

**PERIODONTAL STATUS, TREATMENT NEEDS AND AWARENESS
OF PERIODONTAL DISEASES AMONG ADULT CARDIAC PATIENTS
ATTENDING MUHIMBILI NATIONAL HOSPITAL, DAR ES SALAAM,
TANZANIA**

Kessy Frank Sifael, DDS

**MDent (Restorative Dentistry) Dissertation
Muhimbili University of Health and Allied Sciences
October, 2014**

**PERIODONTAL STATUS, TREATMENT NEEDS AND AWARENESS
OF PERIODONTAL DISEASES AMONG ADULT CARDIAC PATIENTS
ATTENDING MUHIMBILI NATIONAL HOSPITAL, DAR ES SALAAM,
TANZANIA**

By

Kessy Frank Sifael

**A Dissertation Submitted in (Partial) Fulfillment of the Requirements for the Degree
of Master of Dentistry (Restorative Dentistry) of
Muhimbili University of Health and Allied Sciences**

**Muhimbili University of Health and Allied Sciences
October, 2014**

CERTIFICATION

The undersigned certifies that he has read and hereby recommend for acceptance by Muhimbili University of Health and Allied Sciences a dissertation entitled; “**Periodontal Status, Treatment Needs and Awareness of Periodontal Diseases among Adult Cardiac Patients Attending Muhimbili National Hospital Dar Es Salaam Tanzania**”, in (Partial) fulfillment of the requirements for the degree of Master of Dentistry (Restorative Dentistry) of Muhimbili University of Health and Allied Sciences.

Dr. E. G. S. Mumghamba

(Supervisor)

Date



Dr. Tumaini Simon

(Co-Supervisor)

Date

DECLARATION AND COPYRIGHT

I, **Kessy Frank Sifael**, declare that this **dissertation** is my own original work and that it has not been presented and will not be presented to any other university for a similar or any other degree award.

Signature..... Date.....

This dissertation is a copyright material protected under the Berne Convention, the Copyright Act 1999 and other international and national enactments, in that behalf, on intellectual property. It may not be reproduced by any means, in full or in part, except for short extracts in fair dealing, for research or private study, critical scholarly review or discourse with an acknowledgement, without the written permission of the Directorate of Postgraduate Studies, on behalf of both the author and the Muhimbili University of Health and Allied Sciences.

ACKNOWLEDGEMENT

It is not possible for a single individual to cover all the aspects that has made this dissertation into being, and I am therefore deeply grateful to all those who have, with such good grace given their time and energy to supply valuable opinions, facts or even moral support.

First and foremost I am greatly thankful to the Almighty God for granting me this opportunity, good health and strength enough willed to work on this dissertation, without which this work could have been impossible to complete.

My sincere gratitude goes to my principal supervisor Dr. E. G. S. Mumghamba. He has been an outstanding inspiration and has provided guidance to me in academic, spiritual and personal endeavours. His tireless effort, encouragement and constructive inputs have made this work complete. May Almighty God bless you.

I also wish to extend my appreciation to my co-supervisor Dr. Simon Tumaini for his valuable comments and supports to this work.

Special thanks to Mr. Simon Mushi, Dr. Lucy Mmary, Dr. Karpal Singh for assisting me in data collection, entry and analysis.

I would also like to express my sincere thanks to Dr. Robert Mvungi, head cardiac unit Muhimbili National Hospital for allowing me to collect data from their department, without forgetting Dr. Tatizo Waane, Dr. Peter Kisenge, Dr. Tulizo Shemsanga and Ms. Prisca Kamugisha for their crucial assistance in data collection from research patients during the entire period of study.

Thanks to the MUHAS management through the Director of Postgraduate Studies who granted permission for this study to be conducted and the Ministry of Health and Social Welfare for providing funds.

My heartfelt gratitude goes to my beloved wife Devotha Leonard Kessy and our family for their support, encouragement and prayers that strengthened me in the moment of despair during the entire period of study.

Last but not least, my special thanks to my parents for their love, care and for planting a seed of desire to learn in me. May God bless them abundantly.

DEDICATION

This dissertation work is affectionately dedicated to my lovely wife and my parents.

ABSTRACT

Background

The periodontal diseases (PDs) have recently been reported to be associated with cardiovascular diseases (CVDs). In Tanzania there is no available information on the matter. In Tanzania, the most common cardiovascular diseases includes: hypertension, cardiomyopathy, stroke, angina pectoris valvular heart diseases, rheumatic heart disease, congestive cardiac failure, ischemic heart disease.

Objective

The aim of this study was to determine the periodontal status, treatment needs and awareness of periodontal diseases among adult cardiac patients attending the Muhimbili National Hospital, Dar-es-salaam Tanzania.

Methodology

This was a hospital based descriptive cross-sectional study conducted between July and December 2013. No sampling was done. All consented patients were included in the study. The study participant's socio-demographic factors were gathered through self administered structured questionnaires in the cardiac unit, followed by clinical examination carried out by single examiner in the dental building for assessing the presence of plaque, calculus, gingival bleeding on gentle probing, periodontal pocket depth in (mm), gingival recession in (mm) and periodontal attachment loss in (mm). Also tooth mobility and missing teeth were assessed accordingly.

A sample of 340 cardiac patients, 116 male and 224 female subjects aged 18 years and above who attended the Muhimbili Cardiac clinic during the study period was enrolled in the study. All information obtained were coded, entered in a computer and analyzed using SPSS version 16.0. Frequencies and percentages were chosen to show the distribution of periodontal diseases in adult cardiac patients. Chi-square test was used to compare proportions between sex and age group studied. The t- test was used for comparing the mean number of sextants examined according to the age groups and sex respectively, and the level of statistical significance was set at $p < 0.05$.

Results

Of the 340 study participants, 224 (65.9%) were female providing a male to female ratio of about 1:2. It was observed that, majority of the males (75.9%) and females (74.6%) participants were not aware of the gum diseases and their differences were not statistically significant. Majority of the patients presented with plaque, calculus and gingival bleeding on gentle probing in one or more of the teeth surfaces examined.

The prevalence of gingival bleeding on gentle probing was 79.3% among all cardiac patients studied, among males (84.8%), among female (73.5%) with mean number of sites with gingival bleeding 11.11 ± 6.27 . The prevalence of dental plaque was 91.8% among all cardiac patients studied, among males (97.3%) and among females (95.6%) with mean number of sites with plaque 12.28 ± 6.84 . The prevalence of dental calculus was 96.5% among all cardiac patients studied, among males (98%), among females (95.8%) with mean number of sites with calculus 15.0 ± 6.42 .

The prevalence of mobile teeth was 17% among all cardiac patients studied with mean number of mobile teeth 0.5 ± 1.58 . Majority with mobility grade II.

The prevalence of missing teeth was 90.9% among all cardiac patients studied. The mean number of missing teeth was 3.47 ± 3.48 among males and 3.15 ± 3.06 among females. There was statistical significance difference in mean number of missing teeth between the age groups. Majority of tooth loss was due to dental caries 91.4% followed by periodontal diseases 7.3% and the least was due to trauma (1.3%).

The prevalence of periodontal pockets greater than 3.5 mm was 9.4% among all cardiac patients studied. Periodontal pockets were more common in the age groups 45-64 and 65+ years. There was significant difference in mean sites with periodontal pockets less than 3.5mm between age groups. The prevalence of gingival recession was 20.5% among all cardiac patients studied with mean 5.39 ± 14.63 with no significant difference in the mean number between males and females as well as between age groups. The prevalence of periodontal attachment loss was 20.3% among all cardiac patients studied with mean 5.69 ± 15 . There was

no difference in mean number of sites with periodontal attachment loss between males and females as well as between age groups.

Practically every participant needed oral hygiene instructions and professional scaling and root planning (TN-1 and TN-2). Scaling and root planing (TN-2) was needed to all participants. Complex periodontal treatment needs required to about 0.9% all over 45 years old for the patients with periodontal pockets greater than 5.5 mm.

Conclusion

This study has shown that majority of the patients were not aware of the gum diseases. Majority of the patients presented with plaque, calculus and gingival bleeding on gentle probing in the teeth surfaces examined. Teeth mobility was observed in few subjects examined of which majority of the examined teeth had grade two mobility. Periodontal diseases accounted the second cause of teeth loss. Periodontal pockets were more prevalent in the age groups of forty five years and above. About one fifth of the studied population had gingival recession and the prevalence increased with age. The periodontal treatment needs for the study population include mainly oral hygiene instructions followed by professional scaling and root planning. The need for complex periodontal therapy was limited to a smaller proportion of the study population.

Recommendations

1. More effort is needed to provide oral health information (education) to general public.
This can be done to:
 - Individuals (attendance to dental clinics for check up and treatment)
 - Cardiac patients at clinics to reinforce effective tooth brushes for needy patients
 - Medical personnel to include some dental contents in medical, nursing curricular to increase the awareness.
 - Communities through media (radio and television programs).
2. Oral health promotion is to be instituted to improve oral hygiene so as to prevent gingivitis and periodontal diseases to the general population.

TABLE OF CONTENTS

CERTIFICATION	ii
DECLARATION.....	iii
ACKNOWLEDGEMENT	iv
DEDICATION.....	v
ABSTRACT	vi
LIST OF TABLES.....	xi
ABBREVIATIONS	xii
INTRODUCTION	1
Background.....	1
Literature Review.....	5
PROBLEM STATEMENT.....	8
RATIONALE	9
OBJECTIVES.....	10
Broad objective	10
Specific objectives	10
METHODOLOGY	11
Study area.....	11
Study design.....	11
Study population	11
Sample size	11
Sampling technique.....	12
Inclusion criteria	12

Exclusion Criteria	12
Ethical Issues	12
Data collection	13
Calibration of the examiner and reliability of the clinical data	13
Questionnaire and clinical examination	15
Data management and data analysis	19
RESULTS	20
DISCUSSION.....	31
CONCLUSION	35
RECOMMENDATIONS.....	36
REFERENCES	37
APPENDICES	43
Appendix I (a): Informed Consent Form (English version).....	43
Appendix I (b): Informed Consent Form (Kiswahili version)	46
Appendix II (a): Questionnaire (English version)	49
Appendix II (b): Questionnaire (Swahili version)	53
Appendix III: Clinical Examination Form.....	57

LIST OF TABLES

Table 1:	Intra-examiner reproducibility for each condition studied.....	14
Table 2:	Distribution of the study population by social-demographic factors.....	20
Table 3:	Distribution of the study population by type of the cardiovascular disease.....	21
Table 4:	Distribution of the study participants regarding awareness of gum diseases by age and sex.....	22
Table 4.1:	Distribution of study participants regarding awareness of gum diseases to have an effect on cardiovascular disease by age and sex.....	23
Table 5:	Mean sites \pm SD with gingival bleeding, calculus and plaque between upper and lower (0-96 sites) and between anterior (0-120 sites) and posterior (0-72 sites) of teeth among age groups.....	24
Table 5.1:	Mean sites \pm SD with gingival bleeding, calculus and plaque between upper and lower (0-96 sites) and between anterior (0-120 sites) and posterior (0-72 sites) of teeth among sex.....	25
Table 6:	Percentage distribution of number of mobile teeth by sex age group and grade.....	26
Table 7:	Percentage distribution of number of teeth lost by age and sex.....	27
Table 8:	Mean number of sites \pm SD with periodontal pockets, gingival recession and attachment loss by sex.....	28
Table 8.1:	Mean number of sites \pm SD with periodontal pockets, gingival recession and attachment loss by age group.....	29

ABBREVIATIONS

ACSs	Acute Coronary Syndromes
CAD	Coronary Artery Disease
CAL	Clinical Attachment Level
CDC	Centers for Disease Control
CEJ	Cementoenamel junction
CHD	Coronary Heart Disease
CI	Confidence Interval
CPI	Community Periodontal Index
CPITN	Community Periodontal Index of Treatment Needs
CRP	C - reactive Proteins
CVD(s)	Cardiovascular Diseases
DMFT	Decayed, Missing, Filled Tooth
FIT	Focal Infection Theory
GIT	Gastrointestinal Tract
GUT	Genital Urinary Tract
HSPs	Heat-Shock Proteins
IHDs	Ischemic Heart Diseases
MDENT	Masters of Dentistry

