AWARENESS OF PLAQUE AND CALCULUS AND THEIR ROLE IN CAUSATION OF PERIODONTAL DISEASE IN AN ADULT POPULATION IN NAIROBI.

RESEARCH PROPOSAL FOR A COMMUNITY DENTISTRY PROJECT
SUBMITTED IN PARTIAL FULFILMENT OF THE AWARD OF BACHELOR OF DENTAL SURGERY DEGREE OF THE UNIVERSITY OF NAIROBI

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**SUMMARY:**

Plaque and calculus are acquired tooth integuments which play a significant role in causation and progression of periodontal disease. It is therefore important to have knowledge on the actual level of awareness of the general population about the role of played by these integuments in causing periodontal disease hence this is the main objective of this study.

A cross-sectional study will be carried out among adult patients visiting the University Dental Hospital in the months of August and September 2005. Interviewer-administered questionnaires will be given to respondents who will be expected to fill them truthfully and return them.

Among others, variables sought include age and sex of respondents, their oral hygiene habits and knowledge about plaque and calculus.

A total of 385 questionnaires will be prepared and dispatched to adult patients presenting at the oral diagnosis clinic during the period of the study and who will consent to participate. Information gathered may help in understanding the level of public awareness on tooth integuments and their role in causing periodontal disease in relation to oral health status.
Introduction

Plaque is a biofilm formed of bacteria in a matrix of extracellular bacterial polymers, salivary and/or gingival exudate products and food debris. Calculus is mineralized plaque. The ions causing mineralization (calcium, phosphate among others) are mainly derived from saliva and get incorporated into the plaque. Plaque usually develops after oral hygiene measures like tooth brushing and accumulates to high levels with poor oral hygiene. Initially, the bacteria found in plaque are relatively harmless as far as periodontal disease initiation is concerned but as plaque gets older, it gets colonized by more virulent and destructive bacteria, the so-called periopathogenic bacteria. Calculus is tightly adherent to the tooth at both the supragingival and subgingival surfaces. Continued plaque and calculus accumulation leads to change in environmental factors. As plaque and calculus progress subgingivally, the complexity of the biofilm changes with the bacteria at the bottom of the pocket producing hydrolytic enzymes. These enzymes are destructive to periodontal tissues. The gingiva is first affected leading to gingivitis that progresses to periodontitis if plaque control measures are not undertaken.

Periodontal disease is classified as either gingivitis or periodontitis. While gingivitis usually presents as red, painful, swollen and bleeding gums and bad odour emanating from the mouth, periodontitis presents with similar symptoms but with additional loss of attachment of teeth both from the alveolar bone and gingival recession. One local source puts the prevalence of periodontitis in Kenya at about 10%. On a global scale, studies done, however, have indicated that there is a much higher prevalence of periodontal disease. American surveys have shown that the prevalence of periodontal disease increases from 29% at age 19-44 years to 50% in people aged more than 45 years.

Due to the high incidence of periodontal disease in the general population in mind and the relatively poor prognosis that it carries if unchecked, this prompted the study to be carried out. The study will be carried out to assess the level of awareness of Nairobi residents on the role of acquired tooth integuments in causation of periodontal disease. This is coupled to the fact that many people with these integuments in the general population cannot relate their oral hygiene habits to their periodontal health status.
The importance of the findings of this study once it is complete is that it will give an inkling into how informed the Kenyan population is on the essence of having good oral hygiene habits. The results can then be used in formulating policies and implementing measures to undertake public awareness campaigns on good oral hygiene practices and the various remedial measures that can be done in case one already has calculus. The dental healthcare provider will also benefit as this information will assist them to be more aggressive in advising and motivating his patients on how to maintain good oral health and thus prevent complications arising from periodontitis.
LITERATURE REVIEW:

