

**ORAL HEALTH STATUS IN HUMAN  
IMMUNODEFICIENCY VIRUS POSITIVE PATIENTS  
ATTENDING PORT REITZ HOSPITAL, MOMBASA  
COUNTY, KENYA**

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**DECLARATION**

This thesis is my original work and has not been presented for a degree in any other University.

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This thesis has been submitted for examination with our approval as the University Supervisors

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## **DEDICATION**

I dedicate this work to the Almighty God and to my Lord and Saviour Jesus Christ for the gift of life and for all the blessings. I also dedicate this to my mother Pastor Rose Nereah Owino and to my lovely Sons, Daughters and Grandchildren.

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## **ABBREVIATIONS AND ACRONYMS**

<b>ARVs</b>	Anti-Retroviral
<b>CCC</b>	Comprehensive Care Clinic
<b>CPI</b>	Community Periodontal Index
<b>DMFT</b>	Decayed, Missing, Filled Teeth
<b>HAART</b>	Highly Active Anti-Retroviral Treatment
<b>HIV</b>	Human immunodeficiency virus
<b>HIV/AIDS</b>	Human immunodeficiency virus/acquired immunodeficiency syndrome
<b>KAP</b>	Knowledge, attitudes and practices
<b>LGE</b>	Linear gingival erythema
<b>NUG</b>	Necrotizing ulcerative gingivitis
<b>NUP</b>	Necrotizing ulcerative periodontitis
<b>OH</b>	Oral health
<b>OHIP 14</b>	Oral Health Impact Profile 14
<b>PLWHA</b>	People Living With HIV/AIDS

**UNAIDS**

United Nations Programme on HIV and AIDS

**WHO**

World Health Organization

## OPERATIONAL DEFINITION OF TERMS

- Oral health:** Being free of chronic mouth and facial pain, oral and throat cancer, oral sores, birth defects such as cleft lip and palate, periodontal (gum) disease, tooth decay and tooth loss, and other diseases and disorders that affect the mouth and oral cavity.
- Dental caries:** is an irreversible microbial disease of the calcified tissues of the teeth, characterized by demineralization of inorganic portion and destruction of the organic substance of the tooth which often leads to cavitation.
- The Decayed, Missing, Filled (DMF) index:** is well established as the key measure of caries experience in dental epidemiology that has been in use for more than 70 years.
- Community periodontal index:** The severity and degree of periodontal diseases (gingivitis, periodontitis) in an individual (or in a section of a population) and is assessed, according to a WHO recommendation, by the CPI (Community Periodontal Index) taking as its basis the three features of bleeding, dental calculus, and gingival sulcus.
- Periodontitis:** is a set of inflammatory diseases affecting the periodontium, i.e., the tissues that surround and support the teeth.
- OHIP 14:** an assessment tool used to measure the oral health related quality of life



**Adverse drug reaction:** (WHO, 1972) A response to a drug which is noxious and unintended, and which occurs at doses normally used in man for the prophylaxis, diagnosis, or therapy of disease, or for the modifications of physiological function'

**Hydroxyapatite:** an inorganic calcium containing constituent of bone matrix and teeth, imparting rigidity to these structures

**WHO Oral Health Programme:** a global oral health policy that emphasizes that oral health is integral and essential to general health and that oral health is a determinant factor for quality of life. The policy is detailed in the world oral health report 2003.

## ABSTRACT

The HIV/AIDS epidemic is one of the most serious epidemics to ever have affected humanity. About 40 million people were infected with HIV in 2001, and millions have already died of AIDS. Many more people are affected because their parents, other family members, friends and co-workers have died of AIDS or were infected with HIV. The impact of oral health care is of particular importance among people living with HIV/AIDS (PLWHA). Complications of oral health problems associated with HIV were well documented in the literature. Oral manifestations, such as oral ulcers, dental caries, and salivary gland disease, oral warts, Kaposi's sarcoma, necrotizing ulcerative periodontitis, oral hairy leukoplakia and candidiasis could be strongly associated with HIV infections and might be present in up to 50% of people with HIV infection and up to 80% of people diagnosed with AIDS. The objective of this study was to determine the oral health status in HIV positive patients attending Port Reitz Hospital in Mombasa County. The specific objectives were to find out the prevalence of caries and periodontal disease among HIV positive patients attending Port Reitz hospital as well as their knowledge attitudes and practice with respect to oral health. The study adopted a descriptive cross-sectional study design. Clients who were 18 years and above and were HIV positive visiting the comprehensive care clinic of Port Reitz Hospital were recruited. A total of 368 patients were interviewed from a possible 385 due to drop outs in the course of clinical assessments and interviews. Clinical data was collected using a WHO oral health assessment questionnaire and observations on knowledge, attitudes and practice and social demographics were made using a second questionnaire. Data collected was cleaned and keyed into an MS Excel spread sheet then exported to SPSS version 20 for analysis. The findings were presented using frequency tables, bar charts and pie charts. Measures of association were computed at the corresponding 95% confidence intervals. The prevalence of dental caries among patients at Port Reitz Hospital was 14.2% with the proportion experiencing decay, missing and filled teeth due to caries being 11.1%, 7.1% and 9.1%, respectively. The DMFT index in this population was not significantly related to age, sex and ART status of the patients. Of the 368 patients, 39.3% had healthy teeth. Conversely, 5.8% had bleeding gums, 13.8% had calculus, 36.5% had pockets (4-5mm) and 0.2% had pockets (6 or more than 6mm). Findings indicated that 6.3% of the patients had access to information on HIV related oral diseases. With regard to knowledge on oral diseases, the three most commonly known oral disease related to HIV were bleeding gums (28.3%), cavities (17.0%) and ulcers (15.1%). Nearly all of the patients interviewed (99.5%) expressed a need for more information on oral diseases related to HIV. Most of the patients (98.9%) regarded treatment of oral diseases as important as treatment in other parts of the body. When asked about their practice, 63.6% Of clients in the study said that they cleaned their teeth more than once a day using tooth brushes (96.3%). The recommendation from the study is that oral health care and treatment should be included as part of comprehensive care for HIV patients. These patients should be given information on oral diseases related to HIV and oral health care and maintenance..

## CHAPTER ONE

### INTRODUCTION

#### 1.1 Background Information

The HIV/AIDS epidemic is one of the most serious epidemics to ever have affected humanity. About 40 million people were infected with HIV in 2001, and millions have already died of AIDS. Many more people are affected because their parents, other family members, friends and co-workers have died of AIDS or are infected with HIV (UNAIDS & WHO, 2007). The Kenya AIDS Indicator Survey 2007 found that 7.1% of Kenyans aged 15–64 years and 7.4% of those aged 15–49 years were infected with HIV. There was disproportionate distribution of HIV infection by sex and age; women had nearly 30% more infections than men of the same age, with the difference more pronounced in younger women.