MNH	Muhimbili National Hospital
MUHAS	Muhimbili University of Health and Allied Sciences
NBTE	Non Bacterial Thrombolytic Endocarditis
NBTV	Non Bacterial Thrombolytic Vegetation
OPG	Orthopantomograph
P	Probability Value
PAL	Periodontal Attachment Loss
PD(s)	Periodontal Diseases
PTLBW	Preterm Low Birth Weight
PVD	Peripheral Vascular Disease
RR	Relative Risk
SPSS	Statistical Package for Social Sciences
TN-0	Treatment Need category - 0
TN-1	Treatment Need category - I
TN-2	Treatment Need category - II
TN-3	Treatment Need category - III
USA	United States of America
WHO	World Health Organization

INTRODUCTION

Background

Periodontal diseases (PDs) are diseases which involve the periodontal structures in particular the periodontal ligaments, gingiva, alveolar bone and cementum (Ranney 1993). The diseases are some of the most common infectious diseases seen in humans characterized by gingival inflammation, loss of connective tissue and bone from around the roots of the teeth, which leads to eventual tooth exfoliation. Periodontal (gum) diseases include: Gingival diseases, Chronic periodontitis, Aggressive periodontitis, Periodontitis as a manifestation of systemic diseases, Necrotizing periodontal diseases, Abscess of periodontium, Periodontitis associated with endodontic lesions and Developmental or acquired deformities and conditions (Armitage 1999). The main cause of the diseases shown to be bacterial plaque (also called biofilm), which is a sticky; colorless film that constantly forms on teeth. Bacterial plaque pathogens include *Aggregatibacter actinomycetemcomitans*, *Porphyromonas gingivalis*, and *Tannerella forythia* (Socransky and Haffajee 2003, Ready et al. 2008). These bacterial plaque pathogens form a part of the normal residential micro-flora in the oral cavity, but when the ecological balance is disturbed, it may favour the initiation, establishment and progression of gingivitis advancing into periodontitis, though, not always the case (Slots 2004). The signs and symptoms of periodontal diseases include gums bleeding easily when one brushes or when probed gently during clinical examination, gums are inflamed and sensitive to touch, (interdental papillae may look bluish-red in color), possible bad breath and bad taste, gums may begin to pull away from the teeth (attachment loss), loss of bone, (horizontally, angular on X-ray), Pockets of equal or greater than 3.5mm, gum boils or abscesses may develop, teeth look longer as gums begin to recede, front teeth may begin to drift, showing spaces, and teeth may become mobile or loose.

The concept that dental diseases may influence distant structures is to some extent based on the theory of “focal infection” which emerged at the beginning of the twentieth century. It was based on personal clinical experience of a few dentists and physicians (O'Reilly and Claffey 2000) and it came to an end in the early fifties. However, in the late eighties some clinicians

continued to propose that certain bacteria and its products within the periodontal pocket could enter the bloodstream and may become harmful to the whole body (Thoden and Abraham-Inpijn, 1984). Recent advancement in molecular biology, microbiology, immunology and genetics has lead researchers to resume the study of the relationship between oral and systemic diseases with a more scientifically oriented approach. Epidemiological and interventional studies on humans have revealed close associations between periodontal diseases and systemic diseases, such as cardiovascular disease (CVD) (Nakano et al. 2009), preterm low birth weight (PTLBW) (Vettore et al. 2008), diabetes mellitus (Silvestre et al. 2009), respiratory infection (Luckfeld et al. 2008), and osteoporosis (Reddy et al. 2002). From those results, it is not an exaggeration to state that periodontal infection represents a significant risk factor for various systemic diseases. Studies have shown that *Porphyromonas gingivalis* has been reported to be involved in the development of systemic diseases due to systemic inflammation with increased circulating cytokines and mediators, direct infection, and cross-reactivity/molecular mimicry between bacterial antigens and self-antigens (Seymour et al. 2007). Furthermore, periodontal pathogens including *P. gingivalis* have been detected in heart valve lesions and athermanous plaque (Nakano et al. 2009).

The relationship between cardiovascular diseases and periodontitis was first reported at the end of the 1980s (Mattila et al. 1989). In the recent decade, the epidemiological causal associations between periodontal disease and cardiovascular diseases have been reconsidered (Hujoel et al. 2001). According to Focal Infection Theory (FIT), "foci" of sepsis at distant sites were responsible for the initiation and progression of a variety of inflammatory diseases (Pallasch and Wahl 2000). For example the most visible and investigated focal infection is the metastasis of microorganisms from various body locales (most notably the skin, mucosa, oral cavity, GIT and GUT) to a damaged valve of the heart to infect a non-bacterial thrombotic endocarditis or vegetation (NBTE or NBTV). Due to injury to the cardiac valves (mostly the mitral and aortic valves), a layer of platelets and fibrin the (NBTV or NBTE) deposit on these valves and incorporate circulating bacteria or fungi into this matrix resulting in bacterial or infective endocarditis (Thomas et al. 2003). But a direct causal relationship between periodontitis and atherosclerotic cardiovascular disease is not yet established. However,

several biologically plausible mechanisms were proposed. The first was; direct effect of oral infections. In support of this pathway, two oral bacteria *P. gingivalis* and *Streptococcus sanguis* express virulence factors, the collagen-like platelet aggregation associated proteins that induce platelet aggregation (Herzberg and Mayer 1998). This infection and inflammation play an important role in the initiation and progression of atherosclerosis. A number of studies implicate a role of oral infection in this respect; some of which have identified oral bacteria in atherosclerotic plaques (Ford et al. 2005). However, these findings were not able to show whether they actually initiate atherosclerosis or invade an already damaged artery (Cullinan et al. 2009). The second mechanism is the inflammation. It has been proven that moderate to severe periodontitis increases the level of systemic inflammation and has been associated with elevation of circulating cytokines and other inflammatory mediators such as C-reactive protein (CRP) and fibrinogen (Dave and Van Dyke 2008, D'Aiuto et al. 2004). C-reactive protein as a strong and independent risk factor or predictor of cardiovascular disease events (Mora and Ridker 2006), C-reactive protein is an acute-phase reactant primarily produced by the liver in response to infection or trauma. The third mechanism is the cross-reactivity/molecular mimicry. In this theory it is proposed that the immune response to bacterial heat-shock proteins (HSPs) may result in antibodies that cross-react with self heat shock proteins expressed on damaged arterial cells which in turn leads to progression of atherosclerosis (Tabeta et al. 2000). Fourthly, new developments in medical research have linked bacteria being the causal of Heart attack. In that respect, *Chlamydia pneumoniae* has been found in the walls of the blood vessel in the patients reported to have heart attacks (Shor et al. 1999).

The summary of the microbial pathways may be categorized as direct and indirect pathways; Direct pathways - Oral microbes and their by products can gain systemic access via the circulatory system. Gentle mastication can induce endotoxemia and this risk is seen to be elevated according to an increased severity of periodontal disease (Geerts et al. 2002). It has been reported that dental procedures and tooth brushing can induce bacteremias (Kinana et al. 2005, Rajasuo et al. 2004, Roberts et al. 1999). These microbes will attach the fatty plaque in the coronary arteries and accelerate blood clot (thrombosis), which in turn will thicken the arterial walls (atherosclerosis) due to the buildup of fatty proteins. It will obstruct blood flow

(ischemia) and may lead to heart attack. It can also cause inflammation and swelling of the blood vessels as well. Also, the increased blood clotting can damage the lining of the blood vessels. All these events can lead to an increased risk of stroke, which is characterized by either bleeding in the brain because of a ruptured vessel or impaired blood flow to a part of the brain when a vessel is blocked by a clot. Laboratory studies demonstrated the ability of *streptococcus sanguis* and *P. gingivalis* to induce platelet aggregation and hyper-coagulability, increasing the likelihood of thrombus formation, which can lead to ischemic cardiovascular events (Fong et al. 2000; Meyer et al. 1998).

Regarding the indirect pathways, atherosclerosis has a strong inflammatory component (Libby 2000, Ross 1999) and epidemiologic evidence suggests that increased levels of systemic inflammation are predictive of cardiovascular events (Ridker 2000; Ridker et al. 1997). People with periodontal disease have elevated levels of systemic inflammatory markers, such as C-reactive protein (Kowolik et al. 2001) and treatment for periodontal disease has been reported to decrease systemic inflammation levels (Kowolik et al. 2001). The mixed infectious biofilm etiology of periodontitis is known but not fully established in CVD (Persson and Imfeld 2008). Streptococcus species in the *S. mitis* group and *S. anginosus* group have been identified in periodontitis and are known as pathogens in endocarditis possibly transported from the oral cavity to the heart through bacteremia during dental therapies, and tooth brushing. Other bacteria in CVD and periodontitis include *Staphylococcus aureus*, and *Pseudomonas aeruginosa*. *Chlamydia pneumoniae* and *P. Gingivalis* lipopolysaccharide capsels share homology and induce heat-shock protein activity and a cascade of pro-inflammatory cytokine (Persson and Imfeld 2008).

Assessing the periodontal status, treatment needs and awareness of periodontal diseases among cardiac patients will be beneficial to this population since the findings will give the insight on level of awareness, periodontal conditions and their treatment needs. Therefore raising and improving the existing awareness, treatment of those in need, improvement of health services for general and oral health especially in this population. Also there is a need to have baseline information on this type of patients in relation to periodontal diseases as there are reports showing the interrelationship.

Literature Review

Periodontal disease is a worldwide problem (Albandar and Rams 2002). It is among the most widespread diseases in mankind (WHO 1978). It has been reported to affect at least one tooth in 80% of adult worldwide (Pihlstrom et al. 2005). Periodontal disease occurs commonly among adults (Bourgeois et al. 2007; Locker et al. 1998), but also children and adolescents are can be affected (Clerehugh and Tugnait 2001).

In United State of America (USA,) one out of every two American adults aged 30 and over has periodontal disease, according to recent findings from the Centers for Disease Control and prevention (CDC) (Fong et al. 2010).

The study done in Jordan on periodontal awareness, knowledge and pattern of dental attendance reported that only 40.4% of participants were aware of periodontal disease. There were no statistically significant differences between male and female subjects with regard to their responses to the level of periodontal awareness (Quteish 2002).

Periodontal diseases in urban and rural, as well as in child and adult populations in Tanzania are a common problem. Prevalence of plaque and gingival bleeding on gentle probing among young mothers was reported to be very high 100%, together with deep periodontal pocket of 6+mm (Mumghamba et al. 2006). The prevalence of gingival bleeding in Tanzania was also reported to be high (94%), (Lembariti et al. 1988; Baelum 1987). Moreover gingival recession and loss of attachment were commonly found among adult population (Lembariti et al. 1988; Baelum, 1987).

The group of disorders of the heart and vasculature that includes high blood pressure, coronary heart disease (CHD), congestive heart failure, stroke, myocardial infarction and rheumatic heart diseases (Pihlstrom et al. 2005) account for approximately 17 million deaths per annum and 40% of all deaths worldwide, of which atherosclerosis contributed for the vast majority of cases (Seymour et al. 2009). Study done in Tanzania reported higher rates of hypertension in both urban and rural areas particularly among obese and the elderly (Njelekela et al. 2001). In addition to traditional exacerbation factors such as smoking, hypercholesterolemia, hypertension, and diabetes mellitus (Seymour et al. 2009; Kusuyama et al. 2006) periodontitis have been shown to be linked with the development of atherosclerosis (Pihlstrom et al. 2005).

The study done in rural adult of Uygur residents in China aiming at explore the relationship between chronic periodontitis and hypertension, indicate significantly relation between periodontitis and hypertension $p < 0.01$. Another study done in Sweden to analyze the relationship between chronic periodontitis and ischemic heart disease (IHD) among 1056 women aged between 38 to 84 years, in 1992-1993; the results showed that there was no statistically significant difference between numbers of pathological gingival pockets between the two groups (58.1% had one or more pathological pockets in the IHD group compared to 57.6% in the non-IHD group). Therefore periodontitis did not seem to have a statistically significant relationship with IHD (Sterman et al. 2009). Another study done in Brazil to evaluate the periodontal status and periodontal treatment needs in cardiac patients and collected information on socio-demographic information, type of heart disease, presence systemic diseases and oral hygiene (Gymenna et al. 2011); 69% of the respondents reported to have last attended dental visit in more than two years. Periodontal pockets greater than 3.5 mm was diagnosed in 34.3% of the sample and 53.1% of sextants presented dental calculus. Therefore the rate of clinical changes suggestive of periodontal disease was high in the studied cardiac patient. Thus, physicians caring for subjects at CVD risk should consult with dentists/periodontists. Dentists must improve their medical knowledge and also learn to consult with physicians when treating patients at CVD risk. In the study done in 29584 adult in rural Chinese on association between tooth loss and increased risk of stroke and heart disease, results indicated that 28% increased risk of heart disease death (95% CI 17–40%), and 12% increased risk of stroke death (95% CI 2–23%).

