KNOWLEDGE AND ATTITUDE TO TOOTH DISCOLOURATION OF PATIENTS VISITING TWO HEALTH CENTRES IN NAIROBI.

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BDS LEVEL III

A community dentistry research project submitted in partial fulfillment of The Bachelor of Dental surgery (BDS) degree of the University of Nairobi.

2013
DECLARATION
I, LUCY KALUVU, declare that this is my original work and has not been submitted elsewhere by other person for research purposes or award of any degrees.

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DEDICATION
I dedicate this project to my parents, Alexander and Rose Masia as they have continued to support my endeavors both financially and emotionally throughout the whole process of carrying out this research.

To my mentor, thank you for your continued encouragement and moral support, intellectual contribution and financial support.
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**LIST OF ABBREVIATION**

BDS- Bachelor of Dental Surgery

KNH- Kenyatta National Hospital

Ksh- Kenya shillings

UON- University of Nairobi

MRes – Masters of Research

MClin Dent –Masters of Clinical Dentistry

PhD- Doctorate of Philosophy

ICT- Information and communications technology
SUMMARY

Background: Tooth discoloration refers to the fading away of the natural color of the tooth and replacement with a stain, usually of a different color to the point of notice. It is a major aesthetic concern in our setup, hence the need to address it. The success of treatment of tooth discoloration is largely dependent on the knowledge and attitude of people towards it. This research study is one of the many ways of tapping into the minds of the public and getting a broader view of their knowledge of the causes of tooth discoloration, its prevention and the treatment options available.

Objective
To determine the knowledge and attitude to tooth discoloration of patients visiting two health centers in Nairobi.

Study design
A descriptive cross-sectional study

Study area
The study was conducted in UON dental hospital, located on Argwings Kodhek road, opposite Lee funeral home and Nairobi Hospital Doctors plaza and Embakasi Health Centre, on Airport North road, opposite Embakasi police station.

Study population
Patients visiting UON dental hospital and Embakasi health Centre.

Data collection
151 patients randomly selected from among the patients visiting this two health centers were issued with self administered questionnaires, which they were required to fill accurately and directly. Some of the variables being investigated were age, gender, occupation and acceptance of tooth discoloration as the dependent variable. Data obtained was analyzed using SPSS version 16 and Microsoft excel and presented using graphs, columns and pie charts.

Results A total of 151 respondents participated in the study. All the questionnaires administered were answered fully and per instructions given. Of these respondents, majority were males 84(55.6%). The respondents ranged in age from 13-72 years with majority being in the 20-29 age groups .Majority of the respondents had previously visited a dentist 110 (72.8%), with most of them naming a tooth ache as the reason for their last dental visit (31.8%). Majority of the respondents were informed about tooth discoloration from the internet (40.6%).48.3% of the respondents named fluorosis as the major form of tooth
discoloration affecting the community while 24.5% of the respondents related the intake of tea and coffee to having a direct relation to tooth discoloration. However, a few respondents (19.2%) associated ageing with tooth discoloration, describing the yellowing of teeth with increase in age. Majority of the respondents (72.8%) believed that diet was not a cause of tooth discoloration. Forty (27.2%) of the respondents were convinced that there is an association between diet and tooth discoloration. Majority of the respondents (94.7%) showed a positive attitude to tooth discoloration and to those affected by it. 91.4% of the respondents shared the belief that discolored tooth can be whitened with 72.8% of them showing familiarity with office and home bleaching as a form of tooth whitening.

**Conclusion**

The respondents had sufficient knowledge regarding tooth discoloration. Majority of them had heard of the term tooth discoloration prior to the day of investigation. The respondents showed awareness of the association of drugs, age, disease and diet to tooth discoloration. However, a great majority did not understand the dentist’s role in the causation of tooth discoloration.

Attitude towards those affected with staining and discoloration was positive. This was shown by the fact that most respondents were accepting of the affected and were willing to find them help.

A great majority of the respondents considered tooth whitening as a successful form of treatment, mostly office and home bleaching. However, other forms of tooth whitening such as placement of porcelain or composite crowns and masking were unpopular among the respondents.

**Recommendations**

Despite the sufficiency in knowledge on the causes of tooth discoloration, there is need to educate the public on the role of endodontic materials in tooth discoloration. This is to ensure an informed approach on the part of the patient before selection of an endodontic material is done. Dentists should also be educated on the importance of taking aesthetic considerations into account, and not focusing solely on the biological and functional aspects when choosing an endodontic material.
1.1 INTRODUCTION
Aesthetic appeal is regarded as a very important attribute to man’s overall view of himself and of others. The appearance of teeth, one’s smile has contributed in volumes to their overall confidence. However, tooth discoloration has proved a major setback. Efforts to understand the causes, effects and treatment methods of tooth discoloration have been made by dental practitioners, cosmetic organizations and health-based organizations all over the world, with the goal of solving what has become a dental health problem.

The term “tooth discoloration” refers to the fading away of the natural color of the tooth or replacement with a stain, usually of a different color to the point of notice (1). Tooth discoloration has been broadly classified as extrinsic or intrinsic. Extrinsic tooth stains are formed from dietary chromogenic molecules and metals that coats the visible enamel surfaces (2). The stain usually results from either colored material binding to the tooth surface or darkening with time, or from a chemical reaction occurring in the plaque to form colored deposits (3). Most extrinsic stains are localized in the gingival third of the tooth above the gingival collar where most bacterial accumulations are found.

Chromogenic bacteria produce green to brown stains following their interaction with ferric sulfide and iron in the saliva and gingival crevicular fluids. Dietary sources such as tea, coffee, and wine, disinfectants such as chlorhexidine and substances such as tobacco have been implicated. They cause a brown to black stain that appears darkest in the gingival third of the tooth (4). Cigarette smoking and khat chewing results in a yellow/brown-black discoloration of teeth.