Dr. M.W Mwacharo recently conducted a study in a rural Kenyan community in Kiambu District in which she sought to find out the oral health status and oral health seeking behaviour of the study population. A total of 370 (138 male and 232 female) people were interviewed using questionnaires. Whereas 226 (60.4%) of the respondents had heard of gum disease, only 26 (11.5%) and 40 (17.7%) respectively mentioned not brushing teeth and germs as causes of gum disease. A total of 115 (50.9%) respondents didn’t know any causes of gum disease and the remaining 41 (18.1%) gave wrong reasons such as bad food, rough toothbrushes and fever. On signs of gum disease, 96 (41.9%) mentioned swelling of the gums, 70 (30.6%) mentioned bleeding gums and 26 (11.3%) knew other signs like pus exudation and mobile teeth. Only 104 (27.9%) respondents knew correctly that regular tooth brushing prevents gum disease.

In another study carried out on aggressive periodontitis in Brazil, Susin and Albandar sought to assess the prevalence of aggressive periodontitis and the risk associated with demographic variables, smoking behavior, and other periodontal variables in a young urban population in southern Brazil. A representative sample of 612 subjects aged 14 to 29 years were sampled using a multistage probability method. A full-mouth clinical examination of six sites per tooth and an interview were performed in a mobile examination center. Aggressive periodontitis was found in 5.5% of the subjects. The disease occurred equally among males and females, but was twice as prevalent among non-whites than whites. In the age groups 20 to 24 years and 25 to 29 years, the subjects had a significantly higher prevalence of tooth loss (90.2% versus 40.4% and 86.1% versus 43.4%), and mean number of missing teeth (2.6 versus 0.9 and 3.4 versus 1.5), than subjects without attachment loss. The subjects also had significantly higher percentages of sites with dental plaque, gingival bleeding, and supragingival calculus than normal subjects. The risk for aggressive periodontitis was higher in the 25- to 29-year than the 14- to 19-year age groups. It was concluded that socioeconomic status, smoking, and dental calculus were significant risk indicators of aggressive periodontitis in the study population.

Susin and colleagues, while studying the risk indicators and epidemiology of gingival recession in an urban Brazilian population, interviewed 1460 subjects by
questionnaires and had full mouth examination done. More than half (51.6%) showed gingival recession. The prevalence, extent, and severity of recession correlated with age. Recession showed a nonlinear relationship with age, with 25 to 50 year olds showing the highest level of recession. Using a multivariable model, cigarette smoking and presence of supragingival calculus were the factors most significantly associated with localized and generalized recession. In conclusion, the investigators found out that the high level of gingival recession in this Brazilian population may be primarily related to destructive periodontal disease and is significantly associated with a high level of supragingival dental calculus.

Tan\(^4\), in a study into bacterial viability within human supragingival dental Calculus, harvested supragingival calculus from patients with moderate to severe chronic periodontitis. After freezing, cryosectioning and staining, the sections were examined with fluorescence microscopy and identified, using the bacterial viability stain, viable bacteria within lacunae/cavities of supragingival calculus. From this study, it appears that viable aerobic and anaerobic bacteria may be present within supragingival calculus specifically within the internal channels and lacunae. Clinically, this may be important, since incomplete removal of supragingival calculus may expose these reservoirs of possible pathogenic bacteria and be a factor in the recurrence of periodontal diseases after treatment.

In another study\(^5\) done in the United States, researchers sought to assess the prevalence and extent of gingival recession, gingival bleeding, and dental calculus in adults in the United States, using data collected in the third National Health and Nutrition Examination Survey (NHANES III). Gingival recession, gingival bleeding, and dental calculus were assessed at the mesio-buccal and mid-buccal surfaces in 2 randomly selected quadrants, one maxillary and one mandibular in a group consisting of 9,689 persons 30 to 90 years of age obtained by a stratified, multi-stage probability sampling method between 1988 and 1994. Among other findings, 91.8% of the people had calculus, and 55.1% had subgingival calculus. The investigators concluded that dental calculus, gingival bleeding, and gingival recession are common in the U.S. adult population. In addition to their unfavorable effect on esthetics and self-esteem, these conditions also are associated with destructive periodontal diseases and root caries. Appropriate measures to
prevent or control these conditions are desirable, and this may also be effective in improving the oral health of the U.S. adult population.