Study done on periodontal diseases outcomes and incident of cardiovascular disease, results showed that males with low number of teeth (≤ 10 at base line had significantly higher risk of CVD (Hung et al. 2004) (RR=1.36; 95% CI 1.11-1.67). as compared to males with a higher number of teeth (25 or more). For females with the same reported extent of tooth loss, the relative risk for CVD was 1.64 95% CI 1.31-2.05) as compared to women with at least 25 teeth (Hung et al. 2004). Concerning oral care with tooth brushing in cardiac patients, studies have shown that participants who reported less frequent tooth brushing had a 70% increased risk of a cardiovascular disease event as compared to participants who brushed twice a day

(Richard 2010). Participants who reported poor oral hygiene (never/rarely brushed their teeth) had significantly increased risk of a cardiovascular disease event. There were also significant associations between frequency of tooth brushing and markers of low grade systemic inflammation that is participants who brushed their teeth less often had increased concentrations of both C reactive protein and fibrinogen. Aggressive treatment of periodontal disease can potentially result in the partial reversal of vascular diseases.

Another study was done in Jerusalem, Israel to determine the relationship between periodontal disease measures and coronary artery disease CAD and acute coronary syndromes (ACSs) (Gotsman et al 2007). The results showed that cases with obstructed coronary arteries had significantly more periodontal destruction than those with mild CAD, as shown by mean periodontal clinical attachment level (CAL), a measure of chronic periodontal disease; 5.43 +/- 1.8 versus 4.85 +/- 1.6; P = 0.02), percentage of teeth with CAL greater or equal to 5mm (82.1 +/- 23.4 versus 70.4 +/- 26.9; P = 0.002) and number of missing teeth (8.75 +/- 6.6 versus 6.76 +/- 6.6; P = 0.03). Logistic regression analysis showed that percentage of teeth with CAL greater or equal to 5 mm was significantly associated with CAD severity. Patients with ACS had significantly higher plaque scores. Therefore periodontal destruction measures are significantly correlated with CAD severity, whereas periodontal infectious measures are significantly associated with clinical cardiac status.

The study done among Spanish military personnel on periodontal status and periodontal treatment needs, the results showed that over 90% of those surveyed, was the need for hygiene instructions. The need for scaling and root planing (82%). Complex treatments were needed by a small percentage (4.5%) of the over 25-year-old population (Rafael et al. 2008).

PROBLEM STATEMENT

Chronic inflammatory periodontal diseases are found worldwide and are among the most prevalent chronic infections in humans. Periodontal diseases and cardiovascular diseases are a worldwide problem and Tanzania is no exception. Individuals with severe chronic periodontitis have been reported to have a significantly increased risk of developing cardiovascular diseases.

However, the assessment of periodontal status, treatment needs and awareness of periodontal diseases in adult cardiac patients among people in Tanzania has not been established. Information about the presence, severity of periodontal diseases, awareness and periodontal treatment needs to the adult cardiac patients in Tanzanian populations is not available. CVDs and Periodontal diseases have some common risk factors e.g. smoking, stress, genetics and increasing age. The preventive approach based on “common risk factor approach include health promotion on disease prevention involving health education, community empowerment, legislative policy development, tobacco cessation, improve oral hygiene, professional cleaning, identification and treatment of systemic diseases (Hujuel et al. 2002).

Tanzania being a developing country with merger resources directs most of its resources to life threatening health conditions; as a result oral health delivery system receives a small proportion of resources that may also not be enough for the management of periodontal patients with cardiovascular diseases. Thus periodontal treatment as well as oral health in general among cardiac patients is not taken into consideration despite the fact that patients are not healthy without good oral health and thus treatment of periodontal diseases may reduce the burden of cardiovascular disease problems.

Therefore, the aim of this study is to assess the periodontal status, treatment needs and awareness of periodontal diseases among adult cardiac patients in a study population comprising of patients attending cardiac clinic in Muhimbili National Hospital.

RATIONALE

Periodontal infection obviously merits prevention and treatment as a health problem in itself. Periodontal treatment must be recommended on the basis of the value of its benefits for the oral health of patients, recognizing that patients are not healthy without good oral health. Nevertheless, cardiac patients should be aware of their periodontal status and need for treatment along with the potential preventive benefits of periodontal interventions. The patient should be empowered to understand the importance of preventive Dentistry and the imperative need for regular dental care. Therefore findings from this study have provided baseline data which will assist planners in both oral and general health care improving the provision of services countrywide through both the training and service sectors of general and oral health delivery mechanism. Also results of this study have provided an insight into the periodontal status, treatment needs and awareness of periodontal diseases among cardiac patients. This study is also part of the author's training towards the partial fulfilment of the Master of Dentistry (MDENT) degree program of the Muhimbili University of Health and Allied Sciences.

OBJECTIVES

Broad objective

To determine the periodontal status, treatment needs and awareness of periodontal diseases among adult cardiac patients attending Muhimbili National Hospital during the study period

Specific objectives

1. To determine the level of awareness on periodontal diseases among adult cardiac patients attending for cardiac treatment by age-group and sex.
2. To determine plaque, calculus and gingival bleeding on probing among patients attending cardiac clinic for treatment by age-group and sex.
3. To determine tooth mobility and tooth loss among patients attending cardiac clinic for treatment by age-group and sex.
4. To determine probing periodontal pocket depth, loss of attachment and gingival recession among cardiac patients attending cardiac clinic for treatment by age-group and sex.
5. To estimate the periodontal treatment needs among patients attending cardiac clinic for treatment by age-group and sex.

METHODOLOGY

Study area

This study was conducted at the MUHAS dental clinic as well as cardiac unit in Muhimbili National Hospital. Questionnaires were administered in the cardiac clinic while periodontal and dental examination was done in the dental clinic. Muhimbili National Hospital is a government hospital/institutions located in the City of Dar es Salaam, serving populations of different background, education and different levels of economics. Also Muhimbili National Hospital is a referral hospital where by a large number of patients with cardiovascular diseases is referred for management.

Study design

This was a descriptive cross-sectional study comprising of a questionnaire and clinical periodontal and dental status examination.

Study population

This study included a sample of all patients aged 18 years old and above attending cardiac clinic at Muhimbili National Hospital in Dar es Salaam city during the period of July-Nov, 2013.

Sample size

A sample of 340 patients, (116 males and 224 females) who attended the cardiac clinic and meeting the inclusion criteria was obtained during the study period.

In determining the study sample size, the following formula was used.

$$n = \frac{Z^2 P (1-P)}{e^2}$$

Where;

- n** = Sample size.
- Z** = Standard normal deviation, set at 95% (1.96)
- P** = Proportion in the population estimated to have periodontal diseases (0.5)
- e** = Level of accuracy/precision, set at 5% (0.05).

$$\begin{aligned} \text{Sample size, } n &= \frac{1.96 \times 1.96 \times 0.5(1-0.5)}{0.05 \times 0.05} \\ n &= 384.16 \approx 385 \end{aligned}$$

Sampling technique

All adult patients that attended the cardiac clinic at MNH were invited to take part in the study and only those who consented were recruited consecutively to attain the sample size.

Inclusion criteria

Cardiac patient aged 18 years and above who could communicate verbally, ambulant, not in critical medical condition, dentate and had no restricted mouth opening for clinical examination.

Exclusion Criteria

The exclusion criteria included cardiac patients that were mentally unstable, had oral tumors/cancers, systemic diseases that may negatively influence periodontal conditions (diabetes mellitus, renal diseases, and bronchial tuberculosis) and those who were completely edentulous.

Ethical Issues

Ethical clearance was obtained from the Ethical Clearance Committee of the Muhimbili University of Health and Allied Sciences through authority letter Ref.No.MU/PGS/SAEC/Vol. IX/. After the assessment of oral condition, findings and advices were disseminated to the participants accordingly. Thereafter treatment was arranged for those who were in need. Refusal to participate in the study did not involve penalties. No discrimination of patient if he/she did not wish to participate in the study. Those refused to participate were assisted to proceed with treatment as per routine hospital procedures. Participants were given an option to stop participating in the study at any time with no repercussion.

Data collection

Pilot studies was conducted before data collection, both from the questionnaire and clinical examination, and this were carried out by the investigator helped by assistants in recording the findings and started as soon as the administration of Muhimbili Dental and Cardiac clinics granted a permission. Clinical examination was performed by one calibrated examiner (Qualified Dental personnel) following the procedures recommended by the World Health Organization (2012). Examination was carried out in a dental clinical room using mouth mirror, periodontal probe and overhead light. Each tooth was examined and its dental and periodontal status recorded.

Calibration of the examiner and reliability of the clinical data

The calibration exercises and reproducibility testing of the clinical examiner was carried out by a single examiner on the same day, in the interval of about two hours from first to second examination and the intra-observer kappa indices were recorded (Table 1). Each periodontal site was assessed and recorded accordingly and 10% of the participants were re-examined for reliability in this research with interval of at least 100 participants (four groups of which 10 patients were selected in every 100 patients examined) and the finding were compared for reliability. Generally, the findings were satisfactory for most of the conditions assessed. The Kappa statistic for the assessed conditions was 0.52–0.64. Good strength of agreement was found in assessment of gingival bleeding, calculus and plaque where as moderate strength of agreement was found in assessment of gingival recession, loss of attachment and periodontal pockets.

Table 1: Intra-examiner reproducibility for each condition studied

Studied condition	Kappa value	Approx.sig.	95%CI	
			Lower bound	Upper bound
Gingival bleeding				
Patient No. 1	0.80	0.01	0.042	0.053
Patient No. 2	0.60	0.06	0.192	0.213
Patient No. 3	0.54	0.09	0.187	0.208
Patient No. 4	0.65	0.03	0.172	0.211
Overall	0.64	0.04	0.148	0.171
Calculus				
Patient No. 1	0.90	0.02	0.060	0.110
Patient No. 2	0.44	0.22	0.189	0.210
Patient No. 3	0.54	0.12	0.178	0.198
Patient No. 4	0.56	0.11	0.162	0.189
Overall	0.61	0.12	0.147	0.177
Plaque				
Patient No. 1	1.00	0.002	0.003	0.011
Patient No. 2	0.41	0.220	0.189	0.210
Patient No. 3	0.61	0.058	0.191	0.212
Patient No. 4	0.51	0.053	0.122	0.139
Overall	0.63	0.083	0.126	0.143
Gingival recession				
Patient No. 1	0.58	0.065	0.184	0.204
Patient No. 2	0.55	0.530	0.126	0.143
Patient No. 3	0.45	0.197	0.520	0.545
Patient No. 4	0.48	0.211	0.530	0.565
Overall	0.52	0.131	0.311	0.364
Loss of attachment				
Patient No. 1	0.55	0.053	0.122	0.139
Patient No. 2	0.60	0.058	0.191	0.212
Patient No. 3	0.78	0.020	0.052	0.054
Patient No. 4	0.35	0.260	0.480	0.505
Overall	0.57	0.097	0.211	0.228
Periodontal pockets				
Patient No. 1	0.87	0.030	0.070	0.090
Patient No. 2	0.65	0.065	0.191	0.223
Patient No. 3	0.21	0.490	1.000	1.000
Patient No. 4	0.35	0.211	0.530	0.565
Overall	0.50	0.199	0.448	0.469

Kappa value: 0.5= Moderate strength of agreement, >0.6 = Good agreement, 1= Complete agreement.