The use of anti-bacterial plaque-inhibiting mouth rinses has shown to chemically alter the acquired pellicle resulting in the formation of brown integuments on the tooth surface. Dental plaque associated staining is one of the major forms of extrinsic staining observed worldwide. It occurs when plaque deposits coat the enamel surface giving it a yellowish appearance. It has been implicated in gingival and periodontal diseases (5).

Intrinsic staining, however, can either be a genetically or acquired abnormality. It usually occurs due to a change in the structure and appearance of dentine. Genetic conditions such as
Amelogenesis imperfecta, Dentinogenesis imperfecta and dentine dysplasia have been associated with intrinsic staining which occurs during the tooth development stages. They result in a characteristic yellowish-brown and bluish-brown staining respectively. Acquired staining results from metabolic, traumatic, idiopathic, iatrogenic and age-related causes. Metabolism-related conditions such as, hepatitis, erythroblastosis fetalis, alkaptonuria and porphyries cause yellowish-green, brown and reddish-purple stains on dentine which are characteristic(6).

Traumatic injury to the tooth surface due to mechanical impact causes pulpal hemorrhage which causes a reddish-purple staining on the pulp and dentine and with time, transforms to a grey-brown stain (7). Root resorption results in a pink staining around the root junction.

Tetracycline staining which is characteristic in children born of mothers who were on tetracycline medication at the time of their pregnancy is intrinsic. These children develop a brown staining on most of their deciduous and permanent teeth (8). Age-related tooth staining is also observed. With increase in age, a yellow discoloration is observed on the tooth surface. This occurs as a result of the natural aging process of the enamel and dentine tissues.

Fluorosis is the major form of intrinsic staining affecting the Kenyan population. It is a developmental disturbance of dental enamel caused by excessive exposure to high concentrations of fluoride. It is characterized by an opaque white appearance in the mild stages, a brown stain in the moderate stage, leaving pitted, rough enamel that darkens over time in severe fluorosis. The main causative agents of dental fluorosis is overexposure to high levels of fluoride in drinking water, fluoridated mouth rinses and dentifrices, ingestion of foods with high fluoride contents such as potatoes, bananas and fish and public water fluoridation. Studies have been carried out globally regarding fluorosis.

In 1901, a young dentist: F.Mckay in the USA, during a practice in Colorado town found out that people living there had stained teeth with varying intensity and concluded that the causative agent was in the drinking water. In 1931, the causative agent after spectrometric analysis was found to be fluoride. Lake Nakuru region in the Rift Valley has the highest record of fluorosis in Kenya. Other regions such as Muranga, Kiambu, Kitui and Taita-Taveta also show a relatively high incidence of fluorosis. Prevalence of dental fluorosis is very high.
especially amongst young children of 8 to 10 years. It is a major setback in the win against tooth discoloration (9).

The prognosis for extrinsic staining is very good. However, intrinsic stains may be more difficult or take longer to remove. Therefore, the prognosis for intrinsic staining is poor (10). As a result of the unawareness of treatment options available and the research methods undertaken to improve their effectiveness, most affected individuals continue living with the discoloration and with time, they lose their aesthetic appeal and self-confidence.

The need for knowledge and awareness of tooth discoloration is mandatory in effectiveness of treatment options. A variety of treatment methods including tooth-whitening options have been sought. This includes teeth bleaching, micro abrasion techniques, bonding, full crowns, and use of porcelain laminates or composite veneers for intrinsic stains. However, prophylactic scaling and polishing has proved the most suitable method in eradicating extrinsic stains.

Tooth bleaching involves the use of carbamid peroxide which breaks down into hydrogen peroxide in the mouth. This oxidizing agent penetrates the porosities in the rod-like crystal structure of enamel and bleaches stain deposits in dentine. The methods available include bleaching strips, pens, gels and laser bleaching. It can be office or home-applied (11).

The enamel micro abrasion technique involves the utilization of a mixture of hydrochloric acid and an abrasive such as pumice which is rubbed onto the surface of the tooth repetitively until the outer layers of enamel are successfully removed, leaving a glassy enamel surface as the finished result. Pits on the enamel surface are filled with composite resin bonding material (12).

Porcelain laminates or veneers is a thin layer of porcelain etched with hydrofluoric acid to increase bonding onto the tooth surface or bonded to the tooth with a dental cement, usually fabricated by a dental technologist that covers the staining on the tooth surfaces. It closely resembles a crown which is a dental restoration which caps or encircles the stained tooth and is bonded to the tooth using dental cement (13).
A study on the knowledge and attitude to tooth discoloration of the public is extremely important as it creates a stepping stone to the eradication of tooth discoloration, hence improvement of aesthetic appeal and overall dental health.
1.2 LITERATURE REVIEW

Tooth discoloration has been considered an issue of interest to many dental practitioners and affected individuals. Tooth discoloration involves the staining of teeth either extrinsically where only the enamel hard tissue is affected or intrinsically where both enamel and dentine hard tissues are affected. Extrinsic stains result from continued consumption of beverages such as tea and coffee, use of tobacco and cigarette smoking. Intrinsic stains, however, are brought about by many causes. This include ageing, metabolic diseases such as porphyries, erythroblastosis foetalis, drugs such as tetracycline, glibenclamide, traumatic injuries to the tooth and excessive consumption of foods such as bananas and potatoes and from excessively fluoridated drinking water. Extrinsic stains can be easily removed through prophylactic scaling and polishing. However, intrinsic stains pose a challenge as they are more difficult to remove. Tooth bleaching, enamel micro abrasion techniques, use of porcelain laminates and crowning are some of the methods that have been used over the years to remove intrinsic stains.

