PERIODONTAL HEALTH STATUS OF HIV DISCORDANT COUPLES AT MOI TEACHING AND REFERRAL HOSPITAL,AMPATH CLINICS

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2018

DECLARATION

I, Dr. Akama Gladys Mwango duly state that this thesis is my original work and has not been presented for the award of a degree in any other university.

Signed..... Date... 24th November 2018

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AWARD

I, Dr. Akama Gladys Mwango do hereby submit my thesis work to graduate school, University of Nairobi, for the award of the Degree of Master of Dental Surgery in Periodontology. The submission of this work has been approved by the supervisors listed below.

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DEDICATION

This thesis is dedicated to my late father, Peter Akama, who had the passion for education despite being illiterate.

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ABBREVIATIONS

AAP	American Academy of Periodontology
AMPATH	Academic Model Providing Access to Health Care
ARVs	Antiretrovirals
CAL	Clinical Attachment Loss
CDC	Centre for Disease Control
CEJ	Cemental Enamel Junction
EC	European Commission
FI	Fusion Inhibitor
GCF	Gingival Crevicular Fluid
HAART	Highly Active Antiretroviral Therapy
ELISA	Enzyme-linked immunosorbent assay
HIV	Human Immunodeficiency Virus
LGE	Linear Gingival Erythema
MT&RH	Moi Teaching and Referral Hospital
NNRTIs	Non-Nucleoside Reverse Transcriptase Inhibitors
NRTIs	Nucleoside Reverse Transcriptase Inhibitors

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NUP Necrotizing Ulcerative Periodontitis

PD Periodontal Disease

PEP Post Exposure Prophylaxis

PI Protease Inhibitors

PrEP Pre-Exposure Prophylaxis

SPSS Statistical Package for Social Sciences

WHO World Health Organization

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DEFINITION OF TERMS

Dental Plaque A specific but highly variable structural entity resulting from colonization and growing microorganisms on surfaces of teeth and consisting of numerous microbial species and strains embedded in an extracellular matrix (WHO 1978).

Periodontal Status The presence of various forms of periodontal disease as measured by various clinical parameters.

Periodontal Diseases Are inflammatory diseases of tooth supporting structures primarily caused by specific bacteria in dental plaque.

Periodontal Indices Are used to measure periodontal status in terms of oral hygiene, gingival inflammation, probing depth and recession which are used to calculate attachment loss.

Periodontal Pocket A pathologically deepened gingival sulcus

Periodontal Charting The recording of the periodontal probing depths in the six surfaces of the tooth crown

Periodontal Probing Depth Distance from the coronal marginal gingiva to sulcus base in millimeters

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HAART A combination of drugs used for treatment of patients with HIV infection, which aggressively suppress HIV replication

HIV Seropositive Development of neutralizing antibodies in individuals who have been exposed to HIV

Pre-HAART Period before implementation of HAART in management of HIV and AIDS

Viral load Measurement of the amount of HIV in blood expressed as copies per milliliter.

Serodiscordant relationship: A state where one partner is infected by Human Immunodeficiency Virus and the other is not.

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ABSTRACT

*Background***:** Periodontal diseases are highly prevalent and are a public health concern. Severity of periodontal diseases depends on host immune response which is affected by genetic and environmental factors. Studies have shown that HIV is a modifier of periodontal diseases although the mechanisms are not clearly understood.Therefore,early diagnosis and management is important in management of these lesions especially in vulnerable groups such as HIV discordant couples.

Methodology: This was a descriptive cross sectional study carried out among one hundred and ninety four HIV discordant individuals in AMPATH outpatient clinics over a three month period. HIV status was confirmed through Elisa in AMPATH laboratories and information was available in the medical records.Socio-demographic characteristics, oral hygiene practices and oral health-seeking behavior were obtained using a semi-structured questionnaire. Oral hygiene status was measured using *Silness* and *Loe*(1964) plaque index, while gingival inflammation was measured using *Loe* and *Silness*(1963) gingival index. Periodontitis was assessed by the amount of Clinical Attachment Loss (CAL).

*Results:*Mean age for participants was 42.3 ±11.7. Periodontal parameters by HIV-Serostatus were clinically similar. However, HIV positive individuals had a lower gingival score which was statistically significant (χ^2=8.00, *df*= 2, *p*=0.018). Chronicperiodontitis was the most prevalent periodontal disease with 37.1 % of participants recording severe levels of the disease.

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*Conclusion***:**Periodontal parameters in HIV positive and HIV negative participants were clinically similar although, there was a reduction in gingival inflammation seen in HIV positive participants. Prevalence of severe chronic periodontitis in this sample population was high. Therefore it is recommended that measures be put in place to actively diagnose and treat periodontal diseases among HIV infected and non-infected individuals.

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CHAPTER ONE

INTRODUCTION

1.0 Background

Periodontal diseases are highly prevalent and are a public health burden because of the associated effects. Globally, they affect more than 50 % of the population with severe forms of disease affecting 10 to 15% of the population [1- 5]. In Kenya, up to 90% of the population suffer from gingivitis while 10-15% suffer from severe chronic periodontitis [2]. They affect the oral health quality of life due to associated pain, loss of function and esthetics[3]. Severe forms of periodontal diseases link oral health to systemic health in three ways: bacteremia, inflammatory products causing systemic injury, activation of the acute phase reaction triggering a cascade of systemic inflammatory reactions [6-8]. There is also the concept of shared risk factors with known chronic diseases such as diabetes, cardiovascular diseases and preterm low birth weight babies [7-11].

The primary etiology of periodontal disease is microbial but the duration, course and severity depends on the host immune response which is further governed by environmental and genetic factors [51, 58, 63-70]. Bacteria host immune interaction trigger a cascade of reactions that stimulate the host to respond causing periodontal tissue destruction to bring about the clinical outcome [18-20]. However, inadequate or dys-regulated host immune response can occur due to genetic variation or influence from the environment. These

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changes affect the way the host responds to oral microbial flora in the homeostatic balance [12, 23].

Human immunodeficiency virus (HIV) is a retrovirus that infects and depletes the cell differentiation 4 T cells which are involved in the host immune humoral response. It is still a public health concern, although prevalence and incidence rate is on the decrease in Sub-Saharan Africa where resources are limited [75-6]. Studies [9-10, 24-30] linking periodontal disease with HIV infections have shown HIV to be a risk factor in periodontal disease severity and prevalence.However, the mechanism of interaction is poorly understood. Most studies [25-27] have linked the modification of periodontal status reported to the depressed immunity in terms of low CD4 T cell count, while others have linked it to microbial composition of HIV infected individuals [30,32]. However, there are still controversies or conflicting conclusions from these studies making the association between periodontal diseases and HIV still unresolved issue.

1.1 Conceptual Framework

Periodontal disease prevalence and severity depend on the host immune and bacterial interplay [13]. Oral hygiene status is affected by oral hygiene practices which are in turn affected by socioeconomic factors, education level and oral health awareness. Modification of these factors improves oral hygiene status leading to elimination or reduction of pathogens that cause periodontal disease [1]. Host immune status is affected by systemic diseases such as HIV/AIDS and genetic variations in individuals [51]. Therefore, oral hygiene and host immune status are independent variables with mediators or intervening variables and the

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outcome is periodontal health or disease. Figure no 1.1 below shows how these factors interact to bring about the observed clinical outcome.

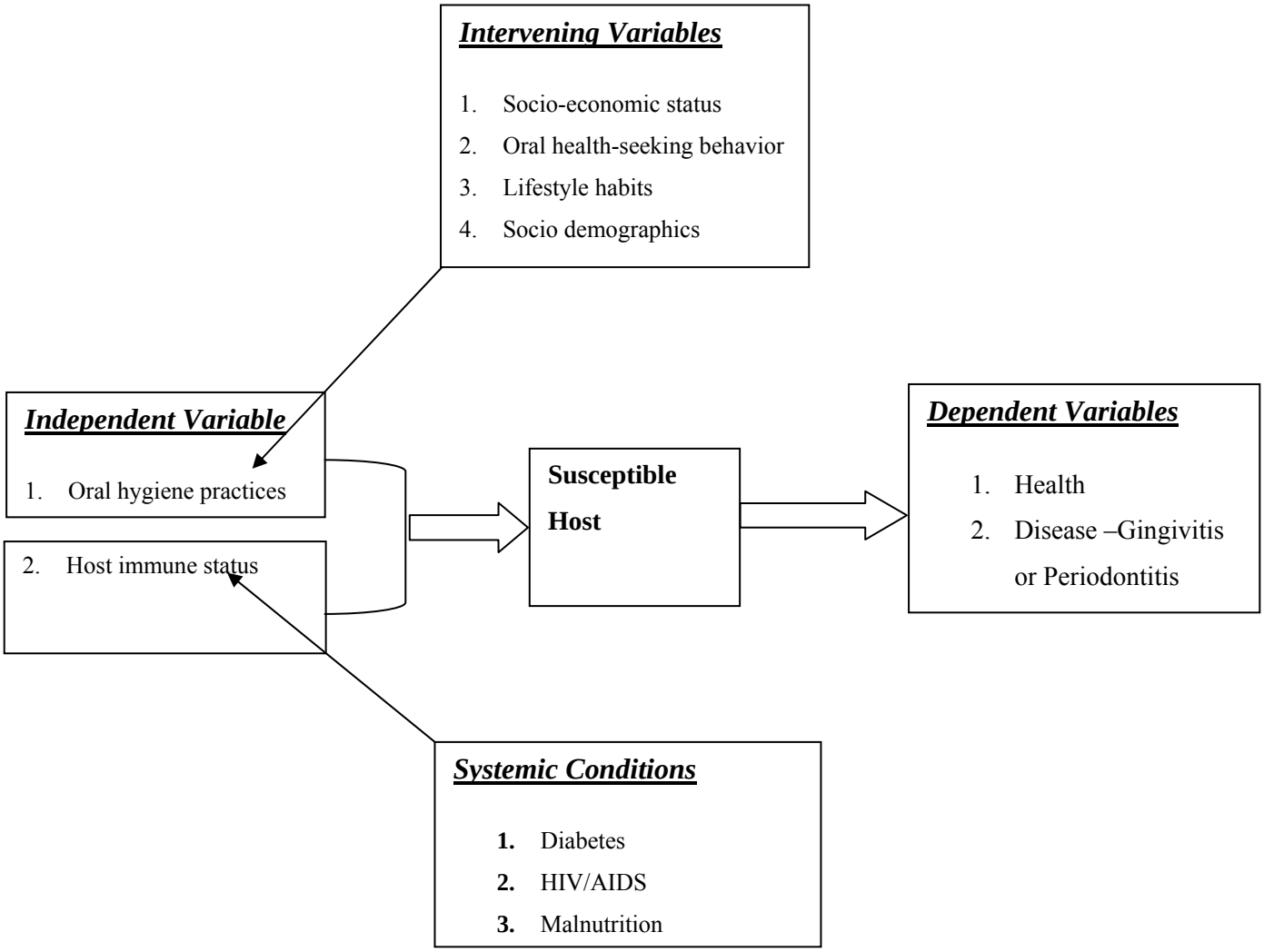

Fig 1.1 Conceptual Framework

1.2Literature Review

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1.2.1Periodontal Diseases Overview

Periodontal diseases affect structures that attach and support the tooth in the alveolar sockets.They have been classified into eight sub-groups, with two broad groups: gingival and periodontal diseases [16].Advancesin microbial research have shown that poly-microbial disruption of host homeostasis is what determines the amount of tissue destruction seen in periodontal disease [12, 23]. This theory is supported by active host innate immune response in healthy tissue; presence of Toll like receptors which recognize microorganisms and organization of oral microbes into a biofilm [19-23].Therefore, an imbalance in this interplay either due to genetic or environmental factors determines the clinical outcome.

