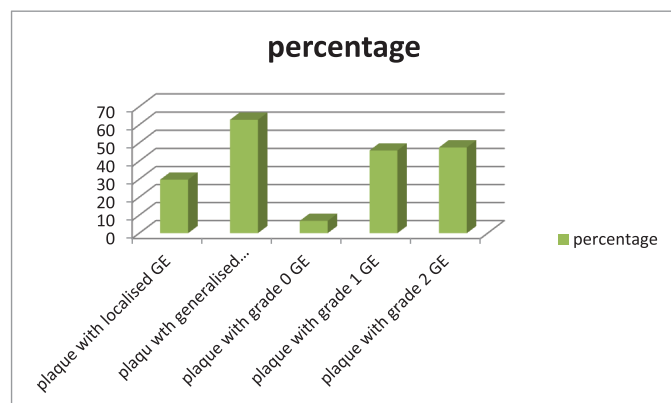


Figure 3: Plaque and distribution of Gingival Enlargement

Of the 22 teenagers with calculus, 9(40.9%) had grade 1 Gingival Enlargement while 12(54.5%) had grade 2 (figure 4).

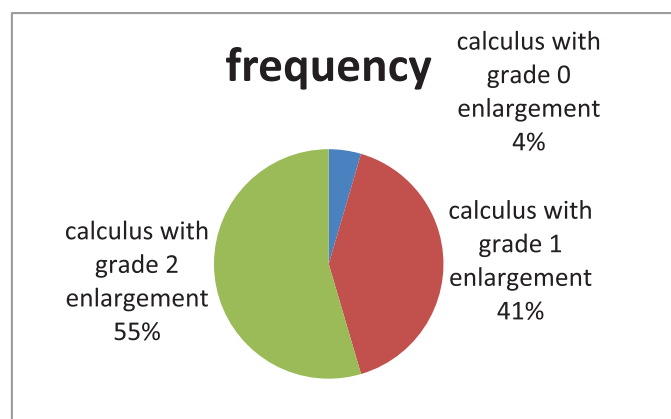


Figure 4: Calculus and distribution of Gingival Enlargement

## Discussion:

The results of the study show that the prevalence of inflammatory Gingival enlargement (GE) amongst this group of rural pubertal students was 141(64.7%). This compares with a study by Sutcliffe (1972)<sup>18</sup> where they reported a prevalence of 65.8% at the peak of gingivitis experience in 11 to 17-year-old teenagers. The comparison of the study by Sutcliffe and the current study is possible since both were carried out on gingival inflammatory changes in teenagers. The current study refers to the pubertal inflammation as GE while the other study referring to the inflammation as gingivitis. In the current study, the pubertal students either had generalized

or localized gingival enlargements. Generalized enlargements were dominant, 95(43.6%). Majority of the enlargements were marginal, 125(57.3%), 89(40.8%) were papillary and 38(17.4%) were diffuse. 62(65.3%) of the generalized enlargements had grade 2 severity while 33(43.7%) had grade 1 severity. None of them reported any medical condition, none were on any medication and none reported to being pregnant.

With regards to plaque deposits, 118(54.2%) teenagers had plaque, of whom 74(62.7%) had generalized enlargement while 35(29.7%) had localized enlargement. Plaque seemed to aggravate the condition of GE with 56(47.5%) presenting with grade 2 severity and 54(45.8%) with grade 1. Chi square test to investigate the correlation between plaque and GE severity, showed that there was a significant association between plaque and the degree of GE ( $\chi^2 = 87.198$ ,  $df = 2$ ,  $p = 0.001$ ).

This finding compares well with the study by Sutcliffe (1972)<sup>18</sup> where they reported a close relationship between the mean number of inflamed sites to the proportion of children with dirty teeth. In 1994, Nakagawa et al<sup>19</sup> showed a proportional increase in inflammation in relation to *P. intermedia* and *P. nigrescens* at puberty and suggested that it was hormonal related. The increase in the later mentioned bacteria could be correlated to an increase in plaque. In the current study, individual plaque bacteria were not identified but plaque was correlated to GE.