Studies have been carried out across different regions of the world including Kenya, all in a bid to address tooth discoloration which has become an urgent dental health issue to the affected individuals. A study by Watts A, et al, 1975 carried out with the objective of carrying out an extensive review of the literature on tooth staining with particular regard to some of the more recent literature on the mechanism of tooth staining involving mouth rinses. The research concluded that knowledge on the etiology of tooth staining is of importance to dental surgeons in order to enable a correct diagnosis to be made when examining a discolored dentition. This would allow the dental practitioner to explain to the patient the exact nature of the condition. Watts (1975) therefore concluded that the mechanism of staining may have an effect on the outcome of treatment and influence the treatment options the dentist is able to offer to the patient.

To examine the incidence and pattern of tetracycline-related tooth discoloration in patients, another study was conducted in Benin City. Information was obtained on demographic parameters, family history of tetracycline tooth discoloration, pattern of discoloration, treatment given and treatment outcome. The criteria for assessing the severity of tooth discoloration was based on the description by Jordan et al who graded severity of staining as slight, moderate or severe. Slight staining was recorded as a light yellow or light grey.
uniform discoloration of the entire dentition without banding or concentration of the stain in any part of the crown. A darker uniform yellow or grey-staining without banding was recorded as moderate staining and the dark grey, purple or blue discoloration with cervical banding was recorded as severe. It was observed that in 81 patients, 31 males and 51 females, aged 11-37 years presented with various degrees of tetracycline tooth discoloration. The patients accounted for 2.2% of the 3750 patients that were seen during the period under review. In 29.5% of the patients, hypoplasia was associated with tetracycline discoloration. Of these, 71.4% were observed in the category with severe discoloration of teeth. A non-genetic pattern of tetracycline tooth discoloration was observed in 40.7% of the patients, with discoloration in siblings only accounting for 51.5% of those affected (16).

A study on the efficacy of extrinsic stain removal by novel dentifrices containing Papa in and Brome lain extracts was carried out to evaluate stain removal efficacy of novel dentifrices containing papa in and brome lain extracts (Glodent) in comparison with a control dentifrice (Colgate regular). Subjects were randomly divided into one of the two study groups. It was a randomized, positive-controlled, double-blinded clinical study. Pre- treatment and post-treatment photographs of four anterior teeth were recorded under standardized conditions and analyzed for lightness and luminosity values. In both test and control groups, the post-treatment luminosity was significantly higher than pre-treatment luminosity. The mean post-treatment luminosity for the test group was found to be significantly higher than the control group. Hence the test dentifrice showed significant stain removal when compared to the control, which could be attributed to the role of proteolytic enzymes in the test dentifrice (17).

To investigate tooth discoloration induced by endodontic materials, a study was carried out in Basel, Switzerland, in 2012. The aim of this study was to investigate the discoloration potential of endodontic materials using bovine tooth models. Two hundred and ten dentine-enamel blocks were prepared out of the middle 1/3 of bovine tooth crowns. Standardized cavities were then prepared on the tooth models and endodontic material placed in the cavities. Cavities were then sealed with composite and stored in water. On observation after 12 months, it was observed that majority of the cavities had color changes and the endodontic materials contaminated with blood showed increased staining (18).
A review by Pub med and Cochrane library, with the purpose of summarizing the existing knowledge on the discoloration potential of materials used for endodontic procedures, summarised literature search covering the period from 1966 to 2011. Ten in-vitro studies, one randomized controlled trial and one multi-centered randomized control trial met the inclusion criteria. It was concluded that recently used endodontic materials did not induce measurable color changes for a wide range of materials currently available on the market, there is only scarce or no evidence available on their staining ability. It was also concluded that endodontic therapy should not focus solely on biological and functional aspects, but take aesthetic considerations into account as well and in order to reduce the risk of material-induced tooth discoloration, all materials should be applied carefully in areas of aesthetic concern (19).

In 2001, a study by Watts and Addy on tooth discoloration in relation to aging and disease was conducted. In conclusion, they showed that wearing of the tooth structure, deposition of secondary dentine due to aging or as a consequence of pupil inflammation and dental sclerosis affected the light-transmitting properties of teeth, resulting in overall gradual darkening of the teeth (20).

A study by Adcock and Shirley et al with the objective of investigating extrinsic iron staining in infant teeth from iron-fortified formula and rice cereal, described a 7-month old infant who presented with extrinsic teeth staining due to inadvertent overconsumption of dietary iron. The infant was fed iron-fortified formula and rice-cereal. Rice-cereal, fortified with iron, was being used as part of a normal infant diet and as a thickening agent when added to the formula for treatment of gastro esophageal reflux. After several months of administration, blackening of the infant’s teeth was noted by the mother. The stain was removed by the pediatric that simply scraped the affected teeth. It was observed that no further staining occurred after the amount of dietary iron was reduced (21).

With the objective of reviewing the biological aspects of Tooth Bleaching, A study done showed a more than 90% success rate for intracoronal bleaching of non-vital teeth, and in a period of 1-8 years’ observation time, from 10-40% of the initially successfully treated teeth needed re-treatment. It was also observed the first subjective change in tooth color was observed after 2-4 nights of tooth bleaching, with more than 90% of the results showing this. Tooth sensitivity was found to be a common side-effect of external tooth bleaching, being
observed in 15-78% of the patients. Direct contact with hydrogen peroxide was found to induce genotoxic effects in bacteria and cultured cells, whereas the effect was reduced or abolished in the presence of metabolizing enzymes. Risk assessment revealed that a sufficient safety level was not reached in certain clinical situations of external tooth bleaching such as bleaching one tooth arch with 35% carbamide peroxide, using several applications per day of 22% carbamide peroxide and bleaching both arches simultaneously with 22% carbamide peroxide. It was recommended that concentrations of less than 10% carbamide peroxide be used when performing external bleaching (22).

A different study by Hat tab et al (1999) and Watts and Addy (2001) with the objective of determining the relationship between diet and tooth discoloration. The results of this study showed that Coffee, tea, red wine, carrots, oranges and tobacco use gave rise to extrinsic staining on teeth (23).