National programmes, international organizations, civil society, communities and individuals have responded to the epidemic. The initial efforts were often weak and scattered as the full nature and scope of the threat had not been fully understood. As the epidemic has progressed, understanding of its complex causes and effects has increased. The WHO Oral Health Programme can make important contributions to the early diagnosis, prevention and treatment of this disease. WHO oral health programme is a global oral health policy that emphasizes that oral health is integral and essential to general health and that oral health is a determinant factor for quality of life (WHO Oral Health Report, 2003). A number of studies have demonstrated that 40-50% of HIV-positive persons have oral fungal, bacterial or viral infections, often occurring in the early stages of the disease (Petersen, 2006)

Oral manifestations such as candidiasis and hairy leukoplakia are common lesions found in patients infected with human immunodeficiency virus (World Health Organization, 2012). There are no conclusive studies in Kenya on the prevalence of oral diseases but

surveys have shown high prevalence of oral diseases particularly periodontitis, dental caries and other rare soft tissue lesions among PLWHIV and AIDS (Kaimenyi, 2004). Since the first reported case of HIV infection in the United States in 1981, a large body of research has propelled the accumulation of knowledge on many aspects of this disease. For dentists, the oral manifestations among HIV/AIDS patients in the pre-antiviral era have not been well recognized (Marston *et al.*, 2007).

Studies in patients receiving highly active antiretroviral therapy (HAART) have revealed a decreased prevalence of common oral lesions that previously defined HIV status. However, HIV salivary gland diseases and oral warts have reportedly been on the rise (Arirachakaran, 2009). Immune reconstitution syndrome, a condition whereby the recovering immune system responds to previously acquired pathogens with an overwhelming inflammatory response, is also increasingly reported (Steigbigel *et al.*, 2008). The effects of HAART on a patient's immune response require further investigation to determine the extent to which oral manifestations are attributable to adverse drug effects, and if so, to find means to mitigate these effects. Oral adverse effects from drugs, as well as oral manifestations in patients with immune reconstitution syndrome, need to be generously investigated in order to fully comprehend the effect of drugs for proper and safe usage in the future (Moura *et al.*, 2008).

## **1.2 Statement of the Problem**

People with human immunodeficiency virus (HIV), the virus that causes acquired immunodeficiency syndrome (AIDS), are at special risk for oral health problems (Freed *et al.*, 2005). Many of these problems arise because the person's immune system is weakened and less able to fight off infection. Approximately 40-50% of HIV-positive persons have oral fungal, bacterial, or viral infections that occur early in the course of the disease. Oral lesions strongly associated with HIV infection include pseudo-membranous oral candidiasis, oral hairy leukoplakia, HIV gingivitis and periodontitis, Kaposi's sarcoma, and non-Hodgkin's lymphoma (Coogan & Sweet; 2002). Dry mouth has been frequently observed in the course of HIV infection (Glick *et al.*, 1994). There is

a need for immediate oral health care and referral, the treatment and prevention of oral disease, and health promotion, particularly among the under-served, disadvantaged population groups of developing countries. In those countries, availability of and access to oral health care are generally low because of shortages of oral health manpower. Well-designed and -documented studies are necessary for the correct assessment of the nature and magnitude of the problem in developing countries, if oral health measures are to be effectively formulated for the HIV-infected. In Kenya oral health surveys have not been done (Kaimenyi, 2004).

### **1.3 Justification of the Study**

Oral lesions may herald decline in immune function, for example, untreated HIV-infected patients with oral candidiasis have been shown to progress to an AIDS diagnosis within a two-year period (Nielson *et al.*, 1994). Controlling a focal infection within the oral cavity may eliminate adverse consequences such as systemic infections. Poorly functioning dentition can adversely affect quality of life. Oral pain or discomfort may cause patients to avoid eating resulting in weight loss, which may be especially distressing for HIV-infected patients concerned about wasting. The presence of oral lesions can have a significant impact on health-related quality of life. Oral health is strongly associated with physical and mental health and there are significant increases in oral health needs in people with HIV infection in adults particularly in relation to periodontal diseases (Coogan & Challacombe., 2005).

#### **1.4 Research Questions**

- i. What is the prevalence of caries among HIV positive patients visiting Port Reitz Hospital, Mombasa County?
- ii. What is the prevalence of periodontal disease and oral Candidiasis among HIV positive patients visiting Port Reitz Hospital, Mombasa County?
- iii. What is the knowledge, attitudes and practices (KAP) of HIV positive patients with regards to oral health among HIV positive patients visiting Port Reitz Hospital, Mombasa County?

#### **1.5 Study Objectives**

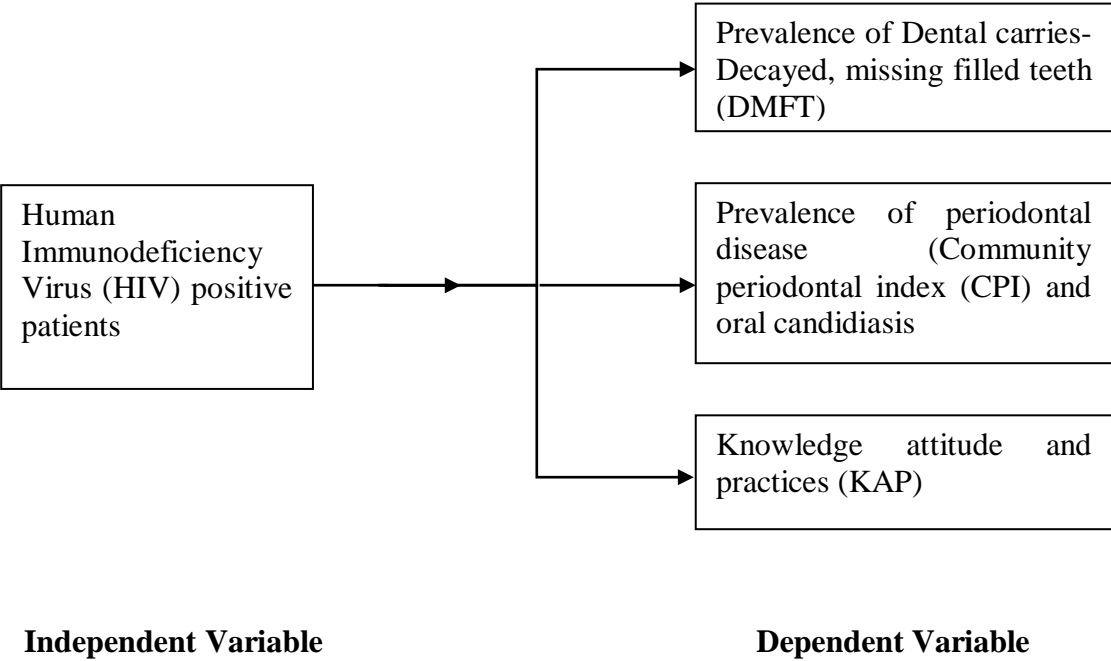
##### **1.5.1 Broad Objective**

To determine the oral health status in HIV positive patients attending Port Reitz Hospital, Mombasa County.

##### **1.5.2 Specific Objectives**

- i. To determine the prevalence of dental caries among human immunodeficiency virus (HIV) positive patients visiting Port Reitz hospital, Mombasa County.
- ii. To determine the prevalence of periodontal disease and oral candidiasis in HIV positive patients visiting Port Reitz Hospital, Mombasa County.
- iii. To determine the knowledge, attitudes and practices (KAP) of HIV positive patients with regard to oral health at Port Reitz Hospital, Mombasa County.