Periodontal diseases vary in symptoms from mild gingival inflammation to severe clinical attachment loss [14-17]. Diagnosis requires thorough medical and dental history with detailed clinical examination. Periodontal examination using various periodontal parameters such as plaque and gingival index scores aid in making a diagnosis. Bleeding on probing of the gingival margins without clinical attachment loss is denoted as gingivitis [14]. Loss of clinical attachment due to apical migration of junctional epithelium is denoted as periodontitis [15-6].

Lifestyle behaviors such as poor oral hygiene practices; low oral health seeking behavior; smoking and alcohol use modify periodontal disease progression [58, 63, 72- 4]. These factors are further affected by low socioeconomic status, low education level and demographics like age and gender. Prevalence and severity of periodontal diseases increase with age while male gender has been associated with poor plaque control and poor oral health seeking behavior [51]. Genetic variations in host immune response receptors,

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cytokines and inflammatory enzymes have also been shown to alter disease prevalence and severity [65-70]. The role of systemic diseases in modifying periodontal disease prevalence and severity has been demonstrated with diseases such diabetes and HIV infections [7-8]. Therefore, periodontal diseases are multifactorial making causality studies complex.

1.2.2Epidemiology of PeriodontalDiseases

Globally periodontal diseases are prevalent and severe forms have been associated with tooth loss hence increasing the burden of oral health diseases [1-3].Severe chronic periodontitis affects 10-15% of the population [3-4]. In Kenya up to 90% of the individuals suffer from some form of periodontal disease[3].This high prevalence makes periodontal diseases a public health concern.

1.2.3 HIV Associated Periodontal Diseases

Association of HIV infection and periodontal health status was first described by Winkler and Murray [35]. They described a condition that was characterized by acute onset of gingival inflammation and referred to it as HIV-gingivitis, which was later renamed linear gingival erythema. Necrotizing ulcerative periodontal lesions associated with low cell differentiation 4 T cell (CD4+ T cell) count, were also reported around that time. Individuals with existing chronic periodontitis had aggressive progression of the lesions leading to severe periodontal tissue destruction [25-28]. Characteristics of these HIV associated periodontal diseases are described below.

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1.2.3.1 Linear Gingival Erythema (LGE)

Clinically, there is a red line along the marginal gingiva.It starts from the anterior teeth and later extends to the posterior teeth. Patients may experience pain and sometimes bleeding. Petechial patches may extend to the attached gingiva. *Candida spp.* has implicated in the etiology of LGE [35]. It does not respond to routine scaling and prophylaxis.

1.2.3.2 Necrotizing Ulcerative Gingivitis

It affects marginal gingiva and inter-dental papilla. Itprogresses rapidly with destruction of soft tissues but there is no periodontal pocket formation. Low CD4+T cell count has been reported in individuals with necrotizing ulcerative gingivitis [33-4].

1.2.3.3 Necrotizing Ulcerative Periodontitis

Clinically these patients present with bleeding gums; mobile teeth;foul smell; soft and hard tissue destruction. Patients experience deep jaw pain. There are no deep pockets but instead there is bone loss. There is lymphadenopathy and general body malaise with*Candida spp.* and reduced CD4+ T cell count being associated with this condition [33-4, 42].

1.2.3.4 Necrotizing Ulcerating Stomatitis

It simulates severe forms of necrotizing ulcerative periodontitis extending to the alveolar and cheek mucosa. There is severe hard and soft tissue destruction. It is associated with severe depression of CD4 + T cells [33].

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1.2.3.5 Chronic Periodontitis (CP)

Clinically, chronic periodontitis presents with bleeding on probing of the gingiva, periodontal pocket formation, gingival recession, tooth mobility and spacing.Variousstudies [25-39] have reported contrasting reports on the prevalence and severity of chronic periodontitis in people living with HIV. Some authors [25-7, 29, and 36]reported increased clinical attachment loss among HIV infected individuals while others found no difference [28, 31,and 37].This variance would be attributed to various case definitions, sample population and data collection techniques. These conflicting results show that chronic periodontitis is still an unresolved issueamong people living with HIV/AIDS(PLWHA).

1.2.4 HIV and Periodontal Disease Interaction

The changes seen in the pattern of periodontal disease progression among HIV individuals is thought to arise from changes in the host immune response cells and pro-inflammatory cytokine production [30, 32]. Studies have shown that HIV infected individualshave decreased levels of T lymphocytes cells in gingival connective tissue and increased PGE_2in gingivalfluid [53-4]. However, periodontal disease is site specific and progression depends on host immune reaction to microbes[12, 23]. HIV is thought to affect this interplay through its effect on host immune response since it infects and depletes the cells responsible for cellular and humoral immune response.

Observational studies [43-50] have associated periodontal diseases with activation of latent HIV infected cells. The following areas of interaction have been observed: up-regulation of various HIV receptors and HIV transcription factor activation by various enzymes produced

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by periodontal pathogens. However, the question on whether chronic inflammation seen in severe chronic periodontitis can activate latent HIV cells and lead to full blown HIV infection still remains unanswered.

1.2.5 HAART and Periodontal Disease

Introduction of Highly Active Antiretroviral Therapy (HAART) is reported to have reduced the severity of gingival inflammation and attachment loss. The mechanisms are not so clear but it is possible that the immune reconstitution associated with HAART affects the bacterial host immune interplay. It is also possible that one of the drugs used in HAART has an anti-inflammatory and antimicrobial effect [30].Furthermore, slot et al showed that viruses have been isolated in periodontal disease lesions [62]. Therefore, use of antiretroviral drugs would suppress these viruses hence contributing to resolution of gingival inflammation However, further research that takes into account the type and duration of antiretroviral drug use may give meaningful insights in HAART and periodontal disease interaction.

1.2.6 HIV Discordance Status

Prevalence of HIV discordance in Africa ranges from 20-35% [76-9]. This is a special group in HIV transmission prevention strategies because one individual is infected with HIV and the other is exposed but not infected. The reason for this mixed status is not known and still remains a myth. Several preventive measures have been put in place toreduce HIV transmission and opportunisticinfections in this group.These include: vaccine trials; couple counseling, protective sexual activities, male circumcision and guided reproductive health [79-80]. Pre and post exposure Prophylaxis (Pr-EP and PEP respectively) among high risk

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HIV groups such as men who have sex with men have been introduced to the HIV management guidelines among high risk groups such as men having sex with men and HIV discordant couples [80]. Oral antibiotic prophylaxis, especially use of co-trimoxazole, to reduce opportunistic infection in the respiratory and gastrointestinal system has also been recommended in the guidelines. These interventions have done well in reduction of HIV transmission and prevention of opportunistic infections [75-6]. However, the role of oral health care management in prevention of opportunistic infections especially in high risk groups is not so clear in HIV management guidelines. Neither is there evidence on periodontal treatment needs among these high risk groups in HIV transmission and opportunistic infections.

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CHAPTER 2

STATEMENT OF THE RESEARCH PROBLEM, STUDY JUSTIFICATION AND OBJECTIVES

2.1Problem Statement

Periodontal diseases are highly prevalent and are becoming a public health concern due to their local and systemic effects both in HIV infected and non HIV infected individuals. Currently, the aims of periodontal treatment are to eliminate etiological factors and restore periodontal form and function. However, response to therapy depends on the host immune status which is weakened by systemic diseases and other environmental factors. During theearly stages,periodontal diseasesare asymptomatic and may go unnoticed till severe forms of disease develop. Therefore, there is need for clinicians to identify these lesions early and treat them to alleviate the local and systemic effects especially in individuals who are immune-compromised.

Interventions aimed at treating or preventing HIV transmission and opportunistic infections are still going on with emphasis on high risk groups like commercial sex workers, men who have sex with men and HIV discordant couples. Incorporating oral health in these prevention strategies would help in improving the oral health quality of life and systemic health of these individuals.However, there is no oral health care policy in HIV management guidelines despite many previous studies making these recommendations. This therefore, means undiagnosed periodontal diseases continue causing local and systemic effects which would be detrimental to the general health of affected individuals.

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2.2Justification of the Study

The pattern of periodontal diseases among people living with HIV has been heavily studied but there is inadequate documentation on the periodontal health status of HIV discordant couples especially in western part of Kenya. AMPATH Kenya, has over sixty satellite centers in North-rift, western and part of Nyanza counties that cater for HIV infected and affected individuals in terms of care and support. Several studies are going on in these centers but there was hardly any documented information on oral health and yet oral diseases affect systemic health or vice versa.

Prevention of opportunistic infections has been emphasized in care of these individuals through medications and nutritional boost. However, periodontal diseases that have been documented to have an effect on nutrition and bacteremia levels have not been included in treatment guidelines.Furthermore, observational studieshave shown that latent HIV cells can be activated through their receptors and transcription factors by periodontal pathogens.Therefore, prevention of periodontal diseases through interventional strategies, in HIV infected individuals, would go a long way in reducing opportunistic infections.However, for policy makers to implement this in HIV care guidelines, evidence on periodontal health status of high risk groups such as HIV discordant individuals should be available.

2.2.1 Rationale for the Study

The public health relevance of traditionally defined periodontal diseases in HIV infected individuals is still significant. Therefore, individuals with compromised immune system

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require early diagnosis and treatment to avoid local and systemic effects of severe forms of disease.

2.2.2 Research Questions

Q1. What is the periodontal health status of HIV discordance individuals?

Q2. Is there a difference in the periodontal health status among HIV positive individuals and HIV negative individuals?

2.3 Objectives

2.3.1 Broad Objective

The aim of the study was to assess the periodontal health status ofHIV discordant individuals.