Questionnaire and clinical examination

Information on age, sex, level of education, type of cardiovascular disease and awareness of periodontal diseases among cardiac patients were gathered through self administered structured questionnaire composed of close ended questions. Two questions were used to collect information on the awareness on the periodontal diseases. One question assessed the awareness of periodontal diseases and the other question assessed the awareness of periodontal diseases to have an effect on cardiovascular diseases. Questionnaires were administered to each patient before a clinical examination in a specified location in the cardiac clinics Muhimbili National Hospital. Those who had difficulties to comprehend, read and write were assisted by the researchers. Thereafter; patients were referred to Muhimbili Dental clinic for clinical examination. With the patient seated in a dental chair with overhead light, clinical examination was done which involved full mouth examination to determine presence of the (1) Gingival bleeding on gentle probing, (2) Plaque, (3) Calculus, (4) Gingival Recession in mm (5) Periodontal pocket depth in mm), (6) Periodontal attachment loss. Also (7) Tooth mobility, (8) Missing teeth were assessed accordingly.

The teeth were divided into six (6) measuring points/surfaces, 3 points on the buccal surfaces (distobuccal, midbuccal and mesiobuccal) and 3 points on the lingual/palatal surfaces (distolingual/palatal, midlingual/palatal and mesiolingual/palatal). The findings were recorded on a clinical data record form according to the following scoring criteria:

Dichotomous scoring (absent or present) was done for three parameters, (gingival bleeding, plaque and calculus).

1. **Gingival bleeding** on gentle probing –Assessment was done in 10 seconds after gentle probing using CPI probe on all six measuring surfaces.
 - Score 0 = absent,
 - Score 1 = present
2. **Dental plaque** – Assessment was done on each measuring surface using the William periodontal probe.
 - Score 0 = absent,
 - Score 1 = present

3. Calculus – Assessment was done on each measuring surface using the CPI probe.

- Score 0 = absent,
- Score 1 = present

4. Gingival recession was scored in mm by measuring the distance from the CEJ apically to where the gingival margin is at its maximum height with the exposure of tooth surfaces. In cases where cementoenamel junction was covered by calculus, the calculus was first removed prior to the identification of the cementoenamel junction. The score was done in the closest whole mm using the Williams periodontal probe calibrated at 1mm interval.

Score was as follows:

- Score 0 = < 1mm
- Score 1 = 1-3mm
- Score 2 = 4-5mm
- Score 3 = >5mm

1. Periodontal pocket depth was scored in mm by measuring the distance from the gingival margin to the bottom of the pocket using the Community Periodontal Index (CPI) probe on all six measuring surfaces. Score was as follows:

- Score 0 = < 3.5mm.
- Score 1 = 3.5 – 5.5mm.
- Score 2 = > 5.5mm.

2. Periodontal Attachment Loss -When recession was present, the PAL was calculated by ADDING the recession measurement to the periodontal pocket depth measurement. When the gingival margin was coronal to the CEJ, the PAL was calculated by SUBTRACTING the distance from gingival margin to CEJ from periodontal pocket depth measurement. When the gingival margin is at the CEJ, no calculations were needed because the probing depth is directly equivalent to the clinical attachment level measurement. Score was as follows:

- Score 0 = < 1mm (health)
- Score 1 = 1-2mm (slight)
- Score 2 = 3-4mm (moderate)

- Score 3 = $\geq 5\text{mm}$ (severe)

3. Tooth mobility – Assessed to estimate the horizontal tooth movement on buccal and lingual/palatal and vertical movement.

i. **Horizontal tooth mobility** – Assessed by putting the handles of two dental instruments on either side of the tooth and applying alternating moderate pressure in the facial-lingual direction against the tooth, first with one, then with the other instrument handle.

ii. **Vertical tooth mobility** – (The ability to depress the tooth in its socket), was assessed using the end of an instrument handle to exert pressure against the occlusal or incisal surface of the tooth. Scored as follows:

- Score 0 = Physiologic mobility, firm tooth
- Score 1 = Slight increase mobility (up to 1mm) “slightly more than physiologic” (Grade I).
- Score 2 = Definite to considerable increase in mobility (greater than 1mm) but with no impairment of function (Grade II).
- Score 3 = Extreme mobility: severe horizontal mobility (greater than 1mm) combined with vertical displacement. (A loose tooth that cannot be used for normal function) (Grade III).

4. Missing teeth – Three parameters were considered, that included missing due to periodontal diseases, missing due to caries and missing due to trauma. The score was as follows:

- Score 1 = missing due to periodontal diseases
- Score 2 = missing due to caries
- Score 3 = missing due to trauma.

Periodontal treatment needs:

During analysis, the periodontal data for individual teeth was transformed into sextants format so that periodontal treatment needs could be assessed using the CPITN index (WHO 1987). CPITN scoring criteria was as follows:

Score 0 = health although the individual might only have shown a lot of dental plaque only

Score 1 = gingival bleeding after gentle probing. The subject has no other periodontal problems specifically calculus or pockets.

Score 2 = supragingival, subgingival or both calculus present but no pocket detected.

Score 3 = periodontal pockets 4-5 mm deep.

Score 4 = periodontal pockets 6 mm or more.

Classification of Periodontal Treatment Needs.

The estimated type of periodontal treatment need was based on the prevailing periodontal conditions in the mouth according to the CPITN score. The treatment categories included the following:

- 1 = Treatment category 0 - (TN-0). No periodontal treatment is needed when all the surfaces are healthy or missing.
- 2 = Treatment category 1- (TN-1). This category involves improvement of personal oral hygiene through self care following suitable oral health education on instructions to individuals found to have gingival bleeding or any other periodontal condition in one or more of the surface examined.
- 3 = Treatment category II - (TN-2). Professional cleaning of the teeth and removal of plaque retentive factors such as calculus through scaling and root planning in addition to oral hygiene instructions is received for persons who showed the presence of calculus or other worse findings like shallow or deep periodontal pockets. Shallow to

moderate pocketing (4-5mm), is managed in the same way as oral hygiene instructions, scaling and root planning as it is known that, this kind of treatment will reduce such pockets to value of 3mm or less.

- 4 = Treatment category III - (TN-3). Any surface exhibiting pocket formation of more than 6mm or deeper probably cannot be successful treated by means of deep scaling and efficient person oral hygiene measures alone. For such cases therefore complex treatment which involves deep scaling, root planning and more complex surgical procedures are assigned as the line of management without forgetting education instruction and motivation in personal oral hygiene.

Data management and data analysis

Recorded data was coded and entered in a data file in a computer and data cleaning was done, analysis was done using Statistical Package for Social Sciences (SPSS) version 16.0 program. Descriptive frequencies and percentages were run to see the distribution of socio – demographic status. Cross tabulation was run to provide explanation on the association between the variables. The Chi-square test was used to compare proportions between sex and age group studied at a statistical significance value of $p < 0.05$ for two groups in order to find out the statistical significance among them. The t tests were used for comparing the mean number of sextants examined according to the age groups and sex respectively. The cut-off point level of statistical significance was set at $p < 0.05$.

RESULTS

The study composed of 340 adult cardiac patients of whom 116 (34.1%) were males and 224 (65.9%) were females providing a male to female ratio of 1:2 (females were twice of the males population). Their age ranged from 18 to 80 years (mean = 50.71 ± 11.47). Male age ranged from 20 to 72 years (mean 50.55 ± 11.32) while female age ranged from 18 to 80 years (mean = 50.79 ± 11.57). Most of the study population had primary school education 55.9 %. Very few participants (6%) had no formal education (Table 2).

Table 2: Distribution of the study population by socio-demographic factors

Social demographic factors	Frequency	Percentage
Sex		
Male	116	34.1
Female	224	65.9
Age group(in years)		
18 – 34	27	7.9
35 – 44	56	16.5
45 – 54	127	37.4
55 – 64	97	28.5
65+	33	9.7
Education level		
None	2	6.0
Primary	190	55.9
Secondary	35	10.3
College/university	113	33.2

About one third (34.7%) of the study participants had hypertension whereby stroke was the least (5.0%) in the group of cardiovascular diseases (Table 3).

Table 3: Distribution of the study population by type of the cardiovascular disease

Diagnosis	Frequency	Percentages
Hypertension	118	34.7
Cardiomyopathy	70	20.6
Stroke	17	5.0
Angina pectoris	23	6.8
Valvular heart diseases	33	9.7
Congestive cardiac failure	27	7.9
Ischemic heart disease	27	7.9
Rheumatic heart diseases	25	7.4
TOTAL	340	100

Majority of the male (75.9%) and female participants (74.6%) were unaware of the gum diseases. The differences in awareness among them was not statistically significant ($\chi^2 = 0.07$, $p = 0.792$). About one quarter (25.7%) of the age group 45+ years were aware of the gum diseases where by majority of the other age group were not aware of the gum diseases. The differences between the age groups were not statistically significant. ($\chi^2 = 0.26$, $p = 0.610$) (Table 4)

Table 4: Distribution of study participants regarding awareness of gum diseases by age and sex.

	Have you ever heard about gum diseases				P- value
	Yes		No		
	n	(%)	n	(%)	
Sex					
Male	28	24.1	88	75.9	0.792
Female	57	25.4	167	74.6	
Age (years)					
18 – 44	19	22.9	64	77.1	0.610
45+	66	25.7	191	74.3	

*p<0.05, **p<0.01, ***p<0.001

Majority of the participants were not aware that gum diseases may have an effect on cardiovascular diseases. Similar findings were observed in all age groups and between males and females. There were no statistical significant differences between sexes and in all age groups. ($\chi^2 = 2.42$, $p = 0.299$ and $\chi^2 = 0.809$, $p = 0.667$) respectively (Table 4.1).

Table 4.1: Distribution of study participants regarding awareness of gum diseases to have an effect on cardiovascular disease by age and sex

	Do you know Gum diseases may have effect on cardiovascular diseases						P- value
	Yes		No		I don't know		
	n	(%)	n	(%)	n	(%)	
Sex							
Male	0	0.0	15	2.9	101	87.1	
Female	3	1.3	37	16.5	184	82.1	
All	3	0.9	52	15.3	285	83.8	0.299
Age (years)							
18 – 44	1	1.2	15	18.1	67	80.7	
45 +	2	0.8	37	14.4	218	84.8	
All	3	0.90	52	15.3	285	83.8	0.667

*p<0.05, **p<0.01, ***p<0.001

The prevalence of gingival bleeding on gentle probing was 79.3% among all cardiac patients studied, among males (84.8%), among female (73.5%) with mean number of sites with gingival bleeding 11.11 ± 6.27 . The prevalence of dental plaque was 91.8% among all cardiac patients studied, among males (97.3%) and among females (95.6%) with mean number of sites with plaque 12.28 ± 6.84 . The prevalence of dental calculus was 96.5% among all cardiac patients studied, among males (98%), among females (95.8%).

Regarding the mean sites with gingival bleeding, plaque and calculus between upper, lower, anterior and posterior teeth among age groups, the results showed that, there was no significant difference in mean sites with gingival bleeding on gentle probing, plaque or calculus among age groups 18-44 and 45+years ($p > 0.05$) (Table 5). However, there is a statistical significant difference in the mean number of sites with plaque between males and females for the anterior and posterior teeth ($p = 0.003$ and 0.047) respectively. Males had significantly more sites of teeth with plaque on the anterior sextants than it was for the females. Females had significantly more sites of teeth with plaque on the posterior sextants than it was for males (Table 5.1).

Table 5: Mean sites \pm SD with gingival bleeding, plaque and calculus between upper and lower (0-96 sites) and anterior (0-120 sites) and posterior (0-72 sites) of teeth among age groups.