**1.6 Conceptual framework**



**Figure 1.1: Conceptual Framework**

## CHAPTER TWO

### LITERATURE REVIEW

#### 2.1 Oral Health and HIV

People with HIV infection and up to 80% of people diagnosed with AIDS (PLWHA), are more likely to experience oral health problems compared to non-HIV-infected people (Reznik, 2005). Once oral health is compromised, PLWHA may experience difficulty in maintaining salivary flow, which can affect chewing, swallowing, tasting foods and ultimately, their ability to take HIV medications and maintain an optimal quality of life (Coogan *et al.*, 2005). The human immunodeficiency virus (HIV) is a lentivirus (slowly replicating retrovirus) that causes the acquired immunodeficiency syndrome (AIDS), a condition in humans in which progressive failure of the immune system allows life-threatening opportunistic infections and cancers to thrive. Without treatment, average survival time after infection with HIV is estimated to be 9 to 11 years, depending on the HIV sub-type (UNAIDS & WHO, 2007).

Infection with HIV occurs by the transfer of blood, semen, vaginal fluid, pre-ejaculate, or breast milk. Within these bodily fluids, HIV is present as both free virus particles and virus within infected immune cells. HIV infects vital cells in the human immune system such as helper T cells (specifically CD4+ T cells), macrophages, and dendritic cells. HIV infection leads to low levels of CD4+ T cells through a number of mechanisms including: apoptosis of uninfected bystander cells, direct viral killing of infected cells, and killing of infected CD4+ T cells by CD8 cytotoxic lymphocytes that recognize infected cells. When CD4+ T cell numbers decline below a critical level, cell-mediated immunity is lost, and the body becomes progressively more susceptible to opportunistic infections (Patton *et al.*, 2000).



Oral health is defined as “being free of chronic mouth and facial pain, oral and throat cancer, oral sores, birth defects such as cleft lip and palate, periodontal (gum) disease, tooth decay and tooth loss, and other diseases and disorders that affect the mouth and oral cavity (World Health Organization, 2003). The prevalence of the two major oral diseases namely periodontal diseases and dental caries has been found to vary from region to region among the general population. Studies have found that the prevalence and severity of these diseases and other oral conditions is higher among people living with the Acquired Immuno-Deficiency Syndrome (PLWHA) than HIV (Human Immunodeficiency Virus) sero-negative persons (Badner, 2005). The PLWHA also tend to suffer from other types of oral diseases which are either very rare or do not occur in the oral cavity among sero-negative individuals (Aguirre *et al.*, 1999).

## **2.2 Theoretical Review**

Studies done throughout the world indicate that oral lesions associated with HIV occur in 50% to 80% of HIV patients (Coogan *et al.*, 2005). These oral lesions have serious consequences for patients and impair their oral-health-related quality of life (Malele; 2007). Between 32 and 46 percent of PLWHA will have at least one major HIV-related oral health problem bacterial, viral, and fungal infections as well as cancer and ulcers in the course of their disease (Glick *et al.*, 1994). In addition poor oral health can impede food intake and nutrition, leading to poor absorption of HIV medications and leaving PLWHA susceptible to progression of their disease. HIV medications have side effects such as dry mouth, which predisposes PLWHA to dental decay, periodontal disease, and fungal infections. Bacterial infections (dental decay and periodontal disease), that begin in the mouth can escalate to systemic infections and harm the heart and other organs if not treated, particularly in PLWHA with severely compromised immune systems (Reznik, 2005).

Worldwide, 60–90% of school children and nearly 100% of adults have dental cavities (WHO Oral Health Factsheet, 2012). Severe periodontal (gum) disease, which may result in tooth loss, is found in 15–20% of middle-aged (35-44 years) adults. Almost half

(40–50%) of people who are HIV-positive have oral fungal, bacterial or viral infections. These often occur early in the course of HIV infection. Globally, about 30% of people aged 65–74 have no natural teeth. Oral disease in children and adults is higher among poor and disadvantaged population groups. Risk factors for oral diseases include an unhealthy diet, tobacco use, harmful alcohol use and poor oral hygiene, and social determinants (WHO Oral Health Fact Sheet, 2012). The deleterious impact of oral health care is of particular importance among PLWHA (Marcus *et al.*, 2005). Complications of oral health problems associated with HIV are well documented in the literature. Studies conducted in countries such as Senegal, Kenya and South Africa report a high prevalence (80%) of the oral manifestations of HIV/AIDS (Coogan *et al.*, 2005). There is, therefore, a need to provide services to alleviate oral problems and improve patient comfort.

### **2.2.1. Dental caries**

Dental caries is an irreversible microbial disease of the calcified tissues of the teeth, characterized by demineralization of inorganic portion and destruction of the organic substance of the tooth which often leads to cavitations (Shafer, 2009). It is a complex disease caused by a physiological imbalance between fluid and mineral dental bio-film (microbial cells in a matrix, favouring the use of nutritional resources available, formerly known as plaque). It is recognized that microorganisms are not only sufficient to explain it, highlighting the important role of bio-film (plaque) in its development (Fejerskov, 2004). The mechanism of the cavity formation is from the fermentation of carbohydrates; the bacteria produce organic acids such as lactic acid, formic, acetic and propionic acids. These acids penetrate the dental tissues, dissolving the enamel (the outside of the tooth), dentine and cementum (tooth root). The dissolution may cause cavitation. In non-cavitated lesions, demineralization can be reversed by calcium and phosphate, together with fluoride, a result of new deposits on the remnants of crystals of tooth enamel. The new mineral crystal surface is much more resistant to acid when compared with the original hydroxyapatite (tooth enamel). The process of de- and re-

mineralization occur daily, leading to cavitations, repair, and reversal or maintaining the status quo (Featherstone, 2004).

A survey done in Kenya showed that dental caries was detected in 34.3% of adults, while 0.4% had missing teeth due to caries and 1.9% had filled teeth. The number of decayed teeth ranged between 1- 11 teeth per person. Females had a higher prevalence (35%) of tooth decay compared to males at 33.1%. The proportion (37.9%) of decayed teeth was higher for persons aged 60+ years compared with those aged 35-44 years (31%). (Kenya National Oral Health Survey Report, 2015).

The **Decayed, Missing, Filled (DMF)** index has been used for more than 70 years and is well established as the key measure of caries experience in dental epidemiology (Larmas, 2010). The DMF Index is applied to the permanent dentition and is expressed as the total number of teeth or surfaces that are decayed (D), missing (M), or filled (F) in an individual. When the index is applied to teeth specifically, it is called the DMFT index, and scores per individual which can range from 0 to 28 or 32, depending on whether the third molars are included in the scoring. When the index is applied only to tooth surfaces, it is called the DMFS index, and scores per individual can range from 0 to 128 or 148, depending on whether the third molars are included in the scoring (Cappelli & Morsby., 2007).