2.3.2 Specific Objectives

i. To assess the oral hygiene status of HIV discordant individuals.
ii. To determine the prevalence and severity of gingivitis in HIV individuals.
iii. To establish the prevalence and severity of periodontitis in HIV individuals.
iv. To compare the periodontal health status of HIV positive and HIV negative individuals.

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2.4 Hypotheses

2.4.1Null Hypotheses

i. There is no difference in theoral hygiene status between HIV positive and HIV negative individuals.

ii. There is no difference in gingival inflammation between HIV positive and HIV negative individuals.

iii. There is no difference in periodontitis between HIV positive and HIV negative individuals.

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Table 2.1:Study Variables

Variable	**Measurements**
Independent	
HIV status	Serology-CD4+ cell count/ viral load
HAART use	Class of ARVs and duration in years
Oral hygiene status	Presence or absence of plaque (plaque score)
Dependent	Gingival inflammation (GI)
Periodontal diseases	Periodontal Probing Depth (mm)
	Gingival recession (mm)
	Clinical Attachment Loss (mm)
Socio-demographic	
Age	Number of years
Gender	Male or female
Education	Highest level of education attained
Occupation	Type of work done
Oral health seeking behavior	Visits to the dentist, treatment offered
Confounders	
Smoking	Number of cigarette packs/year

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CHAPTER 3

MATERIALS AND METHODS

This chapter describes the study design, site and study population. It also describes the methodology used in participant recruitment, data collection and analysis.

3.1 Study Design

This was a cross-sectional hospital-based research done with the aim of obtaining baseline information on the periodontal status of HIV discordant individuals in terms of oral hygiene, gingival inflammation and periodontitis in a period of three months. This design was chosen because it assesses the burden of disease in terms of prevalence and estimates the occurrence of associated risk factors in a population within a short time. However, it has limitations in determining temporal relationships between the risk factors and disease outcomes.

3.2Study Area

The study was done western part of Kenya, at Moi Teaching and Referral Hospital / Moi University (MTRH/MU), AMPATH clinics.AMPATH is a comprehensive care program for

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HIV infected and affected individuals using an academic model. This model was formed by a consortium of international universities led by Indiana University in collaboration with MTRH/MU College of Health Sciences. Their main office is located in the Moi Teaching and Referral Hospitalin UasinGishu county. AMPATH has over 60 rural and urban satellite sites. It serves approximately 3.5 million clients and has three core values namely: Care, Research and Training. To achieve thesecore objectives, it has comprehensive care clinics spread into modules. It has also acquired farms for agriculture to boost their food supply and improve the nutrition of their clients who are infected and affected by HIV.Their strengths include an internationally certified medical laboratory and a well-coordinatedresearch program.It has a retention program for care and follow up of clients. HIV discordant couples in these centres have been encouraged to form psychosocial support groups where they meet and share their opportunities and life challenges. Together with trained counsellors,they discuss issues and live positively.

3.3 Study Population

HIV discordant couples formed the study population. A couple is made up two individuals in a consenting sexual relationship for a specifie period of time. For purposes of this study HIV discordant couples of opposite sex were used since same sex couples were not available. Majority were either cohabiting, married or having a stable sexual relation. This part of Kenya is mainly inhabited by Kalenjins, Luyhas, Kisii and Luos. Their source of living is mainly peasant farming. However, those in urban and periurban areas engage in small enterprises businesses and some are in formal employment.Socioeconomic activities in these region have been affected by increase in population and industrialization which has led to

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rural urban migration in such of employment. Peasant farming is also no longer lucrative and hence most farmers have abandoned it. This has led to low socioeconomic status in the community which has affected their health seeking behavior due to cost involved and access. In prevention of HIV strategies,disclosure issues and HIV stigma are still a challenge due to sociobehavioral factors.Separation among HIV discordantcouples is a threat especially if the woman was the one infected with the HIV virus. Sociobehavioral change in terms of free communication during group discussion is still a challenge due to some cultural beliefs. Forexample, during interaction with the couples, it was clear that some habits such kissing and oral sex were a norm among some communities while to some it was a taboo.

3.4 Sample Design and Procedure

3.4.1 Sample Size Determination

Periodontal disease prevalence among Kenyan adults had been reported at 80% [3]. Sample size determination was done usingFisher's exact formula.

$n=Z^2P(1-P)/d^2$

Where;

n= is the desired sample size

Z= Z value at the level of confidence (0.05)

P= prevalence of periodontal disease

d=precision (5% standard error)

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For 95%confidence interval Z value is 1.96 and d is 0.05 and P is 0.20

$$n = \frac{(1.96)^2 X 0.20\ (1-0.20)}{(0.05)^2}$$

$$n = 245.8624$$

Since study population of interest was less than 10,000 the following formula was used to correct the sample size:

$$nf = n/1 + (n)/(N)$$

Where nf= desired sample size, when population is less than 10,000

N= estimation of study population size

$$nf = 245/1 + 245/1000 = 204$$

3.4.2 Sample Selection

Snow balling technique was used to obtain the desired sample population because the group of interest were few in the general population and attaining the calculated sample size of 204 within a short time was difficult. This was made worse by other ongoing studies in the centers where some individuals from the group of interest were already in an interventional study and issues of study contamination arose after proposal development. Disclosure issues really hampered recruitment process since consent must be obtained from the affected individual before disclosure.

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3.4.3 Inclusion Criteria

1. HIV discordant individuals in the AMPATH retention register.
2. They must have lived or cohabited as sexual partners for more than a year.
3. Over 18 years of age and able to consent.
4. No prior periodontal treatment in the past three months.

3.4.4 Exclusion Criteria

1. Couples who were too ill to participate (not able to consent).
2. Pregnant women.
3. Uncontrolled systemic diseases e .g diabetes.
4. Cancer patients.
5. Those with less than 20 teeth.

3.4.5 Participant Recruitment

The serology status of the HIV discordant couples had been done and confirmed by AMPATH laboratories and those who tested HIV positive were already on antiretroviral therapy and records were available.The investigator gave information sheets containing a summary of the study protocol, consent form and investigation brochures to the primary/specialist healthcare provider. A meeting was held with staff in retention program to sensitize them on these documents since they were the ones to make initial contact with the clients.

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The healthcare provider introduced the study to the clients and obtainedpermission from them to be contacted by the principal researcher. A list of those willing to participate and their contacts was availed to the principal researcher by the facility in-charge. Meetings between willing participants, principal researcher and AMPATH retention program staff to explain the study protocol were convenedweekly.Those willing to be part of the study signed the consent form (Appendix 1) and filled the screening form (Appendix 2).

Information obtained enabled the investigator to screen and filter out clients who did not meet the inclusion criteria and assign study numbers to the rest. Those not meeting the inclusion criteriawere given oral health education and discharged. Those meeting the inclusion criteria were informed that by accepting to participate in the research, their medical records formed part of the research database.Each session per week recruited a minimum of eight couples.

Issues of confidentiality and disclosure were discussed and members were assured of information confidentiality. It was also agreed during the meetings that activities in the AMPATH care program were not to be interrupted while carrying out the study. Fig 3.2 shows the recruitment process.

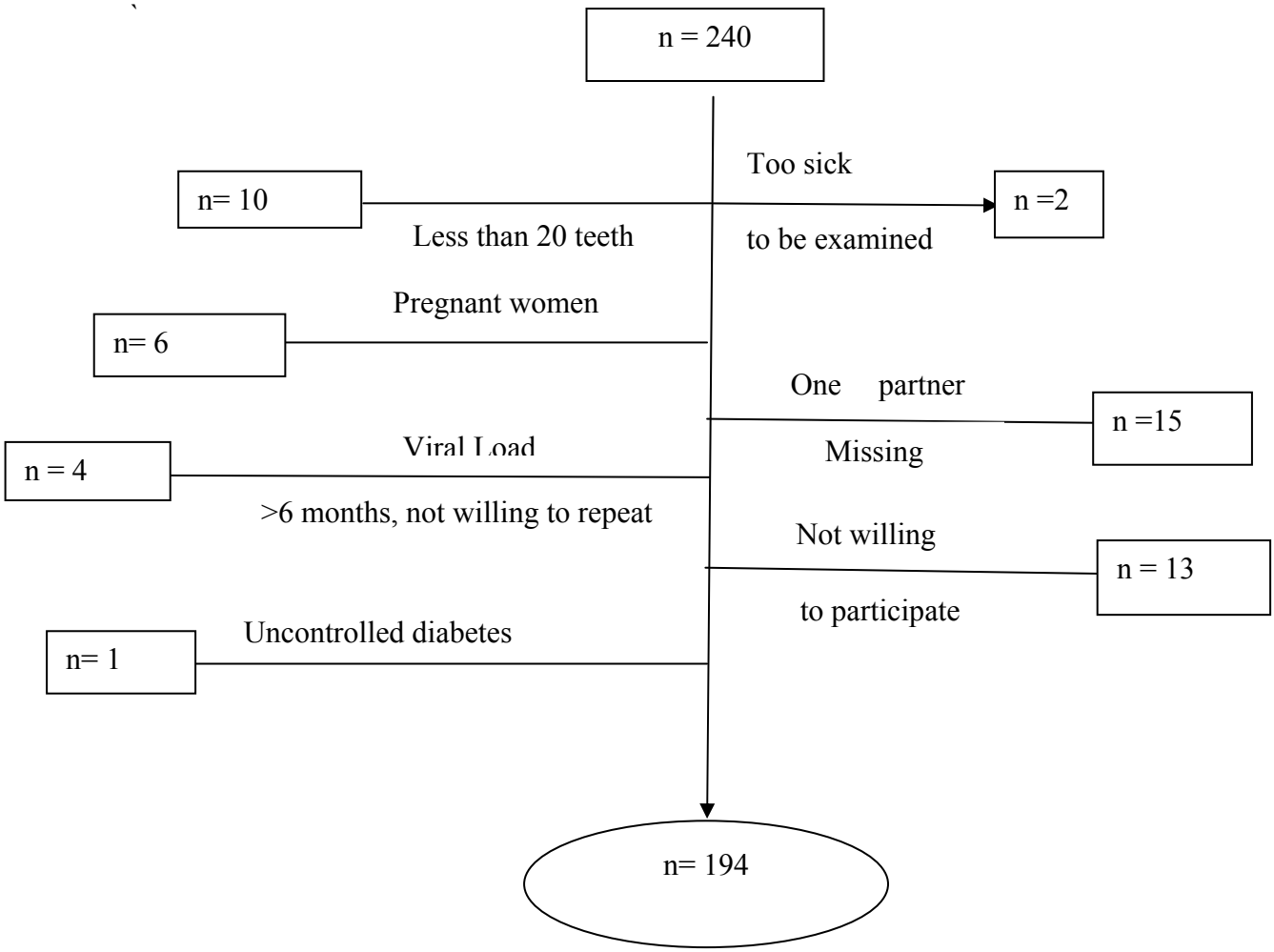

Figure3.1: Flow Chart for Screening of HIV Discordant Couples

3.5 Data Collection Instruments and Technique

3.5.1 Tools and Indices

A modified, pretested WHO semi-structured questionnaire (Appendix 3) was administered to couples to assess their oral hygiene practices, oral health-seeking habits and associated risk factors. These was followed by clinical examination of the individuals. A complete periodontal examination was done to determine the plaque and gingival scores. Periodontal

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pocket depthsand gingival recession measurements were done and information obtained was used to calculate clinical attachment loss. Atypical periodontal diseases were identified using the EC- Clearing House criteria [42] which classifies HIV associated oral lesions into3 categories: lesions strongly associated; less commonly associated and lesions seen. Linear gingival erythema; necrotizing ulcerative gingivitis and necrotizing ulcerative periodontitis are periodontal diseases strongly associated with HIV. The information obtained was recorded in a modified clinical form (Appendix 4). Medical history, serology lab results (CD4 T cell count / viral load) and ARV use records were obtained from medical files and entered into the clinical data form.