Measured variable	Site/teeth	Age Group (yrs)		T-test	P-value
		18-44	45+		
Bleeding	Upper	21.95 \pm 13.41	22.01 \pm 14.61	0.031	0.975
	Lower	22.63 \pm 13.68	22.40 \pm 15.65	0.116	0.980
	Anterior	16.54 \pm 11.51	16.91 \pm 11.66	0.256	0.798
	Posterior	28.03 \pm 16.37	27.49 \pm 18.93	0.234	0.815
	ALL	22.29 \pm 13.74	22.20 \pm 15.21	0.159	0.892
Plaque	Upper	35.96 \pm 15.16	37.12 \pm 15.13	-0.603	0.547
	Lower	36.05 \pm 15.74	37.10 \pm 15.62	-0.535	0.593
	Anterior	21.44 \pm 11.57	24.60 \pm 13.04	-1.970	0.050
	Posterior	50.57 \pm 20.18	49.62 \pm 17.76	0.391	0.696
	ALL	36.00 \pm 15.66	37.11 \pm 15.39	-0.679	0.472
Calculus	Upper	46.87 \pm 12.33	45.46 \pm 13.22	0.857	0.392
	Lower	50.25 \pm 12.99	47.50 \pm 15.15	1.490	0.138
	Anterior	36.55 \pm 11.09	34.21 \pm 12.04	1.570	0.120
	Posterior	60.57 \pm 14.16	58.75 \pm 17.27	0.870	0.390
	ALL	48.56 \pm 12.64	46.48 \pm 14.42	1.197	0.260

*p<0.05, **p<0.01, ***p<0.001

Table 5.1: Mean sites \pm SD with gingival bleeding, calculus and plaque between upper and lower (0-96 sites) and anterior (0-120 sites) and posterior (0-72 sites) of teeth among sex.

Measured variable	Site/teeth	Sex		T-test	P-value
		Male	Female		
Bleeding	Upper	23.22 \pm 14.28	21.35 \pm 14.30	1.14	0.254
	Lower	23.91 \pm 13.90	21.70 \pm 15.46	1.27	0.204
	Anterior	18.08 \pm 10.82	16.18 \pm 11.97	1.43	0.153
	Posterior	29.06 \pm 17.99	26.88 \pm 18.48	1.04	0.300
	ALL	23.57 \pm 14.25	21.53 \pm 15.05	1.22	0.228
Plaque	Upper	36.66 \pm 15.49	36.92 \pm 14.96	-0.15	0.881
	Lower	36.98 \pm 16.17	36.78 \pm 18.38	0.12	0.908
	Anterior	26.65 \pm 12.77	22.37 \pm 12.53	2.97	0.003*
	Posterior	46.99 \pm 19.25	51.33 \pm 18.89	-1.99	0.047*
	ALL	36.82 \pm 15.92	36.85 \pm 16.19	0.24	0.460
Calculus	Upper	46.91 \pm 11.60	45.23 \pm 13.67	1.12	0.261
	Lower	47.62 \pm 13.09	48.46 \pm 15.46	-0.49	0.618
	Anterior	36.30 \pm 9.40	33.99 \pm 12.88	1.71	0.088
	Posterior	58.20 \pm 15.56	59.70 \pm 17.07	-0.78	0.437
	ALL	47.26 \pm 12.41	46.85 \pm 14.77	1.56	0.351

*p<0.05, **p<0.01, ***p<0.001

The prevalence of mobile teeth was 17% among all cardiac patients studied regardless of grade I, II, III of which 25(63%) were female and 15(37%) were males. More than half (58.1%) of the mobile teeth had mobility grade II (Table 6). No teeth mobility was observed in subjects within age group (18-34) years (Table 6). The mean of the mobile teeth 0.5 \pm 1.58. The number of mobile teeth per individual ranged from 1-11 teeth. Mean of mobile teeth for male 0.64 \pm 1.81. Mean of mobile teeth for female 0.43 \pm 1.45. T-test t=1.16, (p = 0.247), Mean of mobile teeth by age group (18-44) = 0.24 \pm 1.11, (45+) mean 0.58 \pm 1.70, T-test t=-1.724, (p = 0.086). No statistical significant difference in mobile teeth between sex and age group.

Table 6: Percentage distribution of number of mobile teeth by sex, age group and grade

Mobility	18-34		35-44		45-64		65+		ALL	
	M	F	M	F	M	F	M	F	M	F
	n=0	n=0	n=3	n=4	n=10	n=13	n=7	n=14	n=20	n=31
	%	%	%	%	%	%	%	%	%	%
GI	0	0	33.3	75.0	50.0	30.8	28.6	35.7	40.0	38.7
GII	0	0	66.7	25.0	50.0	61.5	71.4	64.3	60.0	58.1
GIII	0	0	0.0	0.0	0.0	7.7	0.0	0.0	0.0	3.2
TOTAL	0.0	0.0	100	100	100	100	100	100	100	100

The prevalence of tooth loss in the studied population was 90.9% of which the prevalence of tooth loss in male was 34% and in females was 66%). Majority of the patients with missing teeth belonged to age group (45-64). Missing teeth ranged from one tooth to 20 teeth. The mean of the missing teeth due to any reason was 3.26 ± 3.20 . Mean of missing teeth for male 3.47 ± 3.48 . Mean of missing teeth for female 3.15 ± 3.06 , T –test $t = 0.89$, the difference in mean number of missing teeth between male and female was not statistically significant ($p = 0.374$), Mean for missing teeth by age group (18-44) was 2.55 ± 2.69 and (45+) the mean was 3.49 ± 3.33 , ($p = 0.021$). The difference in mean number of missing teeth between age groups was statistically significant. Majority (91.4%) of the missing teeth were due to caries. Periodontal diseases accounted for 7.3% of the missing teeth. Very few teeth (1.3%) were missing due to trauma (Table 7). The mean number of tooth loss due to periodontal diseases in male was 0.97 ± 3.54 and female was 0.54 ± 2.31 . T –test $t = 1.133$, ($p = 0.83$). No statistical significance differences in mean number of teeth loss due to periodontal diseases between sexes.

Table 7: Percentage distribution of number of teeth lost by age and sex

Reasons	18-34		35-44		45-64		65+		ALL	
	M	F	M	F	M	F	M	F	M	F
	n=8	n=15	n=18	n=34	n=69	n=136	n=11	n=23	n=106	n=208
	%	%	%	%	%	%	%	%	%	%
Periodontal diseases	0.0	0.0	11.1	0.0	7.2	4.4	18.2	34.8	8.5	6.7
Caries	100	100	83.3	100	92.8	94.1	81.8	60.9	90.6	91.8
Trauma	0.0	0.0	5.6	0.0	0.0	1.5	0.00	4.3	0.9	1.4
TOTAL	100	100	100	100	100	100	100	100	100	100

The prevalence of periodontal pockets greater than 3.5mm was 9.4% of which 10 (31%) were males while 22 (69%) were females. The teeth surface with periodontal pockets ranged from one to 180 surfaces. Majority of the patients 90% had normal pocket 0-3.5mm. Very few patients (1%) found to have pockets greater than 5.5 mm. The general mean number of surfaces with periodontal pockets was 5.39 ± 14.63 . Patients with age group 65+ had shown to have more pockets than the other age groups, female being more than males. The difference between mean numbers of sites with periodontal pockets greater than 3.5mm in males and females is not statistically significant ($p > 0.05$) (Table 8). However, there is a statistical significant difference in mean number of sites with periodontal pockets less than 3.5mm between the age groups studied ($p = 0.031$) (Table 8.1).

The prevalence of gingival recession was 20.6 % of which 21 (30%) were males while 49 (70%) were females. Gingival recession ranged from 2 to 180 surfaces. The general mean number of sites with gingival recession for the whole study population was 5.39 ± 14.63 . The difference between mean numbers of sites with gingival recession between males and females

was not statistically significant (Table 8). Likewise, the difference in mean number of sites with gingival recession between the age groups was not statistically significant ($p > 0.05$) (Table 8.1).

The prevalence of periodontal attachment loss was 20.3% of which 21(30%) were males while 48 (70%) were females. The general mean number of loss of attachment sites for the whole study population was 5.69 ± 15 . The difference between mean numbers of sites with periodontal attachment loss in males and females was not statistically significant (Table 8). Similarly, no statistical significance difference between age group ($p > 0.05$) (Table 8.1).

Table 8: Mean number of sites \pm SD with periodontal pocket, gingival recession and attachment loss by sex

Measured variable		Sex		T-test	P-value
		M	F		
Periodontal pocket (mm)	< 3.5	167.24 \pm 29.40	170.26 \pm 22.00	-1.065	0.288
	3.5-5.5	3.17 \pm 17.71	1.83 \pm 7.03	0.997	0.319
	> 5.5	0.00 \pm 0.00	0.15 \pm 1.28	-1.241	0.216
Gingival recession (mm)	< 4	5.53 \pm 19.20	3.47 \pm 8.75	1.361	0.174
	4-5	0.84 \pm 3.50	1.39 \pm 4.47	-1.168	0.244
	> 5	0.00 \pm 0.00	0.01 \pm 0.20	-0.719	0.473
Periodontal attachment loss (mm)	1-2	1.55 \pm 16.71	0.04 \pm 0.45	1.355	0.176
	3-4	2.96 \pm 7.70	2.46 \pm 6.27	0.646	0.519
	> 5	2.19 \pm 6.33	2.67 \pm 7.26	-0.603	0.547

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Table 8.1: Mean number of sites \pm SD with periodontal pocket, gingival recession and attachment loss by age groups

Measured variable		Age group (yrs)		T-test	P-value
		18-44	45+		
Periodontal pocket (mm)	< 3.5	174.31 \pm 19.33	167.59 \pm 26.12	2.162	0.031*
	3.5-5.5	1.55 \pm 5.26	2.52 \pm 13.24	-0.649	0.517
	> 5.5	0.00 \pm 0.00	0.13 \pm 1.19	-0.979	0.328
Gingival recession (mm)	< 4	3.23 \pm 7.68	4.48 \pm 14.64	-0.745	0.457
	4-5	1.34 \pm 4.17	1.16 \pm 4.18	0.337	0.736
	> 5	0.00 \pm 0.00	0.01 \pm 0.19	-0.568	0.571
Periodontal attachment loss (mm)	1-2	0.00 \pm 0.00	0.74 \pm 11.23	-0.596	0.552
	3-4	2.80 \pm 7.11	2.57 \pm 6.68	0.260	0.795
	> 5	2.54 \pm 6.16	2.49 \pm 7.20	0.055	0.956

*p<0.05, **p<0.01, ***p<0.001

Periodontal treatment needs

All subjects, 340 (100%) needed oral hygiene instructions. This category involved improvement of personal oral hygiene through self care following suitable oral health education on instructions to individuals found to have gingival bleeding or any other periodontal condition in one or more of the surface examined (TN-1).

Also all subjects 340 (100%) found to have at least one or more tooth surfaces with calculus. Professional cleaning of the teeth and removal of plaque retentive factors such as calculus through scaling and root planning in addition to oral hygiene instructions was received for persons who showed the presence of calculus (TN-2).

About 3 patients (0.9%) needed complex periodontal treatment (TN-3) all being female in the age group 45+years. These were patients that had pocket formation of more than 5.5mm and any surface with pocket formation of more than 5.5mm cannot be treated by means of deep scaling and efficient person oral hygiene measures alone. Complex treatment which involved more complex surgical procedures (TN-3) was assigned as the line of management without forgetting education instruction and motivation in personal oral hygiene.

DISCUSSION

This study was conducted among the cardiac patients attending the Muhimbili National Hospital and it is the first one of its kind in Tanzania. The reason to choose this study population was that there is a need to have baseline information on this type of patients in relation to periodontal diseases as there are reports showing the interrelationship (Nakano et al. 2009). Patients excluded were those found with medical conditions that are so debilitating that could not permit easy periodontal examination which is an intraoral procedure that demands consciousness, co-operation and ability to open the mouth for a substantial period of time to be able to examine all the parameters in study.

The calibration exercise was carried out with the interval of two hours before first and second examinations and each condition examined demonstrated satisfactory reproducibility ranged from good strength to moderate strength of agreement. The reasons for moderate or low strength in plaque reproducibility could be due to inevitable displacement during the first examination especially when the same subject was examined within the same day. Gingival bleeding, it is known that repeated probing may provoke bleeding (Lang et al. 1991) and that following the use of manual probing with an estimated 20gram force, its reproducibility could be difficult when compared to the use of pressure sensitive periodontal probes (Mayfield et al. 1996). The presence of calculus as hard deposits on the tooth surface created some difficulties in orienting the periodontal probe during subgingival instrumentation and therefore this might have affected the reproducibility of the periodontal pockets and loss of attachment (Listgarten et al. 1976).