### **2.2.2 Periodontal lesions in HIV-infected patients**

**Periodontitis** is a set of inflammatory diseases affecting the periodontium i.e., the tissues that surround and support the teeth. Periodontitis involves progressive loss of the alveolar bone around the teeth, and if left untreated, can lead to the loosening and subsequent loss of teeth. Periodontitis is caused by micro organisms that adhere to and grow on the tooth's surfaces, along with an over-aggressive immune response against these microorganisms. A diagnosis of periodontitis is established by inspecting the soft gum tissues around the teeth with a probe during clinical examination and by evaluating

the patient's X-ray films i.e. radiographic examination, to determine the amount of bone loss around the teeth (Savage *et al.*, 2009).

Considered as one of the earliest clinical features of HIV infection (Robinson 2002), many studies have related the degree of immunosuppression and HIV viral load with the progression and exacerbation of chronic inflammatory periodontal disease (CIPD) (Mellors *et al.*, 1997; Kinane, 1999), with prevalence and severity ranging from 1-66% for gingivitis and 0-91% for periodontitis (Ranganathan *et al.*, 2000).

HIV infection in adults is linked with the expression of various types of periodontal lesions, which include specific forms of gingivitis and necrotizing periodontal diseases, as well as with possible exacerbation of pre-existing periodontal disease (Clearinghouse, 1993). Periodontal diseases strongly associated with HIV infection are classified as linear gingivitis erythema (LGE), necrotizing ulcerative gingivitis (NUG) and necrotizing ulcerative periodontitis (NUP) and are included among the seven cardinal oral lesions, which have been identified and recognized internationally, as oral candidiasis, oral hairy leukoplakia, Kaposi sarcoma, and non-Hodgkin lymphoma (Clearinghouse, 1993; Coogan *et al.*, 2005). The severity and degree of periodontal diseases (gingivitis, periodontitis) in an individual or in a section of a population is assessed, by the CPI (Community Periodontal Index) according to a WHO-recommendation, taking as its basis the three features bleeding, dental calculus and gingival sulcus.

### **2.2.3. Oral candidiasis**

Oral candidiasis may be the first presenting sign of HIV disease and is an important marker of its progression (Klein *et al.*, 1984). In a meta-analysis, it was estimated that the prevalence of oral candidiasis in HIV disease is 33%–50% (Samaranayake, 1992). Other oral fungal infections such as histoplasmosis, cryptococcosis, geotrichosis, and aspergillosis may also be seen in patients with HIV infection, but much less frequently. Although oral candidiasis is regarded as being associated with reducing CD4 counts

(Nielson *et al.*, 1994), it may also occur very early in the course of the infection. There are several distinct variants of HIV associated oral candidiasis.

Pseudomembranous candidiasis (thrush) presents as white/cream plaques easily removed from the underlying mucosa. It may occur at any intraoral site including the oropharynx. Angular cheilitis presents at the anterior commissures as red, cracked, and fissured lesions, unilaterally or bilaterally, while chronic hyperplastic candidiasis may also occur at this site although in HIV disease, it tends to occur more buccally. Classically, chronic hyperplastic candidiasis appears as a white, or red and white speckled lesion that is adherent. It also has malignant potential. Erythematous candidiasis is normally associated with the wearing of dentures, broad spectrum antibiotics, or corticosteroid therapy in the general population. In HIV infection, it presents on the dorsum of the tongue and palatal mucosa, as an area of erythema that may also contain pseudomembranous candidiasis. Of the four variants described, acute pseudomembranous and erythematous candidiasis are the most prevalent, occurring in 20–25% of patients with HIV infection (Korting *et al.*, 1989).

#### **2.2.4. Knowledge, Attitudes, and Practice**

The impact of HIV/AIDS and oral disease on the Quality of Life (QOL) is well documented involving physical and emotional wellbeing, social support systems, and life roles (Sheiham, 2005). It has been reported that HIV positive individuals with oral lesions have significantly lower oral health-related quality of life than HIV positive individuals without oral lesions. The poor quality of life in PLWHA can be attributed to the effect of oral lesions that may alter facial appearance, speech, and cause chewing and swallowing difficulty and pain (Hodgeson, 2006). Poor oral functionality might lead to exacerbation of nutritional problems that may further affect the quality of life (Reznik, 2005). Several knowledge, attitude and practice (KAP) studies have been carried out worldwide in relation to HIV/AIDS transmission and infection, while scanty literature addresses the knowledge, attitude and practices of PLWHA towards HIV/AIDS associated oral lesions (Li *et al.*, 2013).

This study assessed the knowledge, attitude and practices towards HIV/AIDS associated oral lesions within a cohort of HIV/AIDS positive patients. Knowledge identifies the level of understanding towards HIV/AIDS associated oral lesions, attitudes addresses their feelings and ideas towards oral manifestations while practices investigated their professional care seeking behaviour towards HIV/AIDS associated oral lesions.

#### **2.3 Critique of the literature relevant to the study**

Dental caries and periodontal disease have been considered the most important global oral health burdens. Dental caries affects 60-90% of school aged children and the majority of adults. Surveys done to measure the levels of caries in 12 year olds using the decayed missing filled teeth index (DMFT) in American children is relatively high, 3.0, whereas the index in African countries is lower at 1.7 (Peterson, 2003). Worldwide the prevalence of dental caries among adults is high, as the disease affects nearly 100% of the population in the majority of countries. The most common HIV related oral lesion is

candidiasis, predominantly due to *Candida albicans*. While *Candida* can be isolated from 30–50% of the oral cavities of healthy adults, making it a constituent of the normal oral flora, clinical oral candidiasis rarely occurs in healthy patients (Brawner & Cutler, 1989). In stark contrast, clinical oral candidiasis has been reported to occur in 17–43% of patients with HIV infection and in more than 90% of patients with AIDS (Tsang *et al.*, 1995). One report found that unexplained oral candidiasis in healthy adults with risk factors for HIV infection predicted the development of clinical signs of AIDS within 3 months (Klein, 1984).

HIV infection in adults is linked with the expression of various types of periodontal lesions, which include specific forms of gingivitis and necrotizing periodontal diseases, as well as with possible exacerbation of pre-existing periodontal disease (Clearinghouse, 1993). The introduction of HAART has significantly modified the course of HIV disease, at least in the industrialized world, into a manageable chronic disease with longer survival and improved quality of life in HIV-infected subjects (Eyeson *et al.*, 2002). Oral lesions are among the clinical manifestations whose prevalence, severity and course have been affected by this treatment. Although oral candidiasis appears to be the infection more significantly decreased after the introduction of HAART, the current literature suggests that the prevalence and course of periodontal lesions have also been modified (Mataftsi *et al.*, 2011)). Additional research is required regarding biological issues such as the role of oral immune factors and periodontal disease in the persistency of HIV infection, the possibility of oral transmission and the re-emerging of HIV infection.

## **2.4 Research gaps**

In Kenya oral health surveys, involving people with human immunodeficiency virus (HIV), the virus that causes acquired immunodeficiency syndrome (AIDS), have not been done (Kaimenyi, 2004) in spite of the special risk for oral health problems faced by this category of people. Well designed and documented studies are necessary for the correct assessment of the nature and magnitude of the problem in Kenya, if oral health measures are to be effectively formulated for the HIV-infected. Therefore this study sought to fill this gap by investigating the oral health status in HIV positive patients attending Port Reitz Hospital, Mombasa County.