Another study by Kadam et al, with the objective of determining the cause of drug-induced tooth discoloration showed that long-term use of doxycycline for acne vulgaris and brucellosis caused extrinsic staining. It showed that doxycycline bind to the glycoproteins of the dental pellicle, and in patients with poor oral hygiene, undergoes oxidation when exposed to sunlight or bacteria. It also showed that Linezolid was causing a brown discoloration on enamel. This was attributed to their contribution in causing an overgrowth of chromogenic microorganisms causing deposition of chromogenic precipitates in the pellicle (24).

A study on the knowledge and attitude of patients to tooth discoloration is vital. This is because it will enable the dental practitioners, such as me, to know and understand the patients’ extent of knowledge regarding the causes and available treatments for tooth discoloration. This will enable the dentist to plan on patient education strategies on the prevention and treatment options available. This is more so contributory to other research studies that have been done on the same in the past to ensure continuation of research into tooth discoloration.
2.0 STATEMENT OF RESEARCH PROBLEM, JUSTIFICATION AND OBJECTIVES

2.1 PROBLEM STATEMENT
Tooth discoloration has become a major aesthetic concern in our setup, hence the need to determine the knowledge and attitude of people to it. Majority of individuals with discolored teeth develop low self esteem, low levels of confidence in their facial appearance and undergo stigma, both in their personal and professional lives. Therefore, this has necessitated the need to address tooth discoloration, its causes and treatment options.

2.2 STUDY JUSTIFICATION
The results of this study, other than contributing to the research pool, will help educate and create awareness to both the affected and unaffected population on the causes, prevention and treatment options available to alleviate tooth discoloration. Moreover, dental practitioners will become better informed on their patients’ attitude to treatment and hence create better patient education strategies.

2.3 HYPOTHESIS
The knowledge and attitude of patients visiting UON Dental Hospital and Embakasi Health Centre towards tooth discoloration affects their utilization of tooth whitening methods.

2.4 OBJECTIVES
2.4.1 MAIN OBJECTIVES
To determine the knowledge and attitude to tooth discoloration of patients visiting UON Dental Hospital and Embakasi Health Centre.

2.4.2 SPECIFIC OBJECTIVES
1. To determine patients’ knowledge on the causes of tooth discoloration
2. To determine patients’ knowledge on the interventions available to correct tooth discoloration.
3 To determine the attitude of the patients to tooth discoloration
3.0 METHODOLOGY

3.1 STUDY AREA
The study was carried out at The University of Nairobi (UON) Dental Hospital and Embakasi Health Centre. The Dental Hospital is located within the College of Dental Sciences, University of Nairobi, at the junction of Argwings Kodhek road and Valley road, opposite the Nairobi Hospital and Lee funeral home. Embakasi Health Centre is located on Airport North road, opposite Embakasi OCPD.

3.2 STUDY POPULATION
The study population was patients visiting UON Dental Hospital and Embakasi Health Centre.

3.3 STUDY DESIGN
This was a descriptive cross-sectional study

3.4 VARIABLES

3.4.1 Sociodemographic Variables
- Age
- Gender
- Occupation
- Area of residence

3.4.2 Independent Variables
- Knowledge on the causes of tooth discoloration
- Knowledge on the interventions available to correct tooth discoloration
- Attitude to tooth discoloration

3.4.3 Dependent Variable
Utilization of tooth whitening methods
3.5 INCLUSION CRITERIA

- Patients visiting UON Dental Hospital
- Patients visiting Embanks Health Centre
- Patients who will consent to take part in the study
- Patient above the age of 18 years

3.6 EXCLUSION CRITERIA

- Patients not visiting UON Dental Hospital or Embakasi Health Centre
- Patients who will not give their consent to take part in the study
- Patients below the age of 18 years.

3.7 SAMPLING PROCEDURE

The patient sample was obtained by non-probability convenience sampling method in which patients were entered into the study as long as they met the inclusion criteria and had given a written consent.

3.8 DETERMINATION OF SAMPLE SIZE

Fisher’s formula was chosen as the study was a descriptive cross-sectional study. Following a review of recent literature, a confidence level of 50% was sought since no other study that is closely related to the above was found. Assuming a confidence level of 95% and a prevalence of 50%, sample size was calculated as follows:

\[ N = \frac{z^2 p(1-p)}{c^2} \]

\[ n = \frac{1.96^2 0.5(1 - 0.5)}{0.05^2} \]

\[ n = 384 \]

Where \( z = z \) value
P=prevalence
C=1-confidence (1-0.95)

For this study, since the population is <10000, the formula

\[ n_f = \frac{n}{1 + \frac{n}{N}} \]

Where \( n_f \)=desired sample size of a population<10000
\( n \)=sample size derived for a population> 10000
\( N \)=estimated size of the population under investigation

\[ n_f = \frac{384}{1 + \frac{384}{250}} \]

\[ = 151 \text{ subjects} \]

3.9 DATA COLLECTION TOOLS
Self-administered questionnaires, consisting of both open-ended and closed-ended questions were used. The respondents were explained to what the questionnaire was about and how to go about filling it, after which sufficient time was given to the respondents to fill before the questionnaires were collected.