The fact that various studies conducted in different places at different period of time using different methods makes it difficult to compare previous results and limits comparison with present study (Trochim1982). However it is worth making some cautions comparisons in order to get a rough idea of how other findings can be compared with those of the present report. The participants included a diverse population relative to age, sex and education. Sex distribution showed female dominancy with male to female ratio 1:2. The difference which can be attributed to the observation that females were easily to consent since they are more

affected by dental caries much more than males and also more sensitive to health issues, thereby forcing them to seek treatment more frequently (Silverstone et al. 1981).

Periodontal diseases progresses unnoticed, and most people probably recognize it only when it reaches an advanced state (Quteish 2002). In this study, the overall awareness of periodontal conditions was low. The possible explanation would be that in Tanzania the oral health personnel have not been aggressive enough in educating the public about oral diseases. This is a reflection also of the general population as the issue of periodontal diseases which in most cases do not cause pain, is not well known among most people in Tanzania (Quteish 2002). Therefore, to prevent the development of periodontal problems in this group the public needs education. This could be achieved by improving the knowledge and awareness of periodontal conditions through dental health education.

Most of the studied people had gingival bleeding in 79.3% of all sextants. These findings are similar to what Lembariti and colleagues reported among adult population in Morogoro region (Lembariti et al. 1988). Majority of studied population do not brush their teeth effectively, therefore plaque accumulates on to teeth until it matures to the extent of releasing toxins that cause inflammation to the gums. Plaque score was significantly high (91.8%) in the studied population. These findings are similar to the findings obtained from the study done by (Gotsman et al. 2007), in Jerusalem, Israel where patients with cardiovascular diseases had significantly higher plaque scores. The high plaque score could be probably due to lack of oral health promotion. Therefore high plaque score can significantly be reduced through oral health promotion to this studied population as this reinforces people to be responsible for their health.

All the studied participants had dental calculus in almost all sextants coverage compared to the approximately half of the examined sextants from the study done in Brazil (Gymenna et al. 2011). The reasons for the difference could that the studied population in Tanzania was not brushing their teeth effectively. The number of teeth lost had shown to increase with age. Majority of teeth lost were due to dental caries followed by periodontal diseases and least due to trauma. This is a reflection also of the general population that most of the tooth loss reported from African populations has been seen to be due to dental caries and, to a lesser

extent, to periodontal diseases for examples in the Kenyan population (Baelum et al. 1988, Manji et al. 1988, Sanya et al. 2004), as well as in Tanzania (Baelum & Fejerskov 1986, Lembariti et al. 1988, Rambush 1991). One need to be cautious about the results on the possible causes of tooth loss as might not be justifiable as it was probably difficult for the subjects to recall the actual causes of tooth loss. Therefore, registration and records keeping on the reasons for tooth loss in such population is important for the future studies. Tooth mobility was present in few subjects examined of which majority had mobility grade two. The possible explanation could be that the advanced form of periodontal disease which clinically presents with grade III tooth mobility was not a common feature. The comparison of present findings with previous results is limited due to the fact that no information in regard to cardiovascular diseases in relation to tooth mobility which is available in the literature. Therefore, future studies are needed in this respect. The prevalence of periododontal pockets greater than 3.5mm was low, almost one fourth compared to what was in Brazil (Gymenna et al. 2011). The differences in samples with periodontal pockets greater than 3.5mm could be attributed probably due to the facts that in this study, subjects with other systemic diseases like diabetes mellitus which might contribute to increase in number of pockets (Hasaan et al. 2013) were excluded from the study. Gingival recession was found in about one fifth of the subjects examined in one or more of the tooth surfaces and it increased as the age of the patients increased. These findings were not in agreement with other findings from the general population that gingival recession and loss of attachment were commonly found among adult population in Tanzania (Lembariti et al. 1988; Baelum, 1987). The reasons for the disagreement could be the difference in methodology and biased sample as this was hospital based. Also, periodontal attachment loss was found in one fifth of the subjects examined in one or more of tooth surfaces. These findings correlated with other findings from the study done in Jerusalem, Israel among patients with periodontal diseases and cardiovascular diseases (Gotsman et al. 2007).

In this study, objective assessment of all the treatment needs showed that the treatment needs included mainly oral hygiene instructions followed by professional scaling and root planning, the complex periodontal therapy was limited to a smaller proportion of the study population.

These results are the reflection also of the general population of the Spanish national survey of 1993, that majority of the subjects needed oral hygiene instruction. Scaling and root planing was also needed by the majority where few subjects needed complex treatments. (Rafael et al. 2008).

In this study there were some limitations worth mentioning. Due to constraints of resources, radiological assessment using Orthopantomographs (OPG) was not done while this could have given details on the alveolar bone loss due to periodontal disease among patients with CVDs. Also the duration of the study was only six months and therefore the study population was limited to all cardiovascular diseases to get baseline information rather than concentrating to individual cardiac conditions that have showed much relationship with periodontal diseases elsewhere such as arteriosclerosis. This being a hospital based study, though it gives baseline information on the few studied individuals, the findings cannot be generalized to include the whole Tanzanian population.

CONCLUSION

This study has shown that majority of the patients were unaware of the periodontal diseases and also unaware of the periodontal disease to have an influence on cardiovascular diseases. Majority of the patients presented with plaque, calculus and gingival bleeding on gentle probing in one or more of the teeth surfaces examined. Teeth mobility was observed in few subjects examined of which majority of the examined teeth had grade two mobility. Periodontal pockets were more prevalent in the age groups of forty five years and above. About one fifth of the studied population had gingival recession at least on one surface of the tooth and the prevalence increased with age. The treatment needs for the study population include mainly oral hygiene instructions followed by professional scaling and root planning. The need for complex periodontal therapy was limited to a smaller proportion of the study population.

RECOMMENDATIONS

1. More effort is needed to provide oral health education to general public and medical profession. This can be done through educating:-
 - Individual patients attending dental clinics for checkups and treatment
 - Patients attending the cardiac clinics to reinforce effective tooth brushing.
 - Medical personnel to include some dental contents related to general health in medical and nursing curricular.
 - Community in general through mass media (radio and television programs).
2. Oral health promotion be instituted to improve oral hygiene so as to prevent gingivitis and periodontal diseases to the general population.
3. Further studies on periodontal diseases status to specific type of cardiovascular disease.

REFERENCES

1. Albander JM and Rams TE. Global epidemiology of periodontal diseases, *Periodontol 2000*, 2002; 29:7-10.
2. Armitage GC 1999. Development of a classification system for periodontal diseases and conditions. *Annals of Periodontology* 4:1-6.
3. Baelum V, Fejerskov, O, Karring T. Oral hygiene, gingivitis and periodontal breakdown in adult Tanzanians. *J Periodontol Res* 1986;21:221-232.
4. Baelum V. Pattern of periodontal breakdown in adult Tanzanians. *Scand J Dent Res* 1987; 95:221-228.
5. Bourgeois D, Bouchard P, Mattout C. Epidemiology of periodontal status in dentate adults in France, 2002-2003. *J Periodontol Res* 2007; 42:219-227.
6. Clerehugh V, Tugnait A. Diagnosis and management of periodontal diseases in children and adolescents. *Periodontol 2000* 2001; 26:146-168.
7. D'Aiuto F, Parkar M, Andreou G. Periodontitis and systemic inflammation: control of the local infection is associated with a reduction in serum inflammatory markers. *J Dent Res* 2004; 83:156.
8. D.Quteish Taan. Periodontal awareness and knowledge and pattern of dental attendance among adults in Jordan. *Int Dent J* 2002; 52: 94-98.
9. Fong IW. Emerging relations between infectious diseases and coronary artery disease and atherosclerosis. *CMAJ* 2000; 163(1):49-56.
10. Frencken JE, Truin GJ, König KG, Ruiken RM, Elvers HJ. Prevalence of caries, plaque and gingivitis in an urban and rural Tanzanian child population. *Community Dent Oral Epidemiol* 1986;14:161-164.
11. Geerts SO, Nys M, De MP .Systemic release of endotoxins induced by gentle mastication: association with periodontitis severity. *J Periodontol* 2002;73 (1):73-78.
12. Gotsman I, Lotan C, Soskolne WA, Rassovsky S, Pugatsch T, Lapidus L, Novikov Y, Masrawa S, Stabholz A. Periodontal destruction is associated with coronary artery disease and periodontal infection with acute coronary syndrome. *J Periodontol* 2007; 78: 849-858.

13. Haffajee AD. Systemic ant-infective periodontal therapy. *Ann Periodontol* 2003;8,115-181.
14. Herzberg MC, Meyer MW. Effects of oral flora on platelets: possible consequences in cardiovascular disease. *J Periodontol* 1996; 67 (Supplement 10):1138-1142.
15. Herzberg ME, Meyer MW. Dental plaque, platelets and cardiovascular diseases. *Ann Periodontol* 1998; 3:152-160.
16. Hujoel PP, Drangsholt M, Spiekerman C, Derouen TA. Examining the link between Coronary heart disease and the Elimination of chronic dental infections. *J Am Dent Assoc.* 2001; 132:883-889.
17. Kerosuo E, Kerosuo H, Kallio P, Nyandini U. Oral health status among teenage school children in Dar es Salaam, Tanzania. *Community Dent Oral Epidemiol* 1986; 14:338-340.
18. Kinane DF, Riggio MP, Walker KF, MacKenzie D, Shearer B. Bacteraemia following periodontal procedures. *J Clin Periodontol* 2005; 32:708-713.
19. Kowolik MJ, Dowsett SA, Rodriguez J, De La Rosa RM, Eckert GJ. Systemic neutrophil response resulting from dental plaque accumulation. *J Periodontol* 2001; 72:146-151.
20. Kusuyama T, Omura T, Nishiya D, Enomoto S, Matsumoto R, Takeuchi K, Yoshikawa J, Yoshiyama M. Effects of treatment for diabetes mellitus on circulating vascular progenitor cells. *J Pharmacol Sci.* 2006;102:96-102.
21. Lang NP, Nyman S, Senn C, Joss A. Bleeding on probing as it relates to probing pressure and gingival health, *J. Clin Periodontol* 1991;18:257-261.
22. Lembariti BS, Frencken JE, Pilot T. Prevalence and severity of periodontal conditions among adults in urban and rural Morogoro, Tanzania. *Community Dent Oral Epidemiol* 1988; 16:240-243.
23. Leuckfeld I, Obregon-Whittle MV, Lund MB, Geiran O, BjørtuftØ, Olsen I. Severe chronic obstructive pulmonary disease: association with marginal bone loss in periodontitis. *Respir Med.* 2008; 102:488-494.
24. Libby P. Coronary artery injury and the biology of atherosclerosis inflammation, thrombosis, and stabilization. *Am J Cardiol* 2000; 86(8B): 3J-9J.

25. Lindhe J, Karring T, Lang NP. Clinical Periodontology and Implant Dentistry, 3rd ed. Copenhagen: Munksgaard; 1998.pp.297-331.
26. Listgarten MA, Mao R, Robinson PJ. Periodontal probing and the relationship of the probe tip to periodontal tissues. *J Periodontol.* 1976; 47:511-513.
27. Locker D, Slade GD, Murray H. Epidemiology of periodontal disease among older adults: a review. *Periodontol 2000.*1998; 16:16-33.
28. Mattila KJ, Valle MS, Nieminen MS, et al. Dental infections and coronary atherosclerosis. *Atherosclerosis.* 1993; 103: 205–211.
29. Mayfield L, Bratthal G, Attstrom R. Periodontal probe precision using 4 different periodontal probes. *J. Clin Periodontal* 1996; 23:76-82.
30. Meyer MW, Gong K, Herzberg MC. Streptococcus sanguis-induced platelet clotting in rabbits and hemodynamic and cardiopulmonary consequences. *Infect Immun* 1998; 66:5906-5914.
31. Mora S, Ridker PM. Justification for the use of Statins in Primary Prevention: an Intervention Trial Evaluating Rosuvastatin (JUPITER) – can C-reactive protein be used to target statin therapy in primary prevention? *Am J Cardiol* 2006; 97(2A): 33A-41A
32. Mumghamba EGS, Karim KP, Michael J. Oral hygiene practices, periodontal conditions, dentition status and self-reported bad mouth-breath among young mothers, Tanzania. *International Journal of Dental Hygiene* 2006; 4:166-173.
33. Nakano K, Nemoto H, Nomura R, Inaba H, Yoshioka H, Taniguchi K, et al. Detection of oral bacteria in cardiovascular specimens. *Oral Microbiol Immunol.* 2009; 24:64–68.
34. Njelekela M, Negishi H, Nara Y, Tomohiro M, Kuga S, Noguchi T, Kanda T, Yamori M, Mashalla Y, Jian Liu L, et al. Cardiovascular risk factors in Tanzania: a revisit. *Acta Trop.* 2001; 79:231–239.
35. O'Reilly, P. G. and Claffey, N. M.. A history of oral sepsis as a cause of disease. *Periodontol.2000.* 2000; 23:13-18.
36. Pallasch TJ, Wahl MJ. The focal infection theory: appraisal and reappraisal. *Calif Dent Assoc J* 2000; 28:194–200.