Of the 22 teenagers with calculus, 9(40.9%) had grade 1 GE while 12(54.5%) had grade 2 GE. The findings above are consistent with the study by Eleni, Boura and Tsalikis et al, 2009<sup>14</sup> who concluded that pubertal GE occurred due to growth-hormone like steroid sex hormones which amplify the effect of inflammatory mediators in response to plaque.

However, some students presented with enlargements in the absence of plaque. Thus, showing that the sex hormones have an independent contribution to GE as well. In a review by Murakami et al 2018<sup>20</sup>, it was reported that the steroid sex hormones have a transient effect on the periodontium without a concomitant increase in plaque. Therefore, a small amount of plaque could produce an exaggerated gingival response.

## Conclusion:

The prevalence of inflammatory gingival enlargement among the rural teenagers examined was 64.7%. Plaque appears to increase the extent and severity of GE ( $\chi^2=87.198$ ,  $df=2$ ,  $p=0.001$ ).

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## Abstract

**Background:** This case report describes the benefits of a multi-disciplinary approach to the consultation and management of an orthodontic patient. The patient presented to the restorative dentist with a complaint of a discolored upper front tooth and a gap in the lower front teeth that adversely affected her confidence and she developed a habit of covering her mouth when she spoke or smiled.

**Case Report:** The examination revealed a 36-year-old working mother of three with a missing lower left central incisor, discolored upper right central incisor and visible moderate to severe crowding. There was no known history of trauma or of endodontic treatment on the discolored incisor. The plaque control was relatively good with a clinically healthy gingiva with very mild recession around the upper first premolars and the lower left first premolar. There were no carious teeth confirmed by radiographs. Lateral Cephalogram and Orthopantomogram radiographs were used to aid diagnosis of Class II division 2 incisor relationship on a mild Class II skeletal base.

**Management:** A multi-disciplinary consultation was done including a periodontist, a restorative dentist and an orthodontist. A treatment plan was agreed upon which proposed periodontal treatment, followed by orthodontic treatment, then finally endodontic treatment and bleaching/veneer/crown of the discolored central incisor. The treatment began with periodontal therapy including diet counselling and correct brushing technique, followed by orthodontic treatment and an agreement that any restorative work would be delayed until after orthodontic treatment.

Orthodontic treatment using ceramic upper & lower fixed appliances and Class II mechanics over a 16-month period resulted in satisfactory aesthetic improvement. The patient did not require any restorative treatment and retained her natural dentition without the burden of extractions and veneers or crowns. The recession observed was very mild on the left first premolars upper and lower. On the right side, orthodontic treatment had resolved the recession. With correct brushing technique and regular periodontal follow up, the mild recession on the left side would be monitored as progression was not likely to happen since the correct brushing technique had been adopted by the patient. Her confidence was bolstered and she was pleased with the outcome of treatment.

**Conclusion:** This case report illustrates how important it is to have a multidisciplinary approach in patient management. The need for a veneer/crown on the discolored incisor was not necessary and some resolution of the gingival recession was observed after orthodontic treatment.

## Introduction

Highly motivated patients are keen to have an aesthetically pleasing smile. A multi-disciplinary approach offers the patient the best outcome with the risk of dental caries and other dental diseases successfully managed prior to aesthetic improvements being carried out.

A comprehensive clinical assessment that includes an assessment of all aspects of the dentition is essential in treatment planning. A clear understanding of the interrelationships between orthodontics and periodontics is key in treatment planning<sup>1</sup>. Physiological, functional and aesthetic aspects can

be considered and managed comprehensively in the best interests of the patient when different specialties are involved. Thus, giving the patient a wholesome approach that ensures best options are given and the patient is provided with adequate information and sound basis upon which informed consent can be attained.

It is good practice to evaluate the benefits and risks in the best interests of the patient as this will lead to the appropriate consideration of the financial options and time commitments. The definitive treatment plan is therefore optimized and ideally addresses the patient's chief concerns whilst enhancing overall oral and general health.



The need for a multidisciplinary approach to patient management cannot be over emphasized. A periodontal consult before orthodontic treatment is recommended and especially with the increase in the number of adult patients seeking treatment for alignment of teeth<sup>2</sup>. Optimum esthetics can only be achieved when the gingival margins are regular in shape, size and uniformity.