3.10 DATA ANALYSIS AND PRESENTATION
Data was analyzed using SPSS version 16 through interpretation of respondents’ answers and the summarized values presented in the form of graphs, pie-charts and tables. Tests of significance, for example the Chi-Square were carried out to determine the relationship of knowledge and attitude to tooth discoloration towards tooth whitening methods between the two genders.
3.11 MINIMIZING ERRORS

- Pretesting of the questionnaire was done before distribution
- Uniform method of data collection was used
- Accurate analysis and interpretation of data was done

3.12 LIMITATIONS

- Time limitations in carrying out the study
- Uncooperative patients
- Financial constraints despite budget allocation
- Interpretation of patients’ responses which was cumbersome

3.13 ETHICAL CONSIDERATIONS

- Permission to carry out the study was sought from the Kenyatta National Hospital and University of Nairobi Research Standards and Ethics Committee.
- Permission was sought from the Dean, School of Dental Sciences and The Director, Embakasi Health Centre to carry out this study on the respective hospitals they oversee.
- Informed consent was sought from the patients before their inclusion into the study.
- Voluntary participation was advocated.
- Any participant wishing to leave the study was at liberty to do so.
- Information received from the respondents was treated with utmost confidentiality and in a delicate manner
- Information obtained was used only for the named study
3.14 PERCEIVED BENEFITS

- The results of this study will contribute to the research pool on the knowledge and attitude of patients to tooth discoloration.
- The information obtained from this study will serve as a source of literature and reference study to educate people on the causes and treatment options available for tooth discoloration.
- This study will be submitted as a partial fulfillment of the requirements of the Bachelor of Dental surgery degree of the University of Nairobi.
4.0 RESULTS
A total of one hundred and fifty one questionnaires were distributed to patients visiting UON Dental Hospital and Embakasi Health centre between the months of August and October 2013.

4.1 Socio-demographic information

Among the subjects, the males were more in number than female subjects, with the males being 84(55.63%) and the females being 67(44.37%).

Figure 1: Distribution of gender

![Pie chart showing gender distribution: 84 males and 67 females.]

Their ages ranged from 13-72 years with majority of the patients being in the 20-29 age groups.

Figure 2: Distribution of subjects by age and gender
4.2 Frequency of dental visits

 Majority of the respondents 110 (72.8%) had previously visited a dentist, with the reason for the last dental visit being a toothache (31.8%), continuation of treatment (29.4%) ,and loose teeth(24.8%), a regular check-up (12.8%) and discoloration on teeth(0.9%).

Figure 3: Distribution of frequency of dental visit

4.3 Knowledge on tooth discoloration
Majority of the respondents heard of the term tooth discoloration from the internet (40.6%), with 28.6% obtaining the information from friends. 14.3% heard about it from their dentist with 5.3% reading about tooth discoloration from magazines. The remaining 11.3% obtained the information from other sources.

**Figure 4: Distribution of sources of knowledge on tooth discoloration**

![Source of knowledge on tooth discoloration](image)

### 4.4 Knowledge on forms of tooth discoloration

On enquiry, majority of respondents named fluorosis (brown staining from water) as the main form of tooth discoloration (48.3%), 24.5% associated it with drinking tea and coffee with 19.2% associating it with ageing. 7.9% of the respondents gave other forms of tooth discoloration.

**Figure 5: Distribution of the forms of tooth discoloration**
4.5 Knowledge on the causes of tooth discoloration

4.5.1 Role of the dentist in tooth discoloration

When asked about the dentist’s role in tooth discoloration, 92.1% believed that the dentist had no role in the causation of tooth discoloration. However, a small group of respondents 7.9% believed that the dentist can cause tooth discoloration.

Figure 6: Distribution of Dentist’s role in tooth discoloration
4.5.2 Role of diet in tooth discoloration

Majority of the respondents, 110 (72.8%) felt that diet was not a cause of tooth discoloration, with 41 of the remaining respondents (27.2%) associating diet to tooth discoloration. Out of the 110 respondents, the distribution between males and females was almost similar (59 and
51 respectively). However, more males felt that diet causes tooth discoloration as compared to females.

**Figure 8: Distribution of gender and frequency of diet-associated tooth discoloration.**

Majority out of the 41 respondents who thought diet could cause tooth discoloration were in the 30-39 age group (16), followed by the 20-29 age group (15). The 70-79 age group had the least respondents.

**Figure 9: Age distribution and frequency of diet-associated tooth discoloration**
4.5.3 Role of drugs in tooth discoloration

Regarding drugs as a cause of tooth discoloration, majority of the respondents 101(66.9%) agreed, whereas 50(33.1%) did not agree. Out of the 101 subjects that agreed, 52 were males and 49 were female, while out of the 50 respondents that disagreed, 32 were male and 18 female.

Figure 10: Distribution of gender and drug-associated tooth discoloration
4.5.4 Role of disease in tooth discoloration

Majority of the respondents 91 did not agree that disease can cause tooth discoloration, however 60 respondents agreed on an association between the two parameters. Males of age groups 20-29 and 30-39 showed the most disagreement with the above association.

Figure 11: Distribution of age groups and disease-associated tooth discoloration

4.6 Attitude towards tooth discoloration

When asked how they relate to those affected by tooth discoloration, majority of the respondents (94.7%) said that they accept them and try to find treatment for them. 4.6% of the respondents were not sure of how to relate to those affected. However, a small number of respondents (0.7%) said that they would stay away from them.

Figure 12: Distribution of relations to those affected by tooth discoloration
4.7 Related parties affected by tooth discoloration

When asked about who they know that is affected by tooth discoloration, majority of the respondents said a friend (37.3%), a family member (27.1%), spouse (22.0%) and neighbor (5.1%). Some respondents named other parties (8.5%).

Figure 13: Distribution of affected individuals
4.8 Tooth whitening as a form of treatment of tooth discoloration

When asked whether discolored teeth can be whitened, majority of the respondents (91.4%) agreed. 6.6% of the respondents did not agree while a minority of 2.0% were not sure.

Figure 14: Distribution of knowledge of tooth whitening as a form of treatment

4.9 Knowledge of tooth whitening methods

When asked about the different forms of tooth whitening methods used, majority of respondents (72.8%) showed familiarity with office and home bleaching while 5.3% showed familiarity with placement of porcelain or composite crowns and 0.7% of the respondents with masking. 21.2% of the respondents were unaware of any tooth whitening methods.