37. Persson GR, Imfeld T. Periodontitis and cardiovascular disease. *Ther Umsch* 2008; 65:121-126.
38. Pihlstrom BL, Michalowicz BS, Johnson NW. Periodontal diseases. *Lancet*. 2005; 366:1809–1820.
39. Quteish D. Taani. Periodontal awareness and knowledge, pattern of dental attendance among adults in Jordan. *Int Dental J*.2002;52:94-98.
40. Rafael Mombiedro, Sandoval 1, Carmen Llena Puy 2. Periodontal status and treatment needs among spanish military personnel. *Med Oral Patol Oral Cir Bucal*. 2008, 1;13:E464-469.
41. Rajasuo A, Nyfors S, Kanervo A, Jousimies-Somer H, Lindqvist C, Suuronen R. Bacteremia after plate removal and tooth extraction. *Int J Oral Maxillofac Surg* 2004; 33:356-360.
42. Ranney RR. Classification of periodontal diseases. *Periodontol* 2000 1993;2:13–25.
43. Ready D, D’Aiuto F, Spratt DA, Suvan J, Tonetti MS, Wilson M. Disease severity associated with presence in subgingival plaque of *Porphyromonas gingivalis*, *Aggregatibacter actinomycetemcomitans*, and *Tannerella forsythia*, singly or in combination, as detected by nested multiplex PCR. *J Clin Microbiol* 2008; 46:3380–3383.
44. Ridker PM, Rifai N, Stampfer MJ, Hennekens CH. Plasma Concentration of interleukin-6 and the risk of future myocardial Infarction among apparently healthy men. *Circulation* 2000; 101:1767-1772.
45. Roberts GJ. Dentists are innocent! ‘Everyday’ bacteremia is the real culprit—a review and assessment of the evidence that dental surgical procedures are a principal cause of bacterial endocarditis in children. *Pediatr Cardiol* 1999; 20:317-325.
46. Sanya BO, Ng’ang’a PM, Ng’ang’a RN. Causes and pattern of missing permanent teeth among Kenyans. *East Afr Med J* 2004; 81:322–325.
47. Seymour GJ, Ford PJ, Cullinan MP, Leishman S, West MJ, Yamazaki K. Infection or inflammation: the link between periodontal cardiovascular diseases. *Future Cardiol*. 2009;5: 5–9.
48. Seymour GJ, Ford PJ, Cullinan MP, Leishman S, Yamazaki K. Relationship between

- periodontal infections and systemic disease. *Clin Microbiol Infect.* 2007;13
49. Suppl 4:3-10 Sheiham A. Is the chemical prevention of gingivitis necessary to prevent severe periodontitis? *Periodontol 2000* 1997; 15:15–24.
 50. Shor A and Phillips J. Chlamydia pneumoniae and Atherosclerosis. *JAMA* 1999; 262: 2071-2073.
 51. Silverstone LM, Johnson NW, Hardie JM, Williams RAD. Dental caries, Aetiology, Pathology and Prevention 1st Ed. London: Macmillan Press, 1981; 26-27.
 52. Slots J. Herpesviruses, The missing link between gingivitis and periodontitis? *J Int Acad Periodontol* 2004; 6:113–119.
 53. Socransky SS, Haffajee AD. Microbiology of periodontal disease. In: Clinical periodontology and implant dentistry. Lindhe J, Lang NP and Karring T (eds). Oxford: Blackwell Munksgaard 2003, pp. 106–149.
 54. Stenman M, Paldanius M, Saikku P, Sorsa T, Meurman JH. Chlamydia pneumoniae together with collagenase-2 (MMP-8) in periodontal lesions. *J Oral diseases.* 2004; 10:32-35.
 55. Stenman U, Wennström A, Ahlqwist M, Bengtsson C, Björkelund C, Lissner L, Hakeberg M. Association between periodontal disease and ischemic heart disease among Swedish. *Acta Odontol Scand.* 2009; 67:193-199.
 56. Thoden V, V & Abraham-Inpijn, L. Plaque and systemic disease: a reappraisal of the focal infection concept. *J.Clin.Periodontol* 1984; 11: 209-220.
 57. Pallasch TJ, Wahl MJ. Focal infection, new age or ancient history? *Endodontic Topics* 2003; 4:32-45.
 58. Trochim WMK. . Methodologically-based discrepancies in compensatory education evaluations. *Evaluation Review* 1982; 6: 443-480.
 59. Vedin O, Hagström E, Gallup D, et al. Periodontal disease in patients with chronic coronary heart disease: Prevalence and association with cardiovascular risk factors. *Eur J Prevent Cardiol* 2014; 10:1177-1204.
 60. Vettore MV, Leal M, Leão AT, da Silva AM, Lamarca GA, Sheiham A. The relationship between periodontitis and preterm low birth weight. *J Dent Res.* 2008; 87:73–78.

61. WHO. Epidemiology, etiology and prevention of periodontal diseases. Report of WHO Scientific Group, Technical Report Series 621. Geneva 1978.
62. WHO. Oral health surveys. Basic methods, 3rd Edition. Oral health unit, WHO, Geneva 1987.
63. WHO. Periodontal Screening and Recording WHO, Geneva 2012.

APPENDICES**Appendix I (a): Informed Consent Form (English version)**

MUHIMBILI UNIVERSITY OF HEALTH AND ALLIED SCIENCES



DIRECTORATE OF RESEARCH AND PUBLICATIONS, MUHAS
INFORMED CONSENT FORM

ID-NO.

Consent to Participate in a Study

Greetings! My name is Dr.Kessy Frank Sifael; I am working on this research with the objective of assessing the periodontal status, treatment needs an awareness of periodontal disease among adult cardiac patients attending Muhimbili National Hospital Dar Es Salaam, Tanzania

Purpose of the study

The study is conducted in partial fulfilment of the requirements for the degree of Master of Dentistry in Restorative Dentistry of MUHAS. This study is aiming to assess the Periodontal Status, Periodontal Treatment Needs and Awareness among Adult Cardiac Patients Attending the Cardiac Clinic at Muhimbili National Hospital. You are being asked to participate in this study because you have particular knowledge and experiences, information as well as clinical problems that may be important to the study. Kindly please be honest and true for betterment of the results that could lead to better intervention and recommendations for future.

What participation involves.

If you agree to participate in the study, you will first be administered with a questionnaire in order to answer a series of questions in the questionnaire prepared for the study. Secondly you will be referred to a dentist who will perform a brief examination of your mouth. The examiner will provide you with a summary of the findings, offer advice and refer for suitable treatment whenever clinical findings suggests need for referral.

Confidentiality

I assure you that all the information collected from you will be kept confidential. Your name will not be written on any questionnaire or in any report/documents that might let someone identify you. Your name will not be linked with the research information in any way. All information collected on forms will be entered into computers with only the study identification number. Confidentiality will be observed and unauthorized persons will have no access to the data collected.

Risks

We do not expect that any harm will happen to you because of participating in this study.

Right to withdraw and alternatives

Taking part in this study is voluntary. You can stop participating in this study at any time, even if you have already given your consent. Refusal to participate or withdrawal from the study will not involve penalty.

Benefits

The information you provide as well as the findings obtained from oral and dental examinations will help to assess the periodontal status, treatment needs and awareness of periodontal disease among adult cardiac patients.

Whom to contact

If you ever have questions about this study, you may contact the Principal Investigator, Dr.Kessy Frank Sifael (Tel 0753082054 or 0658082054) of Muhimbili University of Health and Allied Sciences, P. O. Box 65001, Dar es Salaam.

If you ever have questions about your rights as a participant, you may call the Chairperson of the Senate Research and Publications Committee, Prof.Mainen Moshi, P. O. Box 65001, Telephone: 255-22-2152489 Dar es Salaam and Dr. E.G.S Mumghamba who is the Supervisor (Tel 0713422245)

Do you agree?

Participant agrees Participant does NOT agree

I have read the contents in this form. My questions have been answered. I agree to participate in this study.

Signature of participant

Signature of Research Assistant

Date

Appendix I (b): Informed Consent Form (Kiswahili version)**CHUO KIKUU CHA SAYANSI ZA AFYA MUHIMBILI****KURUGENZI YA TAFITI NA UCHAPISHAJI****FOMU YA RIDHAA**

Namba ya utambulisho

Ridhaa ya kushiriki kwenye utafiti

Ndugu! Ninaitwa Dr.Kessy Frank Sifael nashughulika kwenye utafiti huu wenye lengo la kuchunguza magonjwa ya fizi ufahamu na uhitaji wa matibabu kwa wagonjwa wa moyo wanaohudhuria kliniki ya moyo hapa Hospitali ya Taifa Muhimbili.

Utafiti huu unafanyika katika kutimiza sehemu ya matakwa ya shahada ya uzamili ya matibabu ya kurekebisha na kuziba meno ya Chuo Kikuu cha Afya na Sayansi ya Tiba Muhimbili. Utafiti unalenga kuchunguza magonjwa ya fizi,kuoza na kupoteza meno kwa wagonjwa wa moyo wanaohudhuria kliniki ya moyo hapa Muhimbili. Unaombwa kushiriki katika utafiti huu kutokana na upeo na ufahamu ulionao au pengine kuwa na magonjwa hayo ambavyo ni muhimu kwa utafiti huu. Tafadhali kuwa mkweli na muwazi kwa vile matokeo ya utafiti huu yanaweza yakatoa maamuzi na mapendekezo ya baadaye kuhusu matibabu.

Jinsi ya kushiriki

Ukikubali kushiriki katika utafiti huu, kwanza utapewa dodoso ili kuweza kujibu maswali toka kwenye dodoso lililoandaliwa kwa ajili ya utafiti huu.

Pili, mganga wa meno atafanya uchunguzi mfupi wa kinywa chako kwa kuangalia afya ya fizi na maeneo yanayozunguka meno, kisha atakufahamisha kuhusu afya yako ya kinywa, kukupatia ushauri wa kitaalam na kukuelekeza mahali sahihi pa kupatiwa matibabu.

Usiri

Taarifa zote zitakazokusanywa kupitia dodoso zitaingizwa kwenye ngamizi kwa kutumia namba za utambulisho. Kutakuwa na usiri na hakuna mtu yeyote asiyehusika atakayepata taarifa zilizokusanywa.

Hatari

Hatutegemei madhara yoyote kukutokea kwa kushiriki kwako kwenye utafiti huu.

Faida

Kama utakubali kushiriki kwenye utafiti huu taarifa utakazotoa zitanuwezesha kutupa mwanga zaidi juu ya matatizo ya fizi, kuoza na kupoteza meno kwa wagonjwa wa moyo na pia matibabu yanayohitajika.

Athari na kukitokea madhara

Hutegemewi kupata madhara yoyote kutokana na ushiriki wako katika utafiti huu.

Uhuru wa kushiriki na haki ya kujitoa

Kushiriki kwenye utafiti huu ni hiari. Unaweza kujitoa kwenye utafiti huu wakati wowote hata kama umeshajaza fomu ya ridhaa ya kushiriki utafiti huu. Kukataa kushiriki au kujitoa kwenye utafiti huu hakutaambatana na masharti yoyote.

Nani wa kuwasiliana naye

Kama una maswali kuhusiana na utafiti huu, wasiliana na Mtafiti: Dr. Kessy Frank Sifael, simu: (0753082054 au 0658082054) wa Chuo Kikuu cha Afya na Sayansi ya Tiba Muhimbili, S. L. P. 65001, Dar es Salaam.