## **CHAPTER THREE**

### **MATERIALS AND METHODS**

#### **3.1 Study Site**

The study was conducted at the Port Reitz County Hospital Comprehensive Care Clinic (CCC) located in Changamwe Sub-County, Mombasa County (Appendix VI). The hospital has a catchment Population of 68,000. Port Reitz Hospital was selected as a study site being the largest county referral facility in Mombasa County (MOH, 2011). The hospital catchment population is varied and includes at risk populations such as long distance truck drivers, as well as employees of the various industries and container terminals. Port Reitz Hospital has departments such as maternity, maternal and child care, clinical care, comprehensive care clinic, support services, rehabilitative services, nutrition, medical social work services, mental unit and nursing services. At the time of the study 2,360 patients were registered at the comprehensive care clinic.

#### **3.2 Study Population**

The study population was adult patients of 18 years and above who were HIV positive attending the CCC at Port Reitz Hospital.

#### **3.3 Target Population**

The target population were adult patients above the ages of 18 years who were HIV positive

#### **3.4 Study Design**

The study adopted a descriptive cross-sectional study design to determine the oral health status of HIV positive patients visiting the facility at that particular time. This design is

used to understand what is in a specific situation with an identified population. According to Owens (2002), this design is useful in collecting data at one point in time from a sample selected to represent a larger population over a short period of time

### 3.5 Sample Size Determination

The study adopted Yamane (1967) formula in determining the desired sample size at 95% confidence level (0.05 level of significance).

$$n = \frac{N}{1 + N(e)^2}$$

Where n = Sample size

N = Population (2560 adult patients of 18 years and above who were HIV positive attending the CCC at Port Reitz Hospital)

e = Level of significance (0.05)

$$\frac{2560}{1 + 2560(0.05)^2} = 345.95 \cong 346$$

Based on the results of the pilot study, the researcher estimated a response rate of 90% and therefore decided to draw a larger sample than the minimum calculated sample of 346 in order to account for uncooperative participants. Therefore, the desired sample size was obtained using the formula:

*Total Sample = Desired sample size ÷ (1 – refusal rate).*

$$\text{Total sample size} = 346 \div (1 - 0.1) \cong 384.4 = 385$$

### **3.6 Sampling Technique**

Systematic random sampling was used in order to provide HIV positive patients equal opportunity to participate in the study. The total number available as per a list pertaining to the age group under study was 2560. The sampling interval was 6.65 (2560/385) and hence every 7<sup>th</sup> patient who met the inclusion criteria was selected. The first participant was randomly selected among the first group of patients that arrived on the first day of sampling.

### **3.7 Inclusion Criteria and Exclusion Criteria**

#### ***Inclusion criteria:***

- i. All clients above 18 years of age visiting the CCC at Port Reitz Hospital;
- ii. HIV positive clients visiting the CCC at Port Reitz Hospital and;
- iii. Willingness to give written consent to participate in the study

#### ***Exclusion criteria:***

- i. Clients who were very sick having opportunistic and other infections at the time of the study.
- ii. Clients unwilling to participate in the study.
- iii. Clients who did not give written consent to participate in the study.

### **3.8 Data Collection tools**

Primary data from clinical examination was collected using the WHO Oral Health structured questionnaire on dental diseases identified as variables in the study (Appendix III). Clinical examination was done with the help of an assistant. A second questionnaire

was used to collect primary data on patient demographics, knowledge, attitudes and practice (Appendix IV).

### **3.9 Pre-testing of Study Instruments**

The WHO Oral Health Data collection tool was not pretested as it is a recommended tool for oral health research.

Pretesting was done on the questionnaire on KAP at Tudor Subcounty hospital. This facility was chosen because being a level 4 hospital it had similar conditions as the research site. The pre-test was aimed at realizing expected problems, reduce error possibility and to test research process and protocol. The second aim was to establish if the study resources were adequate, including time, finances and materials. The pilot study was also aimed at identifying confusing or misleading questions, and to ensure objectives are achieved according to study variables

### **3.10 Data Management and Analysis**

The questionnaires were inspected for completeness before data entry. Data was stored in password protected computer hard disk while the raw data was stored in lockable safes after data entry to ensure the security of the collected data. Quantitative data was cleaned and entered on MS- Excel spreadsheet then exported to Statistical Package for Social Sciences (SPSS) version 20 for analysis. In analysing data for the Likert scale questions, reliability of the responses was first tested and evaluated at Cronbach's alpha=0.7. Cronbach's alpha is a measure of the consistency or reliability of a test scale and is expressed as a number between 0 and 1 (Cronbach 1951). Univariate analysis (descriptive statistics) and bi-variate analysis (chi square test) was carried out to show the interaction between various variables in the study.

### **3.11 Ethical Considerations**

The study was approved by the Pwani University Ethics Review committee (Appendix V). The research procedures were undertaken in a way that ensured that ethical requirements were upheld. The major ethical issues considered were; no coercion, informed consent, privacy and confidentiality, anonymity and preservation of human dignity. Potential participants had the opportunity to make their decision to participate in the study based on adequate knowledge about the study, as provided for in the informed consent in Appendix III. Participants benefitted by being made aware of their oral health status and treatment choices available at the hospital's dental clinic where they were referred for management. There was no physical and psychological risk or harm suffered by the participants in this study as the nature of questions asked were not likely to hurt feelings and the dental examination was done in a way that protected them from any physical harm.

## **CHAPTER FOUR**

### **RESULTS**

#### **4.1 Socio Demographic and Economic Characteristics of Study Participants**

Out of the calculated sample size of 385, the study surveyed 368 (a response rate of 95.6%). This was because some clients dropped out of the study during examination and hence could not complete the second part that involved interviews.

Out of the 368 HIV positive patients recruited at Port Reitz Hospital, 231 (62.8%) were female while 137 (37.2%) were male. Most of the patients, 143 (39.4%) were aged 35-44 years, followed by those aged 45-54 years - 93 (25.6%) and 25-34 years 86 (23.7%). With regard to marital status, 238 (64.5%) of these patients were married, 54 (14.6%) were single while 11 (3.0%) were divorced, 38 (10.3%) were separated and 28 (7.6%) were widowed.

Findings indicated that 102 (27.6%) of the patients were unemployed 121 (32.8%) were on full-time employment 13 (3.5%) were on part time employment, while 130 (35.2%) were engaged in business as a source of income. In addition, majority 197 (53.4%) had studied up to primary level, 119 (32.8%) up to secondary level, 22 (6.1%) had tertiary level of education. Conversely, 6.9% had no formal education (Table 4.1).