Figure 15: Distribution of knowledge on tooth whitening methods
4.10 Success of tooth whitening procedures

Majority of the respondents (92.1%) said that they considered tooth whitening as a successful method of treatment. A minority (5.3%) disagreed with this notion. 2.6% of the respondents when asked were unsure.

Figure 16: Distribution of knowledge on success of tooth whitening procedures
Majority of the respondents who agreed on the success of tooth whitening methods were in the 20-29 age group and those who did not agree were in the same age group also.

**Figure 17: Age distribution and success of tooth whitening procedures**

Male respondents showed the most agreement with the success of tooth whitening and at the same time had the most number of respondents that disagreed.

**Figure 18: Gender distribution and success of tooth whitening procedures**
5.0 DISCUSSION, CONCLUSION AND RECOMMENDATION

5.1 DISCUSSION

A total of 151 respondents participated in the study. All the questionnaires administered were answered fully and per instructions given. Of this respondents, majority were males 84(55.6%) and females 67(44.4%). This is contrary to the notion that woman are more likely to seek dental treatment than men as they are usually more concerned with their oral hygiene and dental appearance. The respondents ranged in age from 13-72 years with majority being in the 20-29 age groups. This is explained by the fact that younger individuals are more prone to oral and dental disease than the elderly due to lifestyle changes and dietary hence are more likely to be found in dental clinics and hospitals than the elderly.

Majority of the respondents had previously visited a dentist 110 (72.8%), with most of them naming a tooth ache as the reason for their last dental visit (31.8%). This is explained by the fact that due to increase in the consumption of carbohydrates and a highly cariogenic diet, tooth destruction by caries has become the leading cause of dental treatment.

Majority of the respondents were informed about tooth discoloration from the internet (40.6%). This is explained by the fact that most patients have become informed about the different dental conditions affecting them and have sought to visit the dentist with an informed approach.

48.3% of the respondents named fluorosis as the major form of tooth discoloration affecting the community. This is in line with a study by F. McKay, a young dentist in the USA practicing in Colorado, who after noticing that people in the community had stained teeth with varying intensity and in 1931, after spectrometric analysis found that high levels of fluoride were present in the drinking water.

24.5% of the respondents related the intake of tea and coffee to having a direct relation to tooth discoloration. This is reflected in a study by Hat tab et al (1999) and Watts and Addy (1975) who concluded that tea, coffee, red wine, carrots, oranges and tobacco gave rise to extrinsic staining of teeth (23).

However, a few respondents (19.2%) associated ageing with tooth discoloration, describing the yellowing of teeth with increase in age. This is in line with a study conducted in 2001 by Watts and Addy on tooth discoloration in relation to ageing, with the conclusion that wearing of the tooth structure results in deposition of secondary dentine as one ages (20).
When asked if the dentist with time and has a role in causation of tooth discoloration, 92.1% did not agree. However, 7.9% were in agreement. A study carried out in Basel, Switzerland investigating the discoloration potential of endodontic materials used by the dentist for tooth restoration discovered that endodontic materials caused color changes in the teeth with time and those contaminated by blood showed increased staining. This is due to leakage of the constituents of the endodontic material once in use (18).

Majority of the respondents (72.8%) believed that diet was not a cause of tooth discoloration. With 40 of the respondents (27.2%) convinced that there is diet-associated tooth discoloration. This relates to a study by Adcock and Shirley et al with the objective of investigating extrinsic iron staining in infant teeth from fortified formula and rice cereal which concluded black stain on the infant’s teeth after several months of administration (21).

101 out of 150 respondents (66.9%) associated drugs to tooth discoloration. A minority of the respondents disagreed (33.1%). This is in line with a study conducted in Benin City to examine the incidence and pattern of tetracycline-related tooth discoloration, which concluded that 2.2% of the patients reviewed presented with varying degrees of tetracycline tooth discoloration. Another study by Kadam et al showed that long-term use of doxycycline for acne vulgaris and brucellosis caused extrinsic staining.

When asked if disease had a role in tooth discoloration, majority of the respondents (91) did not seem to agree. This is contrary to a study done in 2001 by Watts and Addy on tooth discoloration in relation to disease which concluded that deposition of secondary dentine as a consequence of pulpal inflammation and dental sclerosis affected the light-transmitting properties of the teeth, resulting in overall gradual darkening of the teeth (20). Conclusively, the study showed a direct correlation between disease and tooth discoloration.

Majority of the respondents (94.7%) showed a positive attitude to tooth discoloration and to those affected by it. 91.4% of the respondents shared the belief that discolored tooth can be whitened with 72.8% of them showing familiarity with office and home bleaching as a form of tooth whitening. This coincides with a study done to review the biological aspects of tooth bleaching which conclude that 90% of intracoronal bleaching is successful with the first subjective change in tooth color observed after 2-4 nights of tooth bleaching. This explains the fact that 92.1% of the respondents considered tooth bleaching a successful form of treatment.
5.2 CONCLUSION

The respondents had sufficient knowledge regarding tooth discoloration. Majority of them had heard of the term tooth discoloration prior to the day of investigation. The respondents showed awareness of the association of drugs, age, disease and diet to tooth discoloration. However, a great majority did not understand the dentist’s role in the causation of tooth discoloration.

Attitude towards those affected with staining and discoloration was positive. This was shown by the fact that most respondents were accepting of the affected and were willing to find them help.

A great majority of the respondents considered tooth whitening as a successful form of treatment, mostly office and home bleaching. However, other forms of tooth whitening such as placement of porcelain or composite crowns and masking were unpopular among the respondents.
5.3 RECOMMENDATIONS

Despite the sufficiency in knowledge on the causes of tooth discoloration, there is need to educate the public on the role of endodontic materials in tooth discoloration. This is to ensure an informed approach on the part of the patient before selection of an endodontic material is done. Dentists should also be educated on the importance of taking aesthetic considerations into account, and not focusing solely on the biological and functional aspects when choosing an endodontic material.