## Case Report

A 36-year-old female presented to the dental practice seeking a solution for a dental concern that she had been aware of for a period of over 11 years. Her primary concern was dissatisfaction with her smile despite the fact that her teeth were well cleaned and pain free (figure 1). The patient was self-conscious about her teeth and developed a habit of covering her mouth with her hand when she spoke or smiled. Medical history revealed that the patient was a non-smoker and consumed alcohol socially. She reported it to be significantly lower than the WHO recommended limit for women<sup>3</sup>. She had a history of hypothyroidism and was on Levothyroxine for the condition.



Figure 1: The patient's smile at the initial visit

On examination, she had all her teeth except a missing lower left central incisor (31, FDI Nomenclature). The tongue, oral mucosa, gingiva and palate were healthy with no signs of swelling, ulceration or inflammation. There was a discolored upper right central incisor (11), no clinical caries, clinically healthy gingival tissues with minimal plaque deposits. There was mild recession of 1mm on 14, 24, 34 (first premolars). There was severe crowding in the upper arch. Oral hygiene was good. (Figure 2).

Orthodontic examination, extra-orally, showed that the patient had a Class I Skeletal pattern. Frankfort mandibular planes angle was average (28°) with proportionate middle and lower (slightly reduced) facial thirds. Mandible was slightly retrognathic. Nasio-labial angle was normal (90°-100°). Lips were competent with an average lip line. All masticatory muscles were normal on palpation. There was no associated pain or tenderness.

The temporomandibular joint was asymptomatic and demonstrated a normal path and range of movement. On intra-oral examination, there was an angle's classification<sup>4</sup> of Class II Division 2 incisor relationship with an overjet of 1mm measured against the significantly retroclined upper central incisors (11, 21). Upper lateral incisors (12, 22) were significantly flared labially and thus excluded from the line of the upper arch. Thus, the maxilla had severe crowding. The lower arch had a missing lower left central incisor (31). There was some spacing between 41 and 32. The inclination of the teeth was average with a moderate to flat Curve of Spee.

The overbite was reduced and complete to hard tissue. Although the upper centerline was mid-face the lower centerline was over to the left by 2mm as a result of the missing lower left central incisor (31). There was no evidence of displacement.

Molars on the right were in a Class II ½ unit relationship while the left molars were in Class II ¼ unit occlusion. The Canines demonstrated an identical relationship; right canines class II ½ unit and left canines class II ¼ unit relationships respectively (figure 2).

Radiographic examination showed the presence of all permanent teeth excluding the lower left central incisor (31), no carious teeth and no periodontal bone loss. The missing 31 was considered to be congenitally missing. Lateral Cephalogram and Orthopantomogram radiographs were used to aid in diagnosis.

Index of Orthodontic Treatment Need (IOTN)<sup>5</sup> was 4h. This reflects less extensive hypodontia requiring orthodontic space closure to obviate the need for a prosthesis<sup>6</sup>.





Figure 2: Composite of pre-treatment orthodontic intra-oral views

A Royal London Hospital space analysis <sup>7</sup> revealed a borderline space requirement. Although there was a missing lower incisor, the dimensions of the teeth in the upper arch were reduced particularly with the slightly diminutive bilateral upper lateral incisors (12, 22) as such, the Bolton's discrepancy <sup>8</sup> was possibly minimized.

**Diagnosis:** Class II division 2 incisor relationship on a mild Class II skeletal base. Discolored upper right central incisor and mild toothbrush abrasion of 14,24,34. Congenitally missing 31.

**Treatment plan:** The patient was offered two alternative treatment plans. The first one included, endodontic treatment and bleaching of the 11, followed by veneers/crowns in the lower anterior segment. The alternative treatment plan was a multidisciplinary approach of orthodontic treatment including periodontal therapy followed by restorative treatment if any after completion of orthodontic therapy. The patient gave informed consent to have the alternative treatment.

The only concern the patient had was the appearance of the fixed appliance particularly as it would be on for the prescribed duration. She was reassured and informed that tooth colored ceramic brackets and tooth-colored wires would be used to manage this challenge.

The treatment began with periodontal therapy whereby diet counseling, oral hygiene instructions and demonstration of correct brushing technique using the modified charters technique to prevent progression of recession. Modified charters technique is also suitable during orthodontic treatment. She was also educated on how to effectively and reliably use Class II mechanics like elastics. Oral prophylaxis was done.