**Table 4.1: Socio Demographic Characteristics of the Respondents (N=368)**

<b>Socio Demographic and Economic Characteristics of Respondents:</b>	<b>Patients (n=368)</b>	<b>Proportions (%)</b>
<b>Sex:</b>		
Male	137	37.2
Female	231	62.8
<b>Age (in years)</b>		
18-24	19	5.2
25-34	86	23.7
35-44	148	40.2
45-54	93	25.6
55-64	16	4.4
65-74	5	1.4
75-84	1	.3
<b>Marital Status</b>		
Married	237	64.4
Single	54	14.6
Divorced	11	3.0
Separated	38	10.3
Widowed	28	7.6
<b>Employment Status</b>		
Employed Part time	13	3.5
Employed Full time	120	32.8
Unemployed	102	27.6
Business	130	35.2
Retired	1	.3
Student	2	.5
<b>Highest Level of education</b>		
No formal Education	25	6.8
Primary Level	202	55.0
Secondary Level	119	32.3
Diploma	21	5.7
Degree	1	.3

## 4.2 Dental Caries among HIV positive patients

In determining the prevalence of dental caries among the patients selected, crown and roots of selected teeth were examined. To begin with, the crown of the teeth of the sampled patients was examined and the findings indicate that in the 1<sup>st</sup> quadrant, 320 (92.2%), 244 (68.7%) of the 2<sup>nd</sup> and 7<sup>th</sup> teeth were found to be in sound condition. The same teeth (2<sup>nd</sup> and 7<sup>th</sup>) were found to be decayed in 20 (5.4%) and 98 (27.6%) of the respondents and missing in 7 (1.9%) and 12(3.4%) respectively. The corresponding teeth (22 and 27) in the 2<sup>nd</sup> quadrant were found to be sound in 323 (93.6%) and 237 (66.8%) of the respondents respectively. Findings show that 46 (12.5%), 31 (8.9%) and 31 (8.9%) of the patients, 8<sup>th</sup>, 6<sup>th</sup> and 5<sup>th</sup> tooth were missing due to caries. In the second quadrant, 123 (34.4%), 99 (27.9%) and 43 (12.3%) of the patients, the 8<sup>th</sup>, 7<sup>th</sup> and 6<sup>th</sup> teeth were found to be decayed and 50 (14%), 17 (4.8%) and 40 (11.4%) of the same teeth were found to be missing as a results of caries.

In the 3<sup>rd</sup> quadrant, the 2<sup>nd</sup> and 7<sup>th</sup> teeth were sound in 326 (96.7%) and 204 (58%) of the respondents. In the 3<sup>rd</sup> quadrant, the 6<sup>th</sup>, 7<sup>th</sup> and 8<sup>th</sup> teeth were having caries among 66 (18.8%), 103 (29.3%) and 125 (34.7%) of the patients with 50 (14.2%), 42 (11.9%) and 58 (16.1%) of the same set of teeth in the same quadrant missing due to carries as is shown in Table 3(a) below. The 6<sup>th</sup>, 7<sup>th</sup> and 8<sup>th</sup> teeth in the 4<sup>th</sup> quadrant were having caries among 63 (17.7%) 101 (28.3) 142 (38.5%), of the patients with the same set of teeth observed to be missing due to carries for 50 (14.1%), 39 (10.9%) and 54 (14.6%) of the patients respectively (Table 4.2).



**Table 4.2: Status of Crown of the teeth among the Study Participants (N=368)**

<b>Tooth Number</b>	<b>Sound</b>	<b>Decayed</b>	<b>Filled, Caries</b>	<b>Missing, Caries</b>
18	188 (51.0%)	134(36.4%)	-	46 (12.5%)
17	244 (68.7%)	98 (27.6%)	-	12 (3.4%)
16	273 (78.7%)	43 (12.4%)	-	31 (8.9%)
15	285 (81.4%)	34 (9.7%)	-	31 (8.9%)
14	293 (79.2%)	35 (9.5%)	-	20 (5.4%)
13	328 (94.0%)	14 (4.0%)	-	7 (2.0%)
12	320 (92.2%)	20 (5.4%)	-	7 (1.9%)
11	313 (86.2)	23 (6.3%)	-	5 (1.4%)
21	311 (89.9%)	24 (6.9%)	-	7 (2.0%)
22	323 (93.6%)	16 (4.6%)	-	5 (1.4%)
23	326 (94.2%)	11 (3.2%)	-	8 (2.3%)
24	303 (87.6%)	26(7.5%)	-	16 (4.6%)
25	288 (82.8%)	29 (8.3%)	-	31 (8.9%)
26	266 (76.0%)	43 (12.3%)	-	40 (11.4%)
27	237 (66.8%)	99 (27.9%)	-	17 (4.8%)
28	175 (48.9%)	123(34.4%)	1 (0.3%)	50 (14.0%)
48	161 (43.6%)	142(38.5%)	-	54 (14.6%)
47	216 (60.5%)	101(28.3%)	-	39 (10.9%)
46	241 (67.9%)	63 (17.7%)	-	50 (14.1%)
45	310 (89.9%)	29 (8.4%)	1 (0.3%)	4 (1.2%)
44	324 (95.0%)	14 (4.1%)	1 (0.3%)	1 (0.3%)
43	327 (96.2%)	10 (2.9%)	-	2 (0.6%)
42	326 (96.2%)	9 (2.7%)	-	2 (0.6%)
41	325 (95.9%)	11 (3.2%)	-	2 (0.6%)
31	323 (95.6%)	12 (3.6%)	-	1 (0.3%)
32	326 (96.7%)	7 (2.1%)	-	1 (0.3%)
33	330 (97.6%)	6 (1.8%)	-	1 (0.3%)
34	327 (96.5%)	10 (2.9%)	-	1 (0.3%)
35	306 (90.0%)	26 (7.6%)	-	7 (2.1%)
36	233 (66.4%)	66 (18.8%)	1 (0.3%)	50 (14.2%)
37	204 (58.0%)	103(29.3%)	2 (0.6%)	42 (11.9%)
38	165 (45.8%)	125(34.7%)	2 (0.6%)	58 (16.1%)

On examination of the roots of the 2<sup>nd</sup> and 7<sup>th</sup> teeth in the 1<sup>st</sup> quadrant, 365(99.2%) and 363(98.6%) respectively were not recorded as they were not visible. Findings for the same teeth indicate that 2(0.5%) and 3(0.8%) respectively were sound, and 1 (0.3%) and 2 (0.5%) respectively were decayed. Findings in the 2<sup>nd</sup> quadrant for the same teeth, 2<sup>nd</sup> and 7<sup>th</sup>, 365(99.2%) and 358(96.8%) were not recorded, while 2(0.5%) and 5(1.6%) respectively were sound and 1(0.3%) and 5 (1.6%) were decayed respectively. In the 3<sup>rd</sup> quadrant findings on the 2<sup>nd</sup> and 7<sup>th</sup> teeth show that 358 (97.3%) and 358(97.3%) were not recorded. Of those recorded 10(2.7%) and 7 (1.9%) for the 2<sup>nd</sup> and 7<sup>th</sup> teeth respectively were sound and there were no caries in the root of the 2<sup>nd</sup> tooth whereas 3(0.8%) of the 7<sup>th</sup> tooth had caries.

Findings in the 4<sup>th</sup> quadrant for the 2<sup>nd</sup> and 7<sup>th</sup> teeth examined were that 357(97.0%) and 356 (96.5%) of the roots respectively were not recorded as they were not visible for examination. Of those that were visible 10(2.7%) and 7(1.9%) respectively were sound. The roots of the same teeth in this quadrant that were found to be decayed were 1(0.3%) for the 2<sup>nd</sup> tooth and 5 (1.6%) for the 7<sup>th</sup> tooth (Table 4.3).