There is also need for educate the public on available forms of tooth whitening methods, especially use of porcelain and composite crowns, masking and enamel micro abrasion which have a high success rate specially in situations where bleaching is not recommended.
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Appendix I: Consent form

Knowledge and attitude to tooth discoloration of patients visiting two health centers in Nairobi.

The purpose of this study is to investigate the knowledge on the causes of tooth discoloration, awareness of treatment options available and the attitude towards it among patients visiting two health centers in Nairobi.

Procedure: A self-administered questionnaire will be used.

There are no risks involved as the procedure is non-invasive.

Participation is entirely on a voluntary basis and the participant may withdraw from it at any given time.

INVESTIGATORS DETAILS

KALUVU LUCY MUTINDI

BDS LEVEL III

SCHOOL OF DENTAL SCIENCES, UON

CONTACT NUMBER: 0713221847

Dear participant,

I am a third year student pursuing a bachelors degree in Dental Surgery at the University of Nairobi. I wish to request your participation in a study that I am conducting that will form part of my degree work. Participation is voluntary and you may withdraw at your convenience.

The study involves a self-administered questionnaire that you will be required to answer.
You are free to inquire about anything that may not be clear to you in the questionnaire.

I would therefore appreciate your consent by signing here below.

I, Kaluvu Lucy Mutindi, confirm that I have explained the relevant parts of my study to the participant.

Signed……………………………………….
Date…………………………………………………..

I, participant, hereby confirm that I have understood the relevant parts of the study and give consent to participate.

Signed……………………………………….
Date…………………………………………………..

THANK YOU
Appendix II: Fomu ya Idhini
Kwa mhusika

Mimi ni mwanafunzi wa mwaka wa tatu katika chuo kikuu cha Nairobi. Nasomea shahada ya utabibu ya sehemu zinazohusiana na meno.

Mazoezi ninatoteleza ni kuhusu ujuzi wa namna ambayo meno hubadilisha rangi, ujuzi wa namna Hizi na njia za matibabu zikizoko.

Naomba kuchangia kwako katika mazoezi ninayotekeleza kuhusu meno kubadilisha rangi.

Baada ya mambo utakayochangia ni:

1. Mahojiano kuhusu sababu za meno kubadilisha rangi.
2. Kuniuliza kuhusu sehemu yoyote ambayo utakosa kuelewa.

Kuhusika kwako kutakabiliwa na unyenyeku, upesi na mahojiano kati yetu yatabaki kutuhusi sisi na Hayata juzwa wahusika wengine.

MWANAFUNZI
JINA : KALUVU LUCY MUTINDI
NAMBARI YA SIMU : 0713221847

Mimi Lucy Kaluvu, naapa kuwa maelezo yang ni ya uhakika.

Sahihi ........................................ Tarehe ..................................................

Mimi mhusika, nimeyayafahamu na kuyatafakari maelezo yalioelezwa na sahihi yang ni thibitisho

Kwamba nitahusika.

Sahihi ................................. Tarehe ..............................................
Appendix III: Questionnaire
KNOWLEDGE AND ATTITUDE TO TOOTH DISCOLOURATION OF PATIENTS VISITING TWO HEALTH CENTRES IN NAIROBI.

This questionnaire is part of a Community Dentistry Research Project being done as part of the fulfillment of The Bachelor of Dental Surgery degree of The University of Nairobi.

INSTRUCTIONS

IN ENGLISH

1. Please respond to the questions asked by ticking your response(s) or filling in the blank spaces provided.
2. Use a biro pen which is legible. No pencil please.
3. Please try to answer all the questions asked and where one is not sure, please indicate with the following,"I don’t know".

KWA KISWAHILI

1. Tafadhali jibu maswali yalioulizwa hapo chini kwa kuweka alama ya kukubali ama ya kukataa na pia ujaze nafasi zilizochwa.
2. Tumia kalamu ya wino.Tafadhali usitumie penseli.
3. Tafadhali jaribu kujibu maswali yote ambayo yameulizwa na mahali ambapo hauna uhakika,tafadhati uonyeshe kwa sentensi hii ’Sina uhakika’.
GENDER:    MALE [  ]          FEMALE [  ]

AGE (YEARS):   [  ]

OCCUPATION: .................................................

AREA OF RESIDENCE: ..........................................

Q 1. Have you ever visited a dentist before?
    a) Yes
    b) No
If no, answer Q2. If Yes, go to Q3

Q 2. What is your main reason for not visiting the dentist?
    a) Do not suffer any dental problem
    b) Do not have sufficient time to visit
    c) Do not think it is necessary
    d) Cannot afford it
    e) Don’t know

Q3. When was your last visit to the dentist?
    a) One week ago
    b) One month ago
    c) More than one year ago
    d) I can’t remember
    e) Never visited a dentist

Q4. What was the reason for your last visit to the dentist?
    a) Had a tooth ache
    b) My teeth were lose
    c) Continuation of treatment
    d) For a regular checkup
    e) My teeth were discolored
Q5. Have you heard of the term “tooth discoloration”?
   a) Yes
   b) No
   If yes, go to Q6, If no, go to Q8

Q6. Where did you hear it from?
   a) Read from a newspaper or magazine
   b) Heard from my dentist
   c) Heard from my friends
   d) Read about it from the internet.
   e) Other, specify…………………………………………………………………………………………

Q7. What do you understand by the term "tooth discoloration"?