3.5.2 Preliminary Phase

Data collection tools were pre-tested in Uasin GishuCounty Hospital. The questions in the questionnaires were well understood by participants who were literate. However, there were issues in self administration of the questionnaire among participants who would not read or write. This was solved by training a research assistant to administer the questionnaires.Ten individuals were clinically examined and all of them had moderate plaque score accumulation with a mean plaque score of 1. 87± 0.49. All participants exhibited gingival bleeding on probing with a mean gingival index of 1.02±0.43. There were periodontal pocket depths (mean=4.02±1.07mm) and gingiva recessions (mean=2.13±0.57mm) depicting clinical attachment loss and hence periodontitis in nine out of ten individuals.

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3.5.3 Calibration

The principal examiner was calibrated by one of the supervisor who is a specialistin Periodontology.The principal investigator re-examined every 5th patient to evaluate intra-examiner validity and the values ranged between 0.8 to o.88 (plaque score =0.8, probing depth score =0.88, clinical attachment loss=0.83). The readings were almostsimilar and a Kappa score value of between 0.8-0.9 was agreed on.

3.5.4 Data Collection

Socio-demographic variables were obtained using a semi structured questionnaire that was administered by a trained research assistant. Information obtained and recorded included gender, age, occupation, level of education, dental/medical history, oral hygiene habits, smoking and alcohol use.

3.5.4.1 Clinical Examination

The couples were examined in a well-lit room using natural light and examination lamps. Privacy was adhered to at all times by ensuring that each client was examined in a private room. Extra oral and intra-oral examination was done by the principal investigator. Infection control and prevention protocols were observed by single use of sterile equipment anduse of personal protective gear.

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3.5.4.2 Oral Hygiene Status

Oral hygiene status was clinically assessed using Silness and Loe (1964) plaque index which grades amount of plaque from zero to three. Absence of plaque was graded as zero and presence was scored in a scale of 1 to 3. The plaque score were recorded depending on the amount as 1= light plaque, 2=moderate plaque accumulation, 3=heavy plaque deposits.

3.5.4.3 Gingival Inflammation

Bleeding on probing using Loeand Silness(1963) index was used to assess the level of gingival inflammation. Assessment was done by sweeping the William's periodontal probe, under light finger pressure, at the gingival sulcus of the designated index teeth and waiting for at least 15 seconds, before obtaining the results and recording in the modified clinical form.Gingival inflammation level was recorded in a scale of 0 to 3 (0=normal gingiva,1=minimal inflammation, 2=moderate inflammation, 3=severe inflammation).

3.5.4.4 Periodontal Charting

Periodontal charting was done only on teeth that had at least half of the crown intact. Measurements were obtained by probing the mesial, middle and distal, buccal and lingual surfaces of all teeth except the lastmolar and recording the information on the modified clinical form.

Pocket depths were measured from the coronal extent of gingiva to the sulcus base and recorded in millimeters.

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Recessionwas measured by assessing the position of gingival margin from the CEJ. Positive values were given where the gingiva was below the CEJ and negative values where it was above the CEJ.

Recession and probing depths values were used to determine clinical attachment loss.

Examination for the presence or absence of LGE, NUG, NUP, and NUS was done using the EC-Clearing House(1993) criteria.

HAART history and viral loads of HIV seropositive partners were obtained from the client's file. Serology results used for this study were less than 6 months old for viral load and 3 months old for CD4+ T cell count.

3.5.5 *CaseDefinitions*

1.Gingival inflammation characterized by bleeding on probing and no attachment losswas defined as gingivitis. Periodontitis was defined as presence of one or more sites of teeth with clinical attachment loss. Severity of chronic periodontitis was measured according to levels of clinical attachment loss as mild (CAL=1 to 2mm), moderate (CAL=3 to 4mm), severe (CAL>5mm)(***AAP 1999 criteria).***

3. HIV-discordant couple wasdefined as two people in a sexualor romantic relationship for a certain period of time, married or unmarried, monogamous or non-monogamous, over 18 years of age and HIV discordance status confirmed through serological tests (***AMPATH criteria***).

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3.6 Data Analysis and Presentation

Data was pre-coded and entered into Microsoft excel and SPSS. Mean values were used to summarize data and present it in tables, graphs and pie charts for objectives 1 to 3. For objective 4, comparison of variables was done using Chi Square and independent T tests. The Confidence Interval (CI) was already set at 95% and results were considered statisticallysignificant when $p<0.05$.

3.7Ethical Considerations

Approval was given by Institutional Research Ethics Committee (IREC) while authority to carry out the study was sought from the hospital director and AMPATHresearch office (Appendix 5).The research protocol was explained to the clientsbefore data collection and they gave consent. Benefits from the study were explained to the participants. Clinical examination was done by following the standard operating procedures stipulated in the facility quality management standards manual. Participants who required emergency treatment were seen and those who required further treatment were referred to facility dental clinics.Confidentiality was maintained at all times by using codes instead of clients' names. All data was stored in lockable cabinets and password protected computers.

3.8 Study Limitations

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Sampling of the study was done through snowballing technique. This introduced bias in that may be only individuals with dental problems accepted to join the study. Medical history was confirmed from the medical records hence undiagnosed systemic diseases were missed. Recall bias in medical history; missing medical records and sampling would be a source of error. Desired sample was not achieved although, its effect on the power of the study was negligible.

3.9 Study Benefits

Participants received oral health education and counseling.Diagnosis of oral diseases was made and participants were referred accordingly. Those who needed emergency treatment like extraction and pain relief were treated and the cost was met by the principal researcher.

3.10

3.10 Disclosure

The cost of this study was met by the principal investigator for academic purposes. AMPATH gave assistance in terms of personnel, provision of medical care and laboratory services.

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CHAPTER 4

RESULTS

4.0 Introduction

This chapter presents data obtained from questionnaires, medical records and clinical examination. The results are presented according to study objectives. Risk factors associated with periodontal health status are analyzed at the end of the chapter. The chapter is divided into 7 subsections: Socio-demographics (4.1) Oral hygiene status (4.2), Gingivitis (4.3), Periodontitis (4.4), comparison of periodontal parameters by HIV status (4.5), associated risk factors and periodontal disease (4.6), a summary of descriptive data (4.7).

4.1Socio-Demographics of Study Participants

The minimum sample size calculated was 204 participants however individuals who met the inclusion criteria were194. There was equal representation of males and females since there was no same sex couple. The mean age for participants was 43.2±11.7. The socioeconomic status of the study participants was low since majority (n=100, 51.5%) had primary level of education and most of them (n= 190, 97.9%)were in informal employment as illustrated in the figure below.

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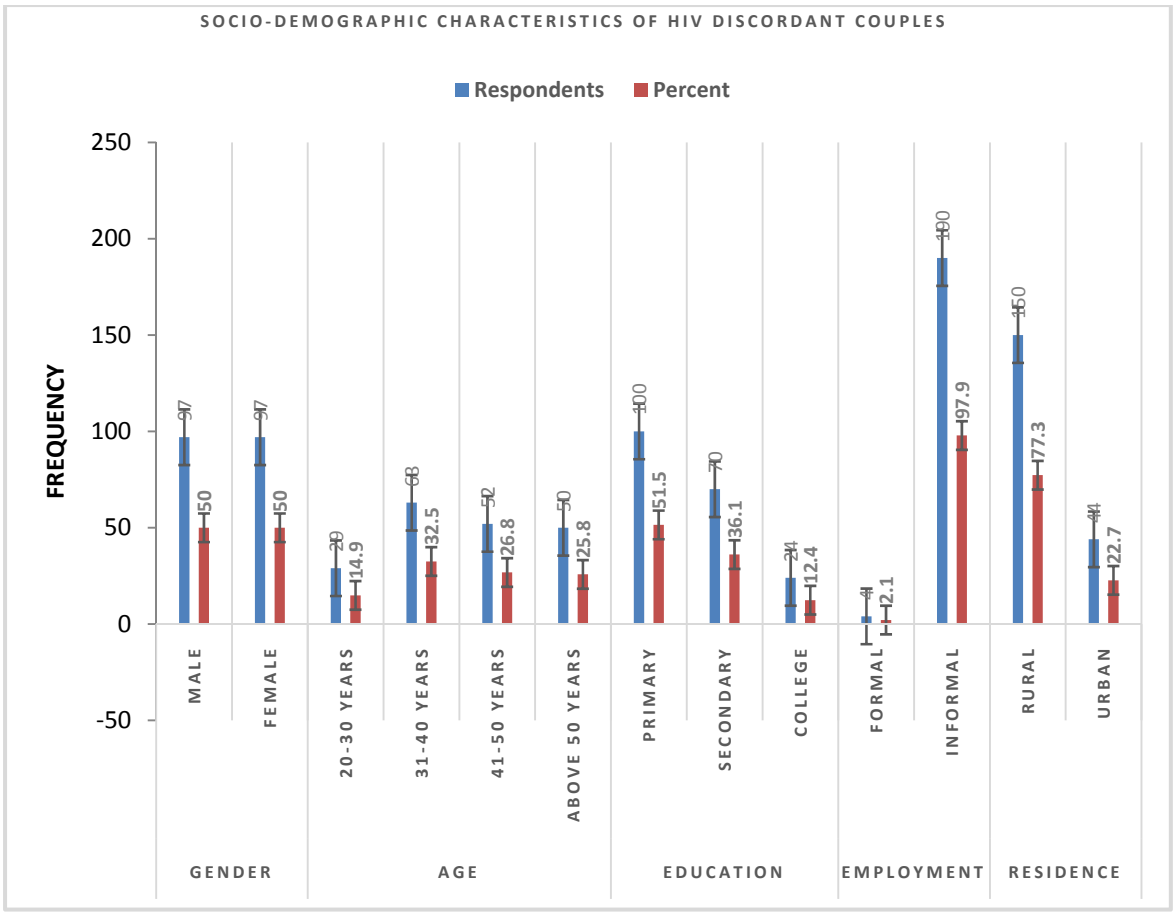

Figure 4.1 Socio-demographics of Participants

4.2 Oral Hygiene Status

The first objective of this study was to describe the oral hygiene status of HIV discordant individuals using plaque sore index.All participants had plaque deposits with a mean plaque score of 1.95±0.69 (Table 4.1). Majority(n=102, 52.5 %) of the participants had a plaque score of 1.1 to 2.0.However, amount of plaque deposits differed by age, gender, frequency of brushing and habits like smoking (Table 4.2). Majority (n=33, 67.3%) of those with heavy

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plaque deposits were aged above 40 years. Most males (n=82, 84.5%)had moderate to heavy plaque deposits while most females (n=79, 81.4%) had light to moderate plaque deposits.