The definitive orthodontic treatment plan was a non-extraction upper and lower fixed appliance therapy with the aid of Class II mechanics to optimize correction of Class II buccal features. The estimated duration of treatment was 16-18 months. This would be followed by a period of retention.

Treatment commenced with the attachment of preadjusted appliances with a 0.022"x 0.028" slot McLaughlin Bennet and Trevisi (MBT) prescription upper ceramic brackets 9. The MBT appliance system has less tipping for anterior upper and lower teeth. The levelling and aligning phase was carried out using 0.0161 Nickel Titanium (NiTi) Natural archform wires.

The intermediate phase enables and optimizes torque expression and preparation for ideal sliding mechanics. The choice of archwires was 0.018"x 0.025" NiTi archwires. There was interim use of 0.018" Stainless Steel (SS) and 0.020" SS archwires. It was anticipated that during the first two phases force levels of up to 150gms per quadrant would be attained.

Finally, working archwires selected were 0.019"x 0.025" SS posted archwires of the natural archform. It was important for purposes of minimizing anchorage loss and reducing the friction to the lowest possible levels that the wires are deemed to be passive before starting the use of elastics for Class II correction.

Class II mechanics were started as appropriate using 3/16", 4.5oz. elastics (127, 58g) These are manufactured and supplied by G&H Orthodontics

(USA) (2165 Earlywood Drive, Franklin, IN 46131 USA). The patient was asked to wear the elastics full time. This translates to consistent efficient correction of Class II buccal segment features. She was able to eat and speak with the elastics in situ and only removed them to carry out tooth brushing and change the elastics after 12 hours of use.

Upon completion of space closure detailing was done using 0.0161 SS wires.

Treatment goals were attained after 16 months. The patient had grown in confidence during the course of treatment. Retention was provided by way of a bonded retainer attached to anterior teeth; upper and lower canine to canine (13 to 23; 43 to 33) in both arches (Figure 3a and 3b upper jaw and 3c and 3d lower jaw).



Figure 3a and 3b: Before and after pictures showing the bonded retainers in the upper jaw



Figure 3c and 3d: Before and after pictures showing the bonded retainers in the lower jaw

Brackets were debonded and impressions done over the teeth with bonded retainers in situ. Vacuum formed upper and lower (Trutain) retainers were fabricated at the selected local laboratory.

The retention regimen was prescribed as follows

1. Full –time wear for 14 days
  2. Night-time wear for subsequent 6 months
- Alternate night time wear indefinitely for long-term retention support.

Intra-oral pictures of different views showing the presentation before the treatment and after the treatment are shown in figures 4a, 4b, 4c, 4d, 4e, 4f.

#### BEFORE

#### AFTER



Figure 4a



Figure 4b



Figure 4c



Figure 4d



Figure 4e



Figure 4f

Figures 4a, 4b, 4c, 4d, 4e, 4f: Different views of the patient before and after treatment.

The patient was pleased with the outcome (Figures 5a and 5b). The discolored tooth was no longer an issue. During the orthodontic alignment of teeth, the palato-lingual torque correction of the tooth's crown position optimized the functional and aesthetic state of all the teeth.

On review after the orthodontic treatment, restorative management was no longer required. The discolored tooth was now not obvious.



## Discussion

This case report aims at demonstrating that multidisciplinary approach to patient management offers the best options for ideal outcomes. In this case, multiple orthodontic extractions were avoided, endodontic treatment, veneers/crowns were avoided as well because different specialists were all involved in the decision making. The two specialties that ended up working on the patient were the periodontist and the orthodontist. The outcome was an esthetic and acceptable smile that was satisfactory to the patient.

The patient presented was looking for an esthetic smile. A discolored upper incisor and a missing 31 were affecting her smile. There was no history of extraction of the missing 31 and this was confirmed radiographically to have been congenitally absent. A meta-analysis investigating the prevalence of non-syndromic tooth agenesis found a higher prevalence in Europe (5.5%) than in North America <sup>10</sup>.

The first treatment of choice of a discolored tooth, is bleaching and/or endodontic therapy. Veneers/crowns have also been treatment options for discolored teeth. In this case report, these options were available. However, through the multidisciplinary approach, it was decided that orthodontic treatment would be done first together with periodontal therapy. Then an assessment would be done to identify the restorative therapy suitable. After the orthodontic treatment, it was apparently clear that no restorative work was necessary.