Kama una swali kuhusu stahili zako kama mshiriki unaweza kumpigia simu Mwenyekiti wa kamati ya Utafiti na Uchapishaji, Prof. Mainen Moshi, S.L.P 65001, Simu: (255 22 2152489) Dar es Salaam au msimamizi wa utafiti huu Dr. E.G.S Mumghamba (Simu: 0713422245)

Je umekubali?

Mshiriki amekubali Mshiriki hajakubali

Mimi nimesoma maelezo ya fomu hii.

Maswali yangu yamejibiwa. Nakubali kushiriki katika utafiti huu.

Sahihi ya mshiriki

Sahihi ya mtafiti msaidizi Tarehe ya idhini ya kushiriki

Appendix II (a): Questionnaire (English version)

Periodontal status, periodontal treatment needs and awareness of periodontal disease among adult cardiac patients attending Muhimbili National Hospital.

- a) Patient ID Number
- b) Date of Birth (Year)
- c) Gender: Male Female
- d) Occupation.....
- e) Education (tick one): No formal education Primary education
 Secondary education College/University

INFORMATION FROM PATIENTS MEDICAL FILE

1. Diagnosis....., BP: (Systolic....., Diastolic....., Height:....., Weight:.....)
2. Have you ever visited a dentist?
 - a. Yes
 - b. No
3. If yes, when was the last time?
 - a. One day ago
 - b. One week ago
 - c. One month ago
 - d. One year ago
 - e. More than one year ago
4. Were you referred by physician to the dentist due to oral and dental problems?
 - a. Yes
 - b. No
5. If yes ,did you comply with treatment
 - a. Fully
 - b. Partial

c. Not at all

6. Do you ever heard about gum diseases?

a. Yes

b. No

(If the answer is No for question no. 6, go to question no. 14)

7. Have you ever experienced gum problem(s)?

a. Yes

b. No

8. If yes, what action did you take

a. Going to the dentist

b. No action taken

(Characteristic of the problem was)

9. Bleeding on teeth brushing

a. Yes

b. No

10. Pain from the gums

a. Yes

b. No

11. Swelling of the gums

a. Yes

b. No

12. Mobility of tooth/teeth

a. Yes

b. No

13. Do you know that gum diseases may have an effect on cardiovascular diseases?

a. Yes

- b. No
 - c. I don't know
14. Do you brush your teeth?
- a. Yes
 - b. No
15. If yes, be sincere how many times do you brush your teeth in/per day?
- a. Once per day
 - b. Twice per day
 - c. Three times a day
 - d. More than three times per day
16. At what time do you brush your teeth? (put tick (√) on the appropriate space)
- a. Before breakfast
 - b. After breakfast
 - c. After meals
 - d. Before supper
 - e. Before going to bed
17. What type of tooth cleaning device you use?
- a. Plastic tooth brush
 - b. Chewing stick tooth brush
 - c. Both plastic and chewing stick
 - d. Other, mention _____
18. Have you ever experienced a problem of bad mouth smell?
- a. Yes
 - b. No

(If No go to question no. 21)

19. How did you know that you have such problem?
- a. Self experienced, Self-perceived Yes No
- b. A spouse/close friend have shared with me that I have such a problem
Yes No
- c. I just feel that the people close to me at work feel uncomfortable with me when I'm talking
Yes No
20. How did you solve the problem?
- a. I brushed more in terms of frequency or force Yes No
- b. I resorted to use mouth wash/antiseptics Yes No
- c. I used chewing gum Yes No
- d. I went to the dentist/doctor Yes No
- e. I did nothing Yes No
- f. Other (specify).....
21. Have you ever smoked cigarette? Yes No
22. If Yes,
- a. Daily Yes No
- b. Once/week Yes No
- c. Several times/week Yes No
- d. Several times/month Yes No
23. How many cigarettes do you smoke per day?
- a. Less than ten cigarette per day Yes No
- b. More than ten cigarette per day Yes No
24. Have you ever tried to QUIT smoking Yes No
25. How long since you quit smoking? month years

THANK YOU FOR RESPONDING TO MY QUESTIONS.

Appendix II (b): Questionnaire (Swahili version)

Dodoso kuhusu hali ya magonjwa ya fizi na uhitaji wa matibabu na ufahamu kwa wagonjwa wenye matatizo ya moyo wanaohudhuria matibabu Hospitali ya taifa ya Muhimbili

- a. Namba ya mgonjwa
- b. Tarehe ya kuzaliwa (Mwaka) [_____]
- c. Jinsia: Mwanaume Mwanamke
- d. Kazi.....
- e. Elimu (Tiki kimoja): Hajasoma Elimu ya msingi
Elimu ya sekondari Elimu ya chuo/chuo kikuu

**TAARIFA MUHIMU KUTOKA KWENYE JALADA LA KUMBUKUMBU ZA
MGONJWA**

1. Aina ya ugonjwa....., BP:Systolic...../Diastolic.....
Urefu....., Uzito.....
2. Je, umewahi kwenda kwa daktari wa meno?
1.Ndiyo
2.Hapana
3. Kama ndiyo,mara ya mwisho ilikua lini?
1.Siku moja iliyopita
2.Wiki moja iliyopita
3.Mwezi mmoja uliopita
4.Mwaka mmoja uliopita
5.Zaidi ya mwaka mmoja uliopita
4. Je umewahi kupata rufaa kutoka kwa daktari wako wa moyo kwenda kwa daktari wa meno
kwa ajili ya matibabu?
1.Ndiyo
2.Hapana
5. Je ulikubaliana na matibabu kutoka kwa daktari wa meno?
1.Ndiyo

2.Hapana

3.Kidogo

6. Je ,umewahi kusikia juu ya ugonjwa wa fizi?

1.Ndiyo

2.Hapana

(Kama jibu ni hapana nenda swali la 14)

7. Je umewahi kupata matatizo ya fizi?

1.Ndiyo

2.Hapana

8. Kama jibu ndiyo, Je ulichukua hatua gani?

1.Kwenda kwa daktari wa meno

2.Sikufanya chochote

(Matatizo ya fizi kama:)

9. Kutoka damu kwenye fizi wakati wa kupiga mswaki

1.Ndiyo

2.Hapana

10. Maumivu kwenye fizi

1.Ndiyo

2.Hapana

11. Kuvimba kwa fizi

1.Ndiyo

2.Hapana

12. Kulegea kwa jino/meno

1.Ndiyo

2.Hapana

13. Je, unajua ugonjwa wa fizi waweza kusababisha magonjwa ya moyo?

1.Ndiyo

2.Hapana

3.Sijui

14. Je, huwa unasafisha meno?

1.Ndiyo

2.Hapana

15. Kama ndiyo,(kuwa mkweli) ni mara ngapi kwa siku? (Weka alama ya vema kwenye jibu)

1.Mara moja

2.Mara mbili

3.Mara tatu

4.Zaidi ya mara tatu

16. Ni wakati gani hasa unapiga mswaki?

1.Kabla ya kifungua kinywa Ndiyo Hapana

2.Bbaada ya kifungua kinywa Ndiyo Hapana

3.Baada ya chakula Ndiyo Hapana

4.Kabla ya chakula cha jioni Ndiyo Hapana

5.Kabla ya kulala Ndiyo Hapana

17. Je huwa unatumia nini kusafisha meno yako?

1.Mswaki wa plastiki

2.Mswaki wa kijiti

3.Mswaki wa plastiki na wa mti

4.Vinginevyo,taja.....

18. Je umewahi kuwa na tatizo la kutoa harufu mbaya mdomoni?

1.Ndiyo

2.Hapana

(Kama jibu ni hapana, nenda swali la 21)

19. Ulijuaje kama unatatizo hilo?

1.Nilihisi kwa uzoefu wangu Ndiyo Hapana

2.Kutoka kwa mtu wangu wa karibu Ndiyo Hapana

3.Kutoka kwa wafanyakazi wenzangu kwamba natoa harufu mbaya kinywani

ninapozungumza Ndiyo Hapana

20. Je ulitatuaje tatizo hilo?

- | | | |
|---|------------|-------------|
| 1. Nilipiga mswaki mara nyingi na kwa nguvu zaidi | Ndiyo [__] | Hapana [__] |
| 2. Nilitumia dawa ya maji | Ndiyo [__] | Hapana [__] |
| 3. Nilitumia vimen'genya kama bigijii nk | Ndiyo [__] | Hapana [__] |
| 4. Nilienda kwa dakitari | Ndiyo [__] | Hapana [__] |
| 5. Vinginevyo (taja)..... | | |

21. Je umewahi kuvuta sigara? Ndiyo [__] Hapana [__]

22. Kama ndiyo

- | | | |
|--------------------------|------------|-------------|
| 1. Kila siku | Ndiyo [__] | Hapana [__] |
| 2. Mara moja kwa wiki | Ndiyo [__] | Hapana [__] |
| 3. Mara nyingi kwa wiki | Ndiyo [__] | Hapana [__] |
| 4. Mara nyingi kwa mwezi | Ndiyo [__] | Hapana [__] |

23. Unavuta/ ulikuwa unavuta sigara ngapi kwa siku?

- | | | |
|----------------------------------|------------|-------------|
| 1. Chini ya sigara kumi kwa siku | Ndiyo [__] | Hapana [__] |
| 2. Zaidi ya sigara kumi kwa siku | Ndiyo [__] | Hapana [__] |

24. Je ulishajaribu kuacha kuvuta sigara? Ndiyo [__] Hapana [__]

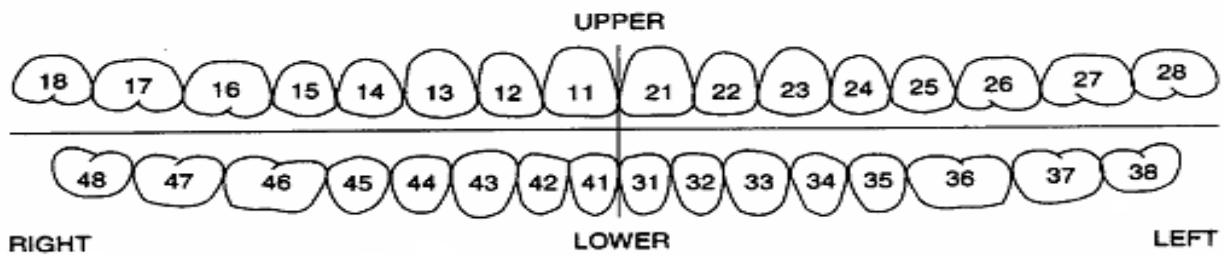
25. Lini uliacha kuvuta sigara? Miezi [__] Miaka [__]

AHSANTE KWA USHIRIKIANO WAKO

GUIDE FOR SCORING CRITERIA (PERIODONTAL STATUS)

PERIODONTAL STATUS	CRITERIA	CODING/SCORE
Gingival bleeding	Absent	0
	Present	1
Plaque score	Absent	0
	Present	1
Calculus	Absent	0
	Present	1
Periodontal pocket depth	Absent, < 3.5mm	0
	Present, 3.5-5.5mm	1
	Present \geq 5.5mm	2
Gingival recession	Absent, < 1mm	0
	Present, 1-3mm	1
	Present, 4-5mm	2
	Present, \geq 6mm	3
Periodontal attachment loss	Absent, < 1mm	0
	Present, 1-2mm	1
	Absent, 3-4mm	2
	Present, \geq 5mm	3

Tooth	18	17	16	15	14	13	12	11	21	22	23	24	25	26	27	28
Missing																
Mobility																



Tooth	48	47	46	45	44	43	42	41	31	32	33	34	35	36	37	38
Missing																
Mobility																

GUIDE FOR SCORING CRITERIA ON TOOTH MOBILITY AND MISSING TEETH.

Tooth mobility: Will be estimated for all teeth according to Ramjford's criteria grades:

- 0 - Physiologic mobility, firm tooth
- 1 - Slight increase mobility (up to 1mm) "slightly more than physiologic" (Grade I)
- 2 - Definite to considerable increase in mobility (greater than 1mm) but with no impairment of function (Grade II)

- 3 - Extreme mobility: severe horizontal mobility (greater than 1mm) combined with vertical displacement. A loose tooth that cannot be used for normal function (Grade III).

Missing:

- 1 - Missing due to periodontal diseases
- 2 - Missing due to caries
- 3 - Missing due to trauma