Table 4.1: Plaque Categories

	Frequency (n)	**Percent (%)**
Light Plaque	43	22.2
Moderate Plaque	102	52.6
Heavy Plaque	49	25.3

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Table 4.2: Distribution of Mean Plaque Score by Gender, HIV Status, Oral Hygiene Habits and Smoking

		0.01-1 (N, %)	**1.1-2.0 (N, %)**	**2.1-3.0 (N, %)**
Gender	male	16 (37.2%)	50(49%)	32(65.3%)
	female	27(62.8%)	52(51%)	17(34.7%)
	Total	**43(100)**	**102(100)**	**49(100)**
Age	20-30 years	10 (23.3%)	14 (13.7%)	5 (10.2%)
	31-40 years	19(44.2%)	33(32.4%)	11 (22.4%)
	41-50 years	9(20.9%)	28 (27.5%)	15(30.6%)
	Above 50 years	5(11.6%)	27 (26.5%)	18(36.7%)
	Total	**43(100%)**	**102(100)**	**49(100%)**
HIV stat	negative	18 (41.9%)	53(52%)	26(53.1%)
	positive	25(58.1%)	49(48%)	23(46.9%)
	Total	**43(100)**	**102(100%)**	**49(100)**
Smoking	smoker	1(2.3%)	8(7.8%)	8 (16.3%)
	non-smoker	41(95.3%)	90(88.2%)	38(77.6%)
	Former	1(2.3%)	4(3.9%)	3(6.1%)
	Total	**43(100%)**	**102(100%)**	**49(100%)**
Brushing frequency	once a day	20 (46.5%)	54(52.9%)	35 (71.4%)
	twice a day	16(37.2%)	40(39.2%)	9(18.4%)
	three times a day	7(16.3%)	8(7.8%)	5(10.2%)
	Total	**43(100)**	**102(100)**	**49(100%)**
Aid	commercial toothbrush	37 (86%)	77 (75%)	35 (71%)
	chewing stick	6(14%)	25(25%)	14(29%)
	Total	**43(100%)**	**102(100%)**	**49(100%)**

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4.3 Gingival Inflammation

The second objective was to establish prevalence and severity of gingival inflammation (gingivitis) using gingival scores obtained. All participants had gingival inflammation with some form of gingival bleeding. Majority(n=90, 46.4%) of participants had moderate gingivitis while minority (n=21,10.8%) had severe gingivitis (Table 4.3). Mean gingival index recorded for all participants was 1.54±0.60with HIV positive and negative participants having a mean gingival score of 1.48 and 1.62, respectively (Figure 4.2).

Table 4.3: Gingivitis Categories

	Frequency (n)	Percent (%)
Mild Gingivitis	83	42.8
Moderate Gingivitis	90	46.4
Severe Gingivitis	21	10.8

4.3.1. Distribution of Gingival Inflammation by HIV status

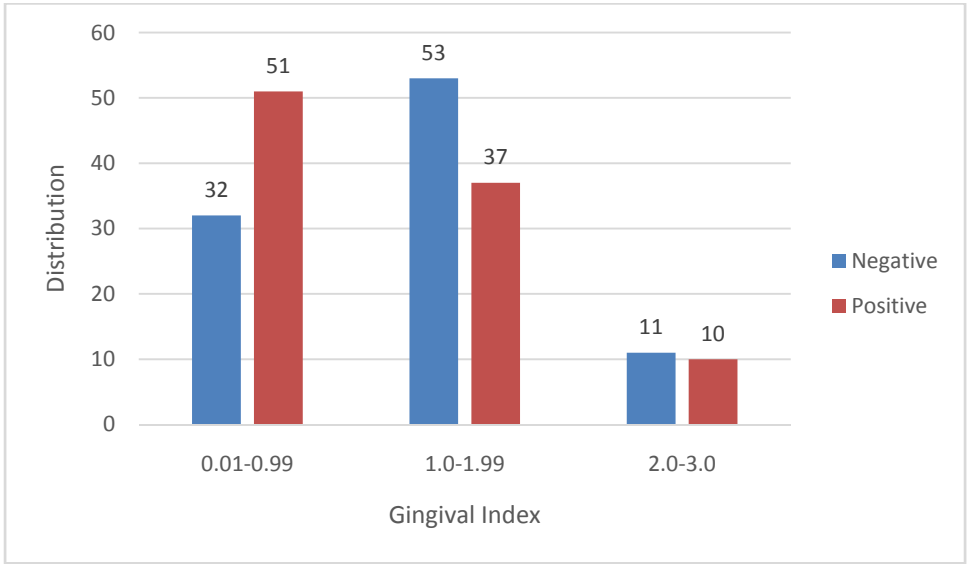

Figure 4.2: Gingival Inflammation by HIV Status

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Most (n=51, 52.6%) of the HIV positive individuals had mild gingivitis while the least (n=10, 10.3%) had severe gingivitis. Majority (n=54, 55.7%) of the HIV negative individuals had moderate gingivitis and the least (n=11, 11.3%) had severe gingivitis (Figure 4.2).

4.4 Periodontitis

Chronic periodontitis was the most (n=162, 83.5%) recorded periodontal disease. However, a few (n=4, 4.13%) HIV positive individuals with chronic periodontitis, had characteristics of atypical forms of periodontal diseases in some sites.

4.4.1 Prevalence and Severity of Chronic Periodontitis

Prevalence and severity of chronic periodontitis was measured using clinical attachment loss and the number of tooth sites affected. Mean clinical attachment loss (CAL) recorded was 3.77± 2.21 mm. Majority (n=145, 74.7%) had clinical attachment loss of more than 2mm. (Table 4.4). Distribution of chronic periodontitis differed by age (fig no 4.4) and HIV status (Fig 4.4).

Table 4.4 Clinical Attachment Loss

Categories	Frequency (n)	Percent (%)
No attachment loss	32	16.5
CAL 1-2mm (mild CP)	17	8.8
CAL 3-4mm (mod CP)	73	37.6
CAL >5mm (severe CP)	72	37.1

Key: CP-Chronic periodontitis; Mod-moderate

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4.4.2 Distribution of Chronic Periodontitis by Age

Prevalence and severity of chronic periodontitis in HIV discordant individuals increased with age. However, there was early clinical attachment loss in participants aged 20 to 30 years with (n=7, 35%) recording severe disease. Moderate chronic periodontitis had a peak between 30 to 40 years (Figure 4.4).

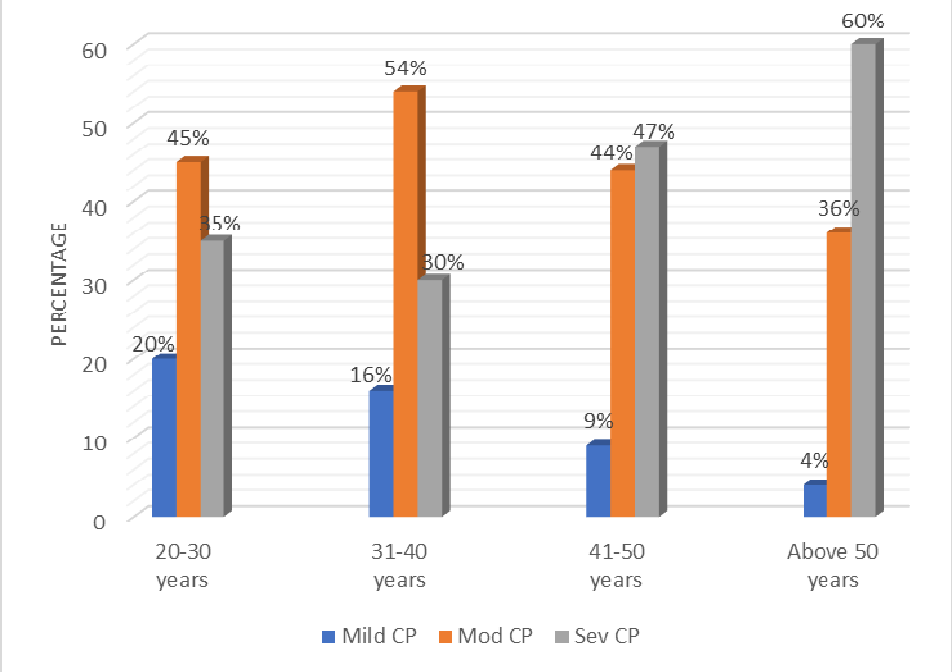

Figure 4.4: Distribution of Chronic Periodontitis According to Age

4.3.3. Distribution of Chronic Periodontitisby HIV status

HIV negative partners had more clinical attachment loss compared to the HIV positive partners. Most (n=41, 49%) HIV negative individuals had attachment loss of > 5mm while the least (n=7, 8%) had an attachment loss of 1 to 2 mm. Majority (n=41, 46%) of HIV positive individuals had an attachment loss of 3 to 4 mm while the least (n= 10 (15%) had an attachment loss of 1 to 2mm (Fig 4.5).