**Table 4.3: Status of the roots of the teeth among study participants (N=368)**

Tooth	Sound	Decayed	Not recorded
18	4(1.0%)	5 (1.6%)	359 (97.6%)
17	3(0.8%)	2 (0.5%)	363 (98.6%)
16	2(0.5%)	3 (0.8%)	363 (98.6%)
15	2(0.5%)	3 (0.8%)	363 (98.6%)
14	2(0.5%)	5 (1.6%)	361 (98.1%)
13	3(0.8%)		365 (99.2%)
12	2(0.5%)	1 (0.3%)	365 (99.2%)
11	2(0.5%)	1 (0.3%)	365 (99.2%)
21	2(0.5%)	1 (0.3%)	365 (99.2%)
22	2(0.5%)	1 (0.3%)	365 (99.2%)
23	2(0.5%)		366 (99.4%)
24	3(0.8%)	1 (0.3%)	362 (98.9%)
25	3(0.8%)	8 (2.2%)	357(97.0%)
26	3(0.8%)	4 (1.1%)	361 (98.1%)
27	5(1.6%)	5 (1.6%)	358 (96.8%)
28	6(2.0%)	5 (1.6%)	357 (97.4%)
38	2(0.5%)	3(0.8%)	363(98.6%)
37	7(1.9%)	3(0.8%)	358(97.3%)
36	4(1.1%)	2(0.5%)	362(98.4%)
35	2(0.5%)	6(2.0%)	360(97.5%)
34	5(1.6%)	4(1.1%)	359(97.3%)
33	3(0.8%)	2(0.5%)	363(98.7%)
32	10(2.7%)		358(97.3%)
31	8(2.2%)	5(1.6%)	315(96.2%)
41	2(0.5%)		366(99.5%)
42	10(2.7%)	1(0.3%)	357(97.0%)
43	3(0.8%)	2(0.5%)	363(98.7%)
44	2(0.5%)	2(0.5%)	364(99.0%)
45	4(1.1%)	1(0.3%)	363(98.6%)
46	3(0.8%)	3(0.8%)	362(98.4%)
47	7(1.9%)	5(1.6%)	356(96.5%)
48	1(0.3%)	3(0.8%)	364(98.9%)

After examination of the selected teeth of sampled patients, treatment received was based on the observed and recorded status of each of the teeth. Majority of the patients received one surface filling as treatment for their dental status in the 7<sup>th</sup> (22.1%, 75) and 8<sup>th</sup> 63(22.1%) teeth in the 1<sup>st</sup> quadrant, 7<sup>th</sup> 54(19.1%) and 8<sup>th</sup> 72(25.7%) teeth in the 2<sup>nd</sup> quadrant, 7<sup>th</sup> 64 (22.9%), 8<sup>th</sup> 68(24.2%) in the 3<sup>rd</sup> quadrant and 7<sup>th</sup> 76 (24.8%), 8<sup>th</sup> 61 (21.2%) in the 4<sup>th</sup> quadrant.

Findings in the study indicated that the following teeth needed two surface fillings; 8<sup>th</sup>, 7<sup>th</sup>, 4<sup>th</sup> and 1<sup>st</sup> teeth in the 1<sup>st</sup> quadrant, the 5<sup>th</sup> and 7<sup>th</sup> teeth in the 2<sup>nd</sup> quadrant, 6<sup>th</sup>, 7<sup>th</sup> and 8<sup>th</sup> teeth in the 3<sup>rd</sup> quadrant and the 4<sup>th</sup>, 5<sup>th</sup>, 6<sup>th</sup>, 7<sup>th</sup> and 8<sup>th</sup> teeth in the 4<sup>th</sup> quadrant (Table 4.4).

**Table 4.4: Recommended treatment among the study participants (N=368)**

<b>Tooth</b>	<b>None</b>	<b>One surface filling</b>	<b>Two Surfaces</b>	<b>Veneer</b>	<b>Crown for any reason</b>	<b>Extraction</b>	<b>Other Care</b>
<b>18</b>	282 (76.6%)	75 (20.4%)	2 (0.5%)	-	-	8 (2.2%)	1 (0.3%)
<b>17</b>	297 (80.7%)	63 (17.1%)	1 (0.3%)	-	-	3 (0.8%)	4 (1.1%)
<b>16</b>	321 (87.2%)	22 (6.0%)	-	-	-	12 (3.3%)	13 (3.5%)
<b>15</b>	329 (89.4%)	14 (3.8%)	-	-	-	9 (2.4%)	16 (4.3%)
<b>14</b>	332 (90.2%)	20 (5.4%)	1 (0.3%)	-	-	7 (1.9%)	8 (2.2%)
<b>13</b>	361 (97.4%)	3 (0.8%)	-	-	-	1 (0.3%)	3 (0.8%)
<b>12</b>	355 (96.5%)	5 (1.4%)	-	-	1 (0.3%)	1 (0.3%)	6 (1.6%)
<b>11</b>	350 (95.1%)	14 (3.8%)	1 (0.3%)	-	-	2 (0.5%)	2 (0.5%)
<b>21</b>	355 (96.5%)	5 (1.4%)	-	1 (0.3%)	3 (0.8%)	4 (1.1%)	-
<b>22</b>	358 (97.3%)	6 (1.6%)	-	-	1 (0.3%)	1 (0.3%)	2 (0.5%)
<b>23</b>	363 (98.6%)	1 (0.3%)	-	-	-	1 (0.3%)	3 (0.8%)
<b>24</b>	350 (95.1%)	8 (2.2%)	-	-	-	3 (0.8%)	7 (1.9%)
<b>25</b>	336 (91.3)	12 (3.3%)	1 (0.3%)	10 (2.7%)	-	9 (2.4%)	-
<b>26</b>	320 (87%)	22 (6.0%)	-	-	-	11 (3.0%)	15 (4.1%)
<b>27</b>	297 (80.7%)	54 (14.7%)	1 (0.3%)	-	-	4 (1.1%)	12 (3.3%)
<b>28</b>	276 (75%)	72 (19.6%)	-	-	-	9 (2.4%)	11 (3.0%)
<b>48</b>	279 (75.8%)	76 (20.7%)	2 (0.5%)	-	-	6 (1.6%)	5 (1.4%)
<b>47</b>	290 (78.8%)	61 (16.6%)	2 (0.5%)	-	-	4 (1.1%)	11 (3.0%)
<b>46</b>	317 (86.1%)	27 (7.3%)	1 (0.3%)	-	-	7 (1.9%)	16 (4.3%)
<b>45</b>	347 (94.3%)	18 (4.9%)	1 (0.3%)	-	-	-	2 (0.5%)
<b>44</b>	360 (97.8%)	7 (1.9%)	1 (0.3%)	-	-	-	-
<b>43</b>	362 (98.4%)	3 (0.8%)	-	-	-	-	3 (0.8%)
<b>42</b>	364 (98.8%)	1 (0.3%)	-	-	-	-	3 (0.8%)
<b>41</b>	365 (99.2%)	1 (0.3%)	-	-	-	-	2 (0.5%)
<b>31</b>	364 (98.9%)	3 (0.8%)	-	-	-	-	1 (0.3%)
<b>32</b>	365 (99.2%)	1 (0.3%)	-	-	-	1 (0.3%)	1 (0.3%)
<b>33</b>	368 (100%)	-	-	-	-	-	-
<b>34</b>	364 (98.9%)	3 (0.8%)	-	-	-	-	1 (0.3%)
<b>35</b>	349 (94.8%)	16 (4.3%)	-	-	-	2 (0.5%)	1 (0.3%)
<b>36</b>	305 (82.8%)	32 (8.7%)	3 (0.8%)	-	-	7 (1.9%)	21 (5.7%)
<b>37</b>	284 (77.2%)	64 (17.4%)	3 (0.8%)	-	-	3 (0.8%)	14 (3.8%)
<b>38</b>	281 (76.4%)	68 (18.5%)	2 (0.5%)	-	-	9 (2.4%)	8 (2.2%)