In the anterior segment torque correction enhances the optical impression of the teeth by affecting the chroma of the anterior teeth in the smile. Chroma refers to the degree of vividness of a color and may also be referred to as saturation, intensity or purity. In this case, just changing the position of the teeth improved the chroma of the upper anterior teeth and bleaching was no longer required.

Orthodontic movement enhances alignment, tip, torque, chroma and dentofacial proportionality. Overall this optimizes the Golden Proportions and the Smile Line.

The improvements in this reported case that came with the orthodontic correction resulted in a harmonious and attractive smile, giving the patient a desirable outcome without requiring restorative

work like bleaching or whitening of the discolored tooth. The discolored tooth (11) showed improved chroma and overall aesthetics. The patient thus was no longer concerned about it. As it remained asymptomatic, she opted out of any intervention such as root treatment or internal bleaching.

The orthodontic correction also improved the tooth position in the alveolar bone and recession was no longer of major concern. The 1mm recession on 14 was corrected. On the left side, mild recession persisted on 24 and 34. Modified charters brushing technique was recommended and the patient adapted well. This brushing method is good for teeth with recession and also it is used during orthodontic treatment. Regular periodontal supportive treatment was recommended so as to monitor the recession. In the event that progression of the recession takes place, then early intervention is possible.

The patient reported that the transformation in her smile led to several other positive changes in her life choices including improved diet, wellness and career development.

In conclusion, this case report illustrates how important it is to have a multidisciplinary approach in patient management. The need for restorative work was not necessary after orthodontic treatment. It is important to note that changing the position of the anterior teeth changed the chroma of the teeth and the initial discoloration was no longer visible. Periodontal treatment was important and would continue so as to maintain the positive outcome long-term.



Figure 5a and 5b: The before and after pictures of the patient's smile

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## INFORMATION FOR CONTRIBUTORS

The Journal of Kenya Dental Association (JKDA) is a quarterly publication that provides a forum for publication of original scientific articles, reviews, clinical case reports and opinion pieces concerning the dental sciences and oral health care.

### 1. The JKDA Editorial Process

All the manuscripts submitted to the JKDA are peer reviewed, and every submission will be acknowledged by email within a week. The first stage of review examines the originality of the material presented, scientific relevance and statistical consistency.

The manuscripts are then further reviewed by at least two external referees before evaluation at an editorial panel meeting.

A final decision on publication will be communicated to the submitting/corresponding author within 3 months of manuscript submission. Proofs will be sent to authors for final publication approval except in the case of letters to the editor and obituaries.

### Manuscript Submission

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Articles should report data from original research that is relevant for the provision of oral health care in developing countries. Reviews must be objective, comprehensive analyses of the subject matter, giving a current and balanced view of the issues discussed. Case reports must be authentic, appropriately illustrated and of critical significance to the practice of dentistry. Letters to the editor should not be more than 800 words and should contain only one illustration and not more than 5 references. Priority shall be given to letters responding to articles published in the journal in the last four months.

Editorials are usually commissioned, but unsolicited communications of up to 1,000 words are welcome. These will also be subjected to a peer review process. Obituaries which are of interest to the JKDA readership may also be submitted. The formal obituary should contain the following information: full names, date and place of birth, education history, degrees and qualification, year and place of qualification, recent appointments and achievements, family members and date and cause of death.

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We only accept manuscripts not already published elsewhere or under consideration by any other journal or publication.

The submission should include signed consent for publication from all authors. Each author's contribution to the paper should also be indicated. An accompanying letter should indicate each author's name, degrees and professional titles. It should also include the work affiliation, and complete address, as well as telephone number and email address.

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Manuscripts containing clinical photographs should include signed consent for publication from patients. In addition, the photographs should be adequately disguised so that the patient is not identifiable.

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Conflict of interest should be stated. Source of funding should be included.

The role of the funding entity in the entire research and publication process should be stated clearly. Possible sources of conflict include: Direct funding for the research or publication; Funding you have received from any organization involved in this or similar research; Any position you hold in an organization that is involved in this or similar research.

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