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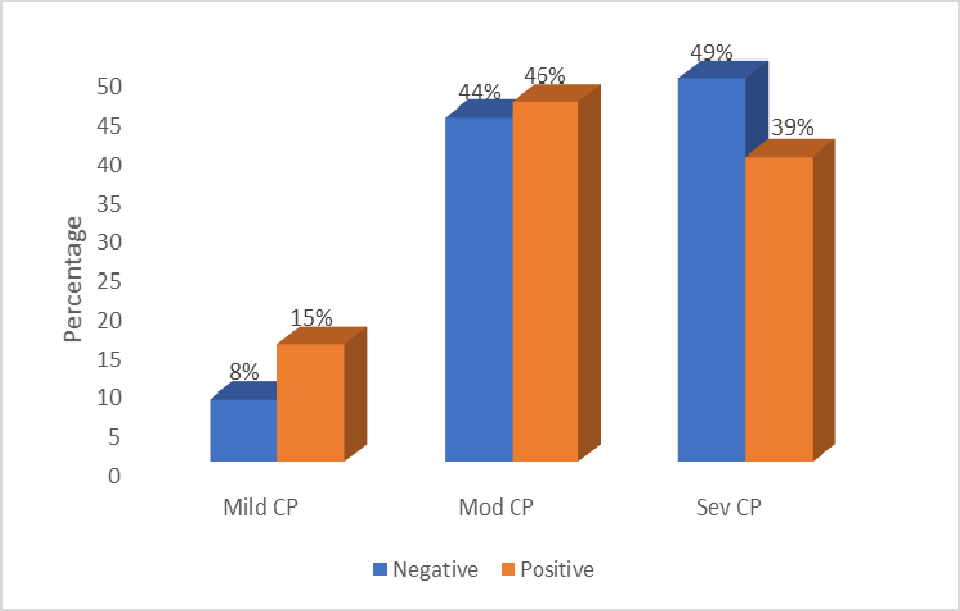

Figure 4.5: Distribution of Chronic Periodontitis in HIV Positive and Negative Participants

4.5Comparison of Periodontal Health Status by HIV status

Objective number four was to compare the periodontal health status by HIV status. This objective was achieved by comparing mean periodontal parameters of HIV positive and HIV negative individuals using Chi square test (Table 4.5). There was a statistically significant difference (χ^2 =8.00, df =2, p=0.018) seen in mean gingival scores with HIV positive individuals having a lower mean gingival score.

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Table 4.5: Mean Periodontal Indices by HIV Status

VARIABLES		HIV status: Negative Frequency (n)	Negative Percent (%)	Positive Frequency (n)	Positive Percent (%)	Chi-square (χ^2, df) p-value)
Plaque Index	o Light Plaque	18	18.6%	25	25.8%	(1.48, 2)
	o Moderate Plaque	53	54.6%	49	50.5%	0.477
	o Heavy Plaque	26	26.8%	23	23.7%	
Gingival Index	o Mild gingivitis	32	33.0%	51	52.6%	(8.00, 2) **0.018***
	o Moderate gingivitis	54	55.7%	36	37.1%	
	o Severe gingivitis	11	11.3%	10	10.3%	
Clinical Attachment Loss	CAL 1-2mm	7	7.2%	10	10.3%	(2.59, 3)
	CAL 3-4mm	33	34.0%	40	41.2%	0.459
	CAL >5mm	41	42.3%	31	32.0%	
	Gingivitis	16	16.5%	16	16.5%	

4.6 Association of Periodontal Health Status with Risk Factor Characteristics

4.6.1 Frequency Distribution of Risk Factors

Systemic disease enquiry revealed that majority (n= 144, 74.2%) had no known systemic disease. Thirty had had Tuberculosis infection and undergone treatment. Diabetes was recorded in one participant while nine participants reported history of Hypertension. Seventeen participants were smokers while eight were former smokers. Twelve females were using hormonal contraceptive (implants).

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Oral hygiene habits assessed included tooth brushing frequency, brushing aids and inter-dental cleaning. Majority (n=109, 56.2%) brushed their teeth once a day using a commercial toothpaste and tooth brush (n=149, 76.8%). Majority (n=146, 75.3%) reported having brushed their teeth that day with most (n=151, 77.8%) of the respondents reporting use of inter-dental cleaning aids such as toothpicks.

Past dental history showed that majority (n=103, 51.5%) had had tooth extraction as a form of treatment while a few (n=29, 14.9%) reported use of painkillers whenever they experienced dental pain. Only a few (n=8, 9.3%) had visit to a dental clinic that year.

Subjective symptoms of periodontal disease were also assessed. Symptoms reported included bleeding on brushing (n=79, 40.7%) and tooth mobility (n=51, 26.3%). Table 4.6 illustrates the risk factors that were assessed.

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Table 4.6. Descriptive Statistics of Risk Factors by HIV Status

		HIV status			
		negative		Positive	
		Frequency (n)	Percent (%)	Frequency (n)	Percent (%)
Age Categories	20-30 years	18	18.6%	11	11.3%
	31-40 years	33	34.0%	30	30.9%
	41-50 years	19	19.6%	33	34.0%
	Above 50 years	27	27.8%	23	23.7%
Sex	male	40	41.2%	58	59.8%
	female	57	58.8%	39	40.2%
medical History	Diabetes	0	0.0%	1	1.0%
	hypertension	3	3.1%	4	4.1%
	None	84	86.6%	60	61.9%
	Norplant	7	7.2%	4	4.1%
	TB	2	2.1%	26	26.8%
	TB and hypertension	0	0.0%	2	2.1%
	TB and Norplant	1	1.0%	0	0.0%
Smoking	smoker	7	7.2%	10	10.3%
	non-smoker	89	91.8%	80	82.5%
	former	1	1.0%	7	7.2%
Do you brush	yes	93	95.9%	94	96.9%
	no	4	4.1%	3	3.1%
Brushing Frequency	once a day	56	57.7%	53	54.6%
	twice a day	30	30.9%	35	36.1%
	three times a day	11	11.3%	9	9.3%
Brushing aid	commercial toothbrush	69	71.1%	80	82.5%
	chewing stick	28	28.9%	17	17.5%
last time brushed	today	67	69.1%	79	81.4%
	yesterday	20	20.6%	10	10.3%
	two days ago	5	5.2%	4	4.1%
	one week ago	1	1.0%	2	2.1%
	rare	4	4.1%	2	2.1%
Interdental Brushing Aids	yes	71	73.2%	80	82.5%
	no	26	26.8%	17	17.5%
Signs/Symptoms of Bleeding when brushing	yes	40	41.2%	39	40.2%
	no	57	58.8%	58	59.8%
Mobile Teeth	yes	28	28.9%	23	23.7%
	no	69	71.1%	74	76.3%
Pain	yes	71	73.2%	61	62.9%
	no	26	26.8%	36	37.1%
Treatment Received	extraction	53	54.6%	47	48.5%
	Tooth filing	1	1.0%	0	0.0%
	painkiller	14	14.4%	15	15.5%
	Tooth replacement	0	0.0%	1	1.0%
	Root canal therapy	1	1.0%	1	1.0%
	none	28	28.9%	33	34.0%
Have you visited a dentist this year	yes	10	10.3%	8	8.2%
	no	87	89.7%	89	91.8%

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4.6.2Bivariate Analysis on Periodontal Disease and Risk Factors (Spearman's rho)

There was a weak, positive correlation between age (ρ=0.252, p<0.001) and prevalence of periodontal disease. Older people were more likely to have periodontal disease than younger people. There was a weak, negative correlation between sex (ρ=-0.204, p=0.004) and prevalence of periodontal disease. Males were more likely to have periodontal disease than females.

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Table 4.7. Bivariate Analysis Prevalence and Severity vs. Risk Factors (Spearman's rho)

		1	2	3	4	5	6	7	8	9	10	11
1	Periodontal Disease	1										
2	Clinical Attachment Loss	-.590**	1									
3	Age Categories	.252**	.000	1								
4	Sex	-.204**	.018	-.432**	1							
5	Medical History	-.103	.069	-.073	-.090	1						
6	Smoking	-.051	.080	.064	.165*	-.005	1					
7	Do you brush	-.008	-.053	.124	-.026	-.124	-.131	1				
8	Brushing Frequency	-.114	-.126	-.059	.072	-.081	.099	.148*	1			
9	Brushing aid	.029	-.030	.100	-.055	-.047	-.135	.221**	-.140	1		
10	Last time brushed	-.005	-.014	.119	-.107	-.037	-.194*	.199**	-.176*	.189**	1	
11	Interdental Brushing Aids	.094	-.130	.055	-.007	-.054	.037	.363**	.021	.060	.211**	1

4.6.3 Regression Analysis (Periodontal Disease by Age and Sex)

Binary logistic regression was used to adjust for confounding in the associationbetween prevalence of periodontal disease and age and sex (Table 4.8). Sex was no longer statistically significantly associated with periodontal disease. Compared to those who were aged 21 to 30

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years, those who were aged above 50 years had a 11.86 higher odds of having periodontal disease (AOR=11.86, CI: 1.30 – 107.99, p=0.028).

Table4.8. Logistic Regression of Periodontal Disease vs. Risk Factors

	Unadjusted Odds Ratio		Adjusted Odds Ratio	
Variable	OR (95% CI)	p-value	AOR (95% CI)	p-value
Age				
21-30 years	1		1	
31-40 years	1.80 (0.64-5.11)	0.269	1.55 (0.53-4.47)	0.422
41-50 years	3.58 (1.05-12.25)	**0.042***	2.51 (0.68-9.24)	0.166
>50 years	18.67 (2.19-158.78)	**0.007****	11.86 (1.30-107.99)	**0.028***
Sex				
Female	1		1	
Male	3.78 (1.44-9.95)	**0.007****	2.23 (0.78-6.36)	0.134

4.6.4 Bivariate Analysis on Periodontal Disease Severity by Duration and Type of ART

Spearman's rank-sum correlation coefficient was used to investigate the association between Severity of periodontal disease and the duration and type of ART (Table 4.9). There was a weak positive correlation between severity of periodontal disease and viral Load (ρ=-0.247, p=0.016). This indicates that severity increases as viral load increases.

Table 4.9. Bivariate Analysis of Periodontal Disease Severity vs. Duration and Type of ART

		1	2	3	4	5
1	Severity	1				
2	ARVS type	.053	1			
3	ARV Use	.017	.661**	1		
4	ARV duration	-.072	.236*	.250*	1	
5	Viral Load	0.247*	.048	.077	.001	1

4.7 Summary of Periodontal Disease Clinical Parameters

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Table 4.10. Descriptive Statistics for Periodontal Parameters

		Plaque Score	Gingival Index	Periodontal Probing Depth	Recession	CAL
N	**Valid**	194	194	194	194	194
	Missing	0	0	0	0	0
Mean		**1.952**	**1.548**	**2.57**	**1.40**	**3.77**
Std. Error of Mean		.0497	.0432	.098	.068	.158
Std. Deviation		**.6919**	**.6017**	**1.369**	**.945**	**2.208**
Range		3.0	3.2	6	4	10
Minimum		1.0	.8	1	0	0
Maximum		4.0	4.0	7	4	10

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CHAPTER 5

DISCUSSION

5.0Introduction

The main objective of the study was to describe the periodontal health status of HIV discordant individuals using periodontal parameters.To the best of my knowledge, this is the first study on periodontal health status in HIV discordant individuals in Kenya. Therefore studies used in the discussion are the ones on the pattern of periodontal diseases among people living with HIV/AIDS and the general population making comparison difficult. Discussion will done according to the specific objectives.