Taani while seeking to provide baseline data on periodontal awareness and health knowledge, and to assess patterns of dental attendance behaviour among 20 to 60 year-old Jordanian adults, prepared and distributed questionnaires which were later returned. About one-quarter of adults reported 'gum bleeding' on brushing, but more subjects (40.4%) believed that they had periodontal disease. Also, 47% of the participants thought that they had a 'rough tooth surface', 16% had 'gum irritation' and 25% had 'bad breath'. There were no statistically significant differences between genders with regard to responses on periodontal awareness (P >0.05). The majority of adults incorrectly defined the meaning of dental plaque and did not know its role in the aetiology of gingival disease. Conversely, the majority of participants (60.8%) were aware that gingival bleeding upon brushing indicated the presence of periodontal disease that can be prevented by brushing and flossing (63.4%), mainly before going to bed (73.9%). He concluded that knowledge and awareness concerning periodontal disease is still poor in Jordan, therefore, more dental health education is needed to improve oral health.
Problem statement:
There is genuine need to study how aware the public is on the role of tooth integuments (A reflection of their oral hygiene status) in causation of periodontal disease.

Justification of the study:
There is a large number of undiagnosed or untreated periodontal disease patients whose plaque control measures are not up to expectation. There is also need to educate and inform diagnosed patients and the general public on the role of plaque and calculus, the control of which is crucial in preventing such eventualities as premature tooth loss and caries.

Objectives:
Main objective
To determine the level of awareness of the study population on the role of acquired tooth integuments in causing periodontal disease.

Specific objectives
1. To determine the oral hygiene habits used by the study population, and frequency of application.

2. To relate the oral hygiene practices (if any) of the study population with their oral hygiene status and therefore determine how susceptible they are to development and progression of periodontal disease, especially periodontitis.

Variables sought:
Independent variables:
1. Age
2. Sex
3. Past dental history.

Dependent variables:
1. Occupation
2. Income level.
3. Tooth brushing and aids to tooth brushing.
4. Knowledge about plaque and calculus.
Hypothesis

Majority of the adult population living in Nairobi is not aware that plaque and calculus play a role in causation of periodontal disease.

METHODOLOGY:

Study area:
The study will be carried out at the University of Nairobi Dental Hospital located on Argwings Kodhek Road in the outskirts of the city of Nairobi. It is the only hospital offering clinical training to undergraduate students pursuing the Bachelor of Dental Surgery degree course as well as postgraduate students in various fields of dentistry in Kenya. It is also one of two referral hospitals in Kenya for oral and maxillofacial conditions and complications.

Study population:
This study will be carried out in an adult population in Nairobi presenting at the oral diagnosis clinic of the University Dental Hospital.

Study design:
This will be a descriptive cross-sectional study. The subject will be expected to fill a questionnaire on their past and present experience (if any) with dental plaque and calculus. The questionnaire will consist of structured self-explanatory questions in English. It has to be appreciated here that respondents who do not understand English will fill it with the aid of an interpreter.

Sample size:
Using a prevalence rate of $50\%$,
Using $95\%$ confidence level and $Z$ value $1.96$,
Sample size $N = \frac{Z^2 \times P(1-P)}{C^2}$

Where $Z$ = $Z$ value
$P$ = Prevalence
$C$ = $1$ - Confidence level

Hence $N = 1.96^2 \times 0.5(1-0.5)
\quad (1-0.95)^2
\quad = 385$ People
**Inclusion criteria:**
Consenting patients will be given questionnaires to fill.