Q8. Do you think the dentist plays a role in causing tooth discoloration?
   a) Yes
   b) No

If yes, go to Q9, If no, skip Q9

Q9. How does the dentist play a role in tooth discoloration? ...............................................................
b) No

Q12. If yes, what type of discoloration do they have? .................................................................
........................................................................................................................................................
........................................................................................................................................................
Q13. How do you relate to people with tooth discoloration?
    a) Laugh at them
    b) Call them names
    c) Stay away from them
    d) Accept them and try to find treatment for them.
    e) Not sure

Q13. Do you think one's diet is a source of tooth discoloration?
    a) Yes
    b) No

Q14. If yes, which foods do you know of that cause discoloration? .................................................................
........................................................................................................................................................
........................................................................................................................................................
Q15. Do you know if drugs cause tooth discoloration?
    a) Yes
    b) No
If yes, go to Q16, If no, go to Q17

Q16. Which drugs do you know of that cause discoloration?
........................................................................................................................................................
........................................................................................................................................................
Q17. Do you know of any diseases that cause teeth to discolor?
    a) Yes
    b) No
If yes, go to Q18, if no, go to Q19

Q18. Who do you know that is affected?
a) A friend
b) A family member
c) A spouse
d) A neighbor
e) Other, specify……………………………………………………………………………………………………

Q 19. Do you think discolored teeth can be whitened?
   a) Yes
   b) No

Q20. Which tooth whitening methods are you aware of?
   a) Office and home bleaching
   b) Micro abrasion technique
   c) Porcelain or composite crowns
   d) Masking
   e) Prophylactic scaling and polishing
   f) None

Q21. Do you consider tooth whitening to be a successful form of treatment?
   a) Yes
   b) No

Q22. In your opinion, would tooth whitening methods improve your self esteem?
   a) Yes
   b) No

THANK YOU VERY MUCH
JINSI:  MWANAMUME [ ]  MWANAMKE [ ]
MIAKA: [ ]
KAZI : .................................................................
UNAISHI WAPI:

SWALI 1: Umewahi kumwona daktari wa meno?
   a) Ndio
   b) La
Kama la, jibu swali la 2, kama ni ndio, enelea kwa swali la 3

SWALI 2: Ni kwa nini hujawahi kumwona daktari wa meno?
   a) Sina shida yeyote ya meno
   b) Nimekosa wakati wa kumwona
   c) Sidhani ni lazima kumwona
   d) Sina uwezo kifedha
   e) Sijui kwa nini

SWALI 3: Ni lini mara yako ya mwisho kumwona daktari wa meno?
   a) Wiki moja iliopita
   b) Mwezi mmoja uliopita
   c) Mwaka mmoja uliopita
   d) Siwezi kukumbuka
   e) Sijawahi kumwona daktari wa meno

SWALI 4: Sababu ya kumwona daktari wa meno ilikuwa nini?
   a) Nilikuwa naumwa na jino
   b) Meno yalikuwa yanatingika
   c) Ni maendelezo ya matibabu
   d) Humwona daktari wa meno kama mazoea
   e) Menno yang badilisha rangi

SWALI 5: Unafahamu maana ya meno kubadilisha rangi?
   a) Ndio
   b) La
Kama jibu lako ni ndio, jibu swali la 6, kama jibu lako ni La, enelea kwa swali la 8

SWALI 6: Ulifahamu maana ya meno kubadilisha rangi kupitia chombo gani?
a) Nilisoma kwa gazette  
b) Nilifahamu kuptia daktari wa meno  
c) Nilifahamu kutokea kwa marafiki  
d) Nilifahamu kuptia njia ya mtandao  
e) Kama si kwa njia zilizotajwa, elezea………………………………………..  

SWALI 7: Eleza unavyofahamu kutokana na jina meno kubadilisha rangi?
………………………………………………………………………………………………………………………………….

SWALI 8: Unadhani daktari wa meno anaweza kusababisha meno kubadilisha rangi?  
a) Ndio  
b) La  
Kama jibu lako ni ndio, jibu swali linalofuata, kama jibu lako ni la, endelea kwa swali la 10  
SWALI 8: Eleza jinsi daktari wa meno anaweza kusababisha meno kubadilisha rangi?
…………………………………………………………………………………………………………………………………..

SWALI 9: Eleza aina za meno kubadilisha rangi unazozifahamu?
……………………………………………………………………………………………………………………………..
……………………………………………………………………………………………………………………………..

SWALI 10: Unamjua mtu yeyote mwenye meno zilizobadilisha rangi?  
a) Ndio  
b) La  
SWALI 11: Unaandamana na watu hawa kwa njia gani?  
a) Huwachekelea  
b) Huwachachele majina ya kidharau  
c) Hukaa mbali na wao  
d) Hujaribu kusaka matibabu kwa nafsi yao  
e) Sijui  
SWALI 12: Unadhani vyakula tunavyopika husababisha meno kubadilisha rangi?  
a) Ndio
b) La

SWALI 13: Kama jibu lako ni ndio, eleza ni vyakula gani?

SWALI 14: Unadhani madawa yanaweza kusababisha meno kubadilisha rangi?
   a) Ndio
   b) La

Kama jibu lako ni ndio, jibu swali linalofuata, Kma ni La, endelea kwa swali la 17

SWALI 16: Eleza ni aina gani ya madawa?

SWALI 17: Unafahamu magonjwa yeyote yanatosababisha meno kubadilisha rangi?
   a) Ndio
   b) La

SWALI 18: Ni nani unayemjua ambaye ameadhirika?
   a) Rafiki
   b) Kaka au dada yako
   c) Bibi au bwana
   d) Jirani
   e) Kama si waliotajwa, eleza

SWALI 20: Unafahamu matibabu yalioko ya meno yaliobadilisha rangi?
   a) Ndio
   b) La

SWALI 21: Ni njia gani za matibabu unazozifahamu?

SWALI 22: Udhani matibabu haya ni ya muhimu?
   a) Ndio
   b) La

SWALI 22: Kwa maoni yako, ni ukweli kusema matibabu haya yana ngwenje?
   a) Ndio
   b) La