5.1 Oral Hygiene Status

The plaque score index recorded in this group was higher than that recorded by Sibuti in hisstudy on the pattern of the periodontal diseases in persons living with HIV/AIDS at Kenyatta, National Hospital [38]. He recorded a plaque score of 1.78 ± 0.49 while the current study recorded a mean plaque score of 1.95 ± 0.69. This difference could be explained by differences in socio-demographics, oral hygiene practices and oral health awareness among study participants.Sibuti in his study had participants of middle socioeconomic status who resided in urban centers. They were relatively younger than those of the current study and in formal employment. Good oral hygiene practices in terms of brushing frequency and technique,aid in removing plaque from tooth surfaces. However, participants in this study had poor oral hygiene practices with majority of them brushing once

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daily instead of the recommended at least twice regimen. This could be attributed to their low socioeconomic status and low level of education. These two factors have been associated with low uptake of oral hygiene instructions and awareness on oral health [63-4].

Demographic factors such as age and sex of participants could have also played a role in the levels of plaque reported [51, 58]. Participants above 50 years had moderate to poor plaque scores and since they formed 25% of the study population the mean plaque score was likely to go up. This could be explained by the loss of manual dexterity and interest in oral hygiene as one grows old, either due to chronic illnesses or mental diseases. It was noted that males had fair to poor oral hygiene scores, compared to females who had fair to good hygiene. This could be because majority of the females in current study were young and maybe conscious of their oral hygiene practices as has been documented in other studies [51, 57].

Oral hygiene instructions are a basic tool in periodontal disease prevention. They are given by oral health or medical care givers to individuals as part of care. However, despite the number of visits by this group to a clinic facility, their oral hygiene was still poor. This calls for urgent measures for clinicians to step up oral hygiene instructions measures in all outpatient clinics either in form of continuous professional education or posters/brochures.

5.2 Gingival Inflammation

All participants had some form of gingival inflammation with a mean gingival score of 1.54 ± 0.60. This was higher than the one obtained bySibuti et al and Ali ST (1.34±0.38 and 1.1) respectively [38-9]. This could be due to poor oral hygiene status of the participants in the

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current study. Plaque harbors over 500 different species of microbes organized in a biofilm. Microbes from this biofilm have been associated with the etiology of periodontal disease directly, through production of antigens and bacterial by-products. The host immune system, responds to this insult through production of antibodies and chemokines that trigger a cascade of inflammatory reactions that lead to extravasation of fluid and cells to the gingival connective tissue. This fluid exudate causes edema and change in color of the gingiva. Vasodilation and engorgement of capillaries in gingival connective tissue causes the bleeding seen on probing [18-23].However, not everyone with poor oral hygiene gets severe gingival inflammation. The host homeostatic function balances immune response and bacterial interplay to maintain health. However, if this homeostatic function is dysregulated the host responds differently to oral microbes [12, 23].

In the current study, there was a statistically significant difference (χ^2 =8.00, df =2, p=0.018) seen in gingival score with HIV status. This is in agreement with other studies[29, 30-1] that had reported reduced gingival inflammation among HIV infected individuals on HAART. The lower gingival scores seen in HIV positive coupleswould be possibly explained bythe following factors. One, HIV infected individuals have a depressed host immunity which affects the host homeostatic balance hence reduced inflammation. Two, HIV positive individuals are put on antiretroviral drugs and antibiotic prophylaxisto lower the viral load and prevent opportunistic infections, respectively.Prophylactic use of antibiotics such as co-trimoxazole(Septrin®) would reduce the quantity and quality of oral microbes and hence reduce their microbial effect on gingival inflammation. Three, HIV positive individuals in the study were on a triple drug combination antiretroviral therapy (2 nucleoside reverse

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transcriptase inhibitors + a non-nucleoside reverse transcriptase inhibitor or protease inhibitor). There wouldbe a possibility that one of the antiretroviral drugs used had anti-inflammatory and antibacterial effect.Four, viruses have been associated in the etiology of periodontal disease and use of antiretroviral drugs could target these pathogens causing disease resolution and reduced gingival inflammation [62]. However, these are postulates and more research is needed in the host/microbial interaction in HIV infected individuals while taking into consideration the duration of HIV infection, viral load levels and duration and type of ARVs.

5.3 Periodontitis

Chronic periodontitis was the most prevalent periodontal disease recorded. Prevalence of chronic periodontitis (83.5%) in the current study was higher than thatreported by Sibuti (62.9%) [38].High prevalence would be attributed to poor oral hygiene since most participants recorded moderate to high plaque scores.Furthermore, chronic periodontitis increases steeply in the third and fourth decade. Majority of participants in the current study were above 30 years of age. By this age, individuals who had gingivitis initially and treatment was not offered had the disease progress into periodontitis. Hence, on analysis the disease severity would be noted to be high unlike would be the case had the participants been below 30 years of age.

Oral health seeking behavior would also affect periodontal disease progression. From the data obtained only nine participants had been to a dental clinic in the preceding one year. Subjective symptoms of periodontal disease were reported among participants but none had received periodontal treatment. Majority preferred to take pain killers or have the tooth

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removed.This would be due to the low income levels and limited access to oral health services. The dental clinic available in one of the sites offered minimal dental services with the nearest well equipped dental clinics being in Moi Teaching and Referral Hospital. This meant that early lesions that were not diagnosed progressed to severe forms of disease. Therefore there is need for oral health care givers to disseminate services to rural areas either through outreach services or setting up of clinics in ministry of health facilities.

The difference in severity of chronic periodontitis HIV sero-status was not statistically significant (χ^2 =2.59, df=2, p=0.459). This is in agreement with a study done in South Africa that compared periodontal parameters in HIV positive individuals and that of the general population where periodontal parameters were found to be similar [37]. However, these two studies contradictedfindings of a study done in Nigeria that compared periodontal status of HIV positive patients and negative controls, where HIV patients had more severe chronic periodontitis than HIV negative controlsthat was independent of lower education [36]. This contradictions would be due to different case definitions, methods of data collection and sample size. The Nigerian study used Community Periodontal Index of Treatment Needs,which charts only indexed teeth in a quadrant while the current study used full mouth periodontal charting.

Comparison of chronic periodontitis by HIV status was statistically not significant but clinically there was a difference in the presentation of clinical attachment loss. HIV positive participants had gingival recession with shallow periodontal pockets while HIV negative participants had deep periodontal pockets. McKaig [27] had associated this clinical attachment loss seen in HIV positive individuals to marginal gingival recession. However,

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the cause of this recession is not known.Would be, there was periodontal disease or gingival ulceration before HIV infection that had healed with after HAART use. Clinical attachment loss measurement is calculated from periodontal probing depth and gingival recession. However, gingival recession has several other causes other than periodontal disease hence not a good indicator of periodontal disease severity. Therefore, there is need for epidemiologists to come up with standardized tools for periodontal disease prevalence and severity studies.

Prevalence of atypical periodontal disease was 4.1%. This was lower than results reported in a study done in Kenyatta National Hospital by Ali STwhere Linear Gingival Erythema was present in 17.4%, NUG (5.5%) and NUP (5.5%) [39]. However, results in the current study were higher than those reported by other studies,done in other parts of the world [33-4].These differences could be due to the sampling method; sample size; and associated risk factors like smoking and high plaque score. The prevalence was high in males than females (3:1) and this could be associated with the high plaque score and viral load seen in males. This is in agreement with a study [33] which had shown association of NUG/NUP with other risk factors like smoking and plaque accumulation.

High prevalence of severe chronic periodontitis(37.1%) and similarity in periodontal parameters other than gingival inflammation scores were unexpected results. Microbial pathogens are eliminated by the innate and adaptive immune response which is suppressed in HIV positive individuals. Hence, these individuals were expected to present with a reduced rather than increased periodontal destruction.However, a dysregulated host immune and

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bacterial interplay can cause severe tissue destruction. This can occur due to gene mutations either in receptors, enzymes and cytokines involved in chronic inflammation. These genetic changes could alter the host response to oral microbes and hence explain the high prevalence and severity seen [64-70].There is also the possibility of bacterial gene mutation with prolonged use of antibiotics[71]. These bacterial strains would have had more virulent factors and hence caused more tissue destruction. There was also a possibility that the clinical attachment loss seenwould be due to marginal gingival recession, due to other causes other than periodontal disease.

Furthermore, the study had various limitations in terms of sampling technique, recruitment, reference material, matching for age and control of confounders which could have led to bias and source of error in the findings. Therefore, future studies should match for age and control for confounders.

Recruitment of participants was done by snow balling technique. This would have been a source of bias in that, maybe only individuals who had dental problems willingly joined the study. Laboratory tests were also not done to confirm serological status of the HIV negative partners at the time of the study. Although, information in the medical records had indicated that they were HIV negative, chances of some being in the “window” period were there.

The role of risk factors in periodontal disease was not one of the main objectives of the study and hence matching for age, gender and other confounders was not done during proposal formulation. However, analysis of the associated risk factors showed some weak correlation of periodontal disease with age and sex. Effect of smoking on prevalence of periodontal disease in this sample population was negligible (Table 8).

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Therefore, information obtained from the current study forms a basis for future studies.

Conclusion

The following conclusions were drawn from the current study. Periodontal health status of HIV discordant individuals in the sample population was clinically similar. However, HIV seropositive individuals had a lower gingival score compared to their HIV negative ones and this was statistically significant. The prevalenceof severe chronic periodontitis was higher than that reported in other periodontal diseases prevalence among HIV infected individuals and the general population studies. Oral health-seeking behavior and access to oral health services was low.

Recommendations

Oral health care approaches among HIV discordant individuals should be the same since periodontal parameters are similar. However, it is highly recommended that more preventive and active management of periodontal disease be instituted for this group of HIV discordant individuals as they were noted to have a high prevalence of periodontal disease. Comprehensive oral health care and access to services should be enhanced to serve the needs of individuals seen in comprehensive care clinics. Therefore, policy makers should include oral healthcare in HIV management guidelines. Due to the limitations of this study

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researchers are encouraged to do longitudinal studies on periodontal status of HIV discordant individuals.

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Appendix 1: Consent Form

I, _____hereby agree to participate in this research study on **"Periodontal status of HIV discordant couples".** The study will be carried out by Dr Akama Gladys Mwango. The study has been approved by Institutional Research and Ethics Committee (IREC).

I have been informed that there are no monetary benefits but my oral health status will be explained to me and there after I will seek further treatment at my own cost. I have also understood that findings from this study will be used to formulate oral health policies in HIV prevention programs.There are no risks associated with the study. However, I have been informed that there will be some minimal pain during periodontal clinical examination.I have been informed that the study is voluntary and no payments will be made to me if I participate.I have been assured of data confidentiality during and after the study and permission will be sought from me before dissemination.I have understood that withdrawal from the study has no implications in terms of medical services from *AMPATH*clinics.