**Exclusion:**
Non consenting patients.

**Data collection tools:**
Questionnaire(Interviewer-administered)

**Constraints anticipated:**
1. Logistics: The investigator is a student with no source of income and thus limiting his ability to meet the financial demands of the study. Time to carry out the study will also be limited by the very tight and demanding clinical schedules.
2. The large size of the Nairobi population may mean that the sample size selected might not be truly representative of the public awareness concerning the study topic.
3. The selected sample of the patients could already be biased by virtue of them having sought dental treatment.

**Perceived benefits:**
1. Partial fulfillment of the award of BDS degree.
2. Practical hands-on experience in community dentistry on the part of the investigator.
3. Improvement in the data available on the study topic.

**Ethical considerations:**
The study will be carried out after the proposal has been approved by the research standards and ethical committee.
No coercion, inducement or force will be used in trying to get respondents fill the questionnaires and they will only do so out of their own free will.
BUDGET

Proposal development

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GRAND TOTAL: 4,020
REFERENCES:
APPENDIX

THE ROLE OF CALCULUS AND PLAQUE IN CAUSATION OF PERIODONTAL DISEASE

QUESTIONNAIRE

Questionnaire no......................

Date......................

Age.............(Years)
Sex..............
Occupation.................
Highest education level attained:

☐ Primary
☐ Secondary
☐ College/University
☐ Post College

Level of income(Kshs):
☐ 0-5,000
☐ 5,001-10,000
☐ 10,001-20,000
☐ 20,001 and above

1. Have you ever been to a dentist?

☐ Yes  ☐ No

2. If yes, why did you go to the dentist?

☐ Toothache
☐ Impaction
☐ Sensitivity
☐ Malalignment
☐ Trauma/injury
☐ Others(specify)..............................................................................................

3. If you answered question 2 what kind of treatment was carried out?

.....................................................................................................................

4. Do you think you take good care of your teeth?

☐ Yes  ☐ No

If your answer is no, go to question 9. If yes, answer question 5.

5. If your answer was yes for question 4, how?
6. What do you use to clean your teeth?
   a) Commercial toothbrush
   b) Chewing stick
   c) I do not clean my teeth
   d) Others (Specify) .................................................................

7. If your answer was yes to either a) or b), in question 6, after how long do you usually change your toothbrush/chewing stick?

       Days/Weeks/Months/Years

8. How long does each of your tooth brushing/cleaning sessions last?
       Minutes.

9. Have you ever experienced any of these symptoms? (Tick where appropriate)
   a) Sensitivity
   b) Bleeding gums
   c) Bad breath
   d) Loose teeth

10. Have you ever observed any of the following on your teeth or on someone else’s teeth? (Tick where appropriate)
    - Coloured deposits on the teeth
      - Yes
      - No
    - Hardened deposits on the teeth
      - Yes
      - No
    - White sticky material on the surface of teeth
      - Yes
      - No
    *If yes to any, answer the next question. If no, go to question 12*

11.a) Where did you observe these deposits?
    a) The inner side of lower teeth
    b) On all teeth
    c) Around the gum margin(s)
    d) Elsewhere (specify) ..........................................................
b) Did you/did the person on whom you saw the deposits seek treatment for them?
   □ Yes □ No □ I don’t know

c) If you had deposits such as the ones mentioned in question 10 above, would you consider it necessary to visit a dentist?
   □ Yes □ No

d) What treatment/advice would you expect to receive?

12. Do you think these deposits play any role in causation of gum disease?
   □ Yes □ No

13. Do you know what would happen if gum disease is left untreated?
   □ Yes □ No

14. If yes, what do you think would happen? *(You can tick more than once)*
   □ Pain and sensitivity in the gums
   □ Gum swelling
   □ Bad breath
   □ Tooth loss
   □ Bleeding of the gums
   □ I don’t know
   □ Others (Specify)

15. Have you ever visited a dentist for professional cleaning of teeth (scaling)?
   □ Yes □ No.