I have read and understood this study protocol and hereby consent.

Signature……..Date:.....

I have explained the study protocol to the above participant

Signature ……Date:.....

Investigator: Gladys MwangoAkama

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`

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Approving IRB: IREC, MOI UNIVERSITY CHS/MTRH

Contact: Chairperson-Prof Edwin Were

Website address: http:/irec.mtrh.or.ke/

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MAELEZO YA KUTAFUTA IDHINI KUTOKA KWA WANANDOA WANAOISHI NA VIRUSI VYA UKIMWI.

Kiini cha Utafiti

Mimi_____,nimepeanaruhusayakushirikikatikautafitiunaochunguza**"HALI YA UFIZI YA WANANDOA WANAISHI NA VIRUSI VYA UKIMWI KATIKA HOSPITALI YA RUFAA YA MOI**". Utafitihuu unafanywanaDaktariAkama Gladys Mwango naumeidhinishwanakamatiya Chuo Kikuu cha Moinakamati ya halmashauri inayoidhinisha utafiti.
Nitajulishwamatokeoyautafitibaadayakuangaliwananitapewamawaidhayanayohitajika.Pia nikiwanamahitajiyadharurayakimatibabunitatumwakwamtaalamukatikahospitaliyaRufaaya Moi.
Nimeelewakwambahakunagharamayeyotekwakushirikikatikautafitihuu.
Habarizotezitakazokusanywakutoka kwangu zitahifadhiwakwasirinakutumiwatukatikautafitihuu.
Majinayanguhayataandikwamahalipopotewakatiwowote. Nakalazotezahabari kunihusuzitafungiwakatikamakabatimaalumwakatiwotewautafitihuu.
Habarihizizitawekwakwenyekompyutanamchunguzipekeeyakendiyeatakayetumiakitambulisho cha siriilikufikiahabarihizi.
Tunasistizausirihuukatikakusimamiahabaritutakazopewailikuzuiakujulikanakwawatakaoshirikikatikautafitihuu.
Hakunamajinayatakayotumikakatikavikaovyasayansikwaummanaripotizitakazochapishwakatikamajaridayasayansi.
Nimesomamaelezoyaliyokohapajuunanimekubalikwahiarikushirikikatikautafitihuu.

…….. **……..**
Jina la Mshiriki Sahihi ya Mshiriki na Tarehe

Mimi niliyepewajukumu la kupeanamaelezokuhusuutafitihuukwamshirikialiyetajwahapajuu,

…… **…….**
Jina la Mtafiti Mkuu Sahihi ya Mshiriki na Tarehe

Jina la mtafiti aliyetoamaelezo:
Gladys MwangoAkama
Nambariya simu: +254 722 909 286
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`

Appendix 2: Screening Form

Date: _____Serial No: _____ _____
Age (years): _____ Code No: _____

Condition/factor	Yes	No
Infections-TB, HSV-I,2		
Diabetes		
Hypertension		
Hepatitis		
Antimicrobials in the last 2 weeks		
Professional cleaning of teeth in the last 3 months		
Pregnancy		
Use of contraceptives (females)		
Smoking		
Autoimmune disease		
Tumours		

`

Appendix 3: Questionnaire

TITLE: PERIODONTAL STATUS OFHIV DISCORDANT COUPLES

Date _____Serial No _____
Age (years) _____ File No_____
Occupation _____Serostatus_____
Level of Education _____

Section A:

Q1.Do you brush your teeth? Yes ☐ No(if no,proceed to question 3)

Q2.How often do you brush?

1. Once daily ☐
2. Twice daily ☐
3. Thrice daily ☐

Q3.Why don't you brush your teeth?

1. No time ☐
2. Not necessary ☐
3. Don't have a brush ☐
4. Forget ☐
5. Other.....go to Q6

Q4. What do you use to brush your teeth?

1. Commercial toothbrush ☐
2. Chewing stick ☐
3. Charcoal ☐
4. Fingers ☐
5. Other (specify).....

Q5.When did you last brush your teeth?

1. Today ☐
2. Yesterday ☐
3. Two days ago ☐
4. One week ago ☐
5. Other (Please Specify).....

Q6.Do you practice inter-dental cleaning? Yes ☐ No ☐

If yes, what do you use? If no, go to 7

1. Toothpick ☐
2. Dental floss ☐
3. String ☐
4. Other (specify).....

`

Q7.Do your gums bleed when brushing your teeth? Yes ☐ No ☐

Q8.Have you had any gum swellings? Yes ☐ No ☐

Q9. Have you experienced mobile teeth? Yes ☐ b ☐

Q10.Have you suffered from pain from your teeth?

Yes ☐ No ☐

If yes, what treatment was done? If no go to 11.

1. Took painkillers ☐
2. Removal of the tooth ☐
3. Tooth cleaning ☐

Q11.Do you practice any of the following habits?

1. Smoking ☐
2. Alcohol ☐
3. Miraa chewing ☐

Q12. Have you visited a dentist in the last 1year? Yes ☐ No ☐

Q13. Have you received any of the following treatments?

1. Check up ☐
2. Filling ☐
3. Removal of a tooth ☐
4. Cleaning ☐
5. Surgery ☐

Section: B

Q14. Are you on any medications currently? If yes list them.....

.....

.....

Q16. For how long have you been taking ARVs?.....

Q17. How often do you take your medication?.....

`

Appendix 4: Clinical Examination Form

Client no: _____age:_____
Module _____Serial no . _____

Gingival Score

Tooth number	16		11		24		36		31		44	
Surface F/L/P	F	P	F	P	F	P	F	L	F	L	F	L
Score												

Plaque Score

Tooth number	16		11		24		36		31		44	
Surface F/L	F	P	F	P	F	P	F	L	F	L	F	L
Score												

Specific Periodontal Diseases (EC Criteria)

Disease	**Present**	**Absent**
LGE		
NUG		
NUP		
NUS		

Medical History Form (To be obtained from the clients' medical records)

Serology Results	
Date	
CD4 Count	
Type of Antiretroviral	
Date Started	
Pr-EP	

`

PERIODONTAL SIX POINT CHART

Maxillary Arch

Tooth	**17**			**16**			**15**			**14**			**13**			**12**			**11**			**21**			**22**			**23**			**24**			**25**			**26**			**27**		
Probing depths																																									
GR																																								
CAL																																								
Probing depths																																								
GR																																								
CAL																																								
Mobility																																								

Mandibular Arch

Tooth	**47**			**46**			**45**			**44**			**43**			**42**		**41**			**31**			**32**			**33**			**34**			**35**			**36**			**37**		
Probing depths																																									
GR																																								
CAL																																								
Probing depths																																								
GR																																								
CAL																																								
Mobility																																								

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Appendix 5 : EthicalApproval

INSTITUTIONAL RESEARCH AND ETHICS COMMITTEE (IREC)

MOI TEACHING AND REFERRAL HOSPITAL
P.O. BOX 3
ELDORET
Tel: 33471//2/3

MOI UNIVERSITY
SCHOOL OF MEDICINE
P.O. BOX 4606
ELDORET

Reference: IREC/2016/56
Approval Number: 0001717

1st September, 2016

Dr. Gladys Akama,
University of Nairobi,
School of Dental Sciences,
P.O. Box 30197-00100,
NAIROBI-KENYA.

INSTITUTIONAL RESEARCH & ETHICS COMMITTEE
01 SEP 2016
APPROVED
P. O. Box 4606-30100 ELDORET

Dear Dr. Akama,

RE: FORMAL APPROVAL

The Institutional Research and Ethics Committee has reviewed your research proposal titled:-

"Periodontal Status among HIV Discordant Couples in Moi Teaching and Referral Hospital".

Your proposal has been granted a Formal Approval Number: ***FAN: IREC 1717*** on 1st September, 2016. You are therefore permitted to begin your investigations.

Note that this approval is for 1 year; it will thus expire on 31st August, 2017. If it is necessary to continue with this research beyond the expiry date, a request for continuation should be made in writing to IREC Secretariat two months prior to the expiry date.

You are required to submit progress report(s) regularly as dictated by your proposal. Furthermore, you must notify the Committee of any proposal change (s) or amendment (s), serious or unexpected outcomes related to the conduct of the study, or study termination for any reason. The Committee expects to receive a final report at the end of the study.

Sincerely,

PROF. E. WERE
CHAIRMAN
INSTITUTIONAL RESEARCH AND ETHICS COMMITTEE

cc CEO - MTRH Dean - SOP Dean - SOM
Principal - CHS Dean - SON Dean - SOD

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Academic Model Providing Access To Healthcare
Telephone: 254 53 2033471/2P.O. BOX 4606, ELDORET Fax: 254 53 2060727

RESEARCH

Ref: RES/STUD/9/2016 **September 16, 2016**

Gladys Akama Mwango
University of Nairobi
School of Dental Sciences,
P.O Box 30197-00100
Nairobi- Kenya

Dear Dr. Akama,

RE: PERMISSION TO CONDUCT RESEARCH AT AMPATH

This is to kindly inform you that your study *"Periodontal Status among HIV Discordant Couples in Moi Teaching and Referral Hospital"* has been reviewed by the AMPATH Research Program Office. Permission is therefore granted to begin collecting your data at AMPATH.

Please note that your research activities should not in any way interfere with the care of patients. This approval does not support access to AMRS data at AMPATH.

You are required to submit a final report of your findings to the AMPATH Research Program Office.

Should you wish to publish your research findings, permission has to be sort from AMPATH Publications Committee. Please contact the AMPATH Research Office in case of any enquiry regarding this matter.

AMPATH CENTRE * RESEARCH * 15 SEP 2016 * P.O Box 4606-30100, Eldoret *

Thank you,

Jepchirchir Kiplagat
Assistant Program Manager - Research.

CC: Chief of Party, AMPATH
Deputy Chief of Party, Research and Training

PERIODONTAL HEALTH STATUS OF HIV DISCORDANT COUPLES AT MOI TEACHING AND REFERRAL HOSPITAL,AMPATH CLINICS

ORIGINALITY REPORT

6%	3%	4%	%
SIMILARITY INDEX	INTERNET SOURCES	PUBLICATIONS	STUDENT PAPERS

PRIMARY SOURCES

1	"ORALS", Journal Of Clinical Periodontology, 7/2006 Publication	<1%
2	"Poster Abstracts", Journal Of Clinical Periodontology, 2012. Publication	<1%
3	shodhganga.inflibnet.ac.in Internet Source	<1%
4	I Cappuyns. "Viruses in periodontal disease - a review", Oral Diseases, 7/2005 Publication	<1%
5	www.ijarr.in Internet Source	<1%
6	bmcoralhealth.biomedcentral.com Internet Source	<1%
7	Health Education, Volume 114, Issue 4 (2014-09-16) Publication	<1%