The average number of decayed teeth was 3.12 (SD=2.45), missing teeth 2.56 (SD=1.98) and filled teeth 1.33 (SD=0.58). The DMFT index was 3.98 (SD=3.21). These indices were based on a rating where 0 to 4.9 was considered very low, 5 to 8.9 was considered low, 9 to 13.9 moderate and 14 to either 28 or 32 were interpreted as high as recommended by Cappelli *et al.* (2007) (Table 4.5).

**Table 4.5: Mean number of teeth decayed, missing or filled as a result of caries among study participants (N=368)**

<b>Proportion of participants with:</b>	<b>Very Low</b>	<b>Low</b>	<b>Moderate</b>	<b>High</b>
Decayed teeth	320 (87.1%)	37 (10.0%)	7 (1.9%)	4 (1.1%)
Missing teeth	351 (95.4%)	15 (4%)	2 (0.5%)	-
Filled teeth	368 (100%)	-	-	-
DMFT	283 (77.1%)	59 (15.9%)	16 (4.3%)	10 (2.7%)

Bi-variate analysis (chi square) was conducted to find out if there were any significant relationships between the DMFT indices and age, sex and whether or not the patients had already been enrolled on ARTs. At 5% level of significance, DMFT index among the patients was established not to be significantly related to age ( $\chi^2$  (18) = 17.556, p=0.485), sex ( $\chi^2$  (3) = 3.669, p=0.300) and ART status of the patients ( $\chi^2$  (3) = 2.158, p=0.540) (Table 4.6).

**Table 4.6: Test of significance of relationship between proportion of participants with various DMFT levels and age, sex and ART enrolment status (N=368)**

Status of teeth:	Proportion with DMFT				Significance Test
	Very Low	Low	Moderate	High	
<b>Age:</b>					
18-24	15 (5.4%)	4 (6.9%)	0 (0.0%)	0 (0.0%)	
25-34	70 (25.1%)	13 (22.4%)	2 (12.5%)	1 (10.0%)	
35-44	112 (40.1%)	23 (39.7%)	5 (31.3%)	3 (30.0%)	$\chi^2$
45-54	66 (23.7%)	16 (27.6%)	7 (43.8%)	4 (40.0%)	(18)=17.556,
55-64	11 (3.9%)	2 (3.4%)	2 (12.5%)	1 (10.0%)	p=0.485
65-74	4 (1.4%)	0 (0.0%)	0 (0.0%)	1 (10.0%)	
75-84	1 (0.4%)	0 (0.0%)	0 (0.0%)	0 (0.0%)	
<b>Sex</b>					
Male	111 (39.1%)	27.6% (16)	31.3% (5)	50.0% (5)	$\chi^2$ (3)=3.669,
Female	173 (60.9%)	72.4% (42)	68.8% (11)	50.0% (5)	p=0.300
<b>ART status (Are you on ART?)</b>					
No	15 (5.3%)	3 (5.2%)	2 (12.5%)	0 (0.0%)	$\chi^2$ (3)=2.158,
Yes	270 (94.7%)	55 (94.8%)	14 (87.5%)	10 (100%)	p=0.540

### 4.3 Periodontal disease, Oral candidiasis among HIV positive participants

Selected teeth as per the WHO oral assessment questionnaire were examined for periodontal diseases. In the 1<sup>st</sup> quadrant, the 1<sup>st</sup>, 6<sup>th</sup> and 7<sup>th</sup> teeth were selected; in the 2<sup>nd</sup> quadrant it was the 6<sup>th</sup> and 7<sup>th</sup> teeth; in the 3<sup>rd</sup> quadrant, it was the 1<sup>st</sup>, 6<sup>th</sup> and 7<sup>th</sup> teeth and finally in the 4<sup>th</sup> quadrant, it was the 6<sup>th</sup> and the 7<sup>th</sup> teeth examined. Findings in the 1<sup>st</sup> quadrant for the 6<sup>th</sup> and 7<sup>th</sup> teeth indicate that 111(30.0%) were healthy, 26 (7.1%) had bleeding gums and 200 (54.5%) had pockets 4-5mm. In the 2<sup>nd</sup> quadrant the same

teeth, 112 (30.5%) were found to be healthy, while 28 (7.6%) had bleeding gums and 195 (53.1%) had pockets 4-5mm. Still on the 6<sup>th</sup> and 7<sup>th</sup> teeth but in the 3<sup>rd</sup> quadrant, 93 (25.3%) of patients had healthy teeth, 30 (8.2%) had bleeding gums, 20 (5.4%) had calculus, and 202 (55.0%) had pockets 4.5mm. Findings on the same set of teeth, the 6<sup>th</sup> and 7<sup>th</sup>, in the 4<sup>th</sup> quadrant, show that 100 (27.2%) were healthy teeth, 27 (7.4%) had bleeding gums, 24 (6.5%) had calculus and 195% (53.1%) had pockets 4.5mm in size as shown in Table 4 below. The mean number of teeth with healthy gums was 2.36 (SD=1.82), bleeding gums were 0.35 (SD=1.10), with calculus were 0.83 (SD=0.98), pockets 4-5mm 2.19 (SD=1.73), and pockets 6 or more than 6mm were 0.01 (SD=0.14) (Table 4.7).

**Table 4.7: Community Periodontal Index: Status of teeth for study participants (N=368)**

CPI status:	17/16	11	26/27	47/46	31	36/37	Average
<b>Healthy</b>	111 (30.2%)	329 (89.9%)	112 (30.5%)	100 (27.2%)	129 (35.1%)	93 (25.3%)	146 (39.5%)
<b>Bleeding</b>	26 (7.1%)	9 (2.5%)	28 (7.6%)	27 (7.4%)	9 (2.5%)	30 (8.2%)	22 (5.9%)
<b>Calculus</b>	15 (4.1%)	19 (5.2%)	15 (4.1%)	24 (6.5%)	214 (58.3%)	20 (5.4%)	51 (13.8%)
<b>Pocket 4-5mm</b>	200 (54.5%)	7 (1.9%)	195 (53.1%)	195 (53.1%)	12 (3.3%)	202 (55.0%)	135 (36.5%)
<b>Pocket 6mm+</b>	1 (0.3%)		4 (1.1%)				3 (0.8%)
<b>Not Recorded</b>	14 (3.8%)	2 (0.5%)	13 (3.5%)	21 (5.7%)	3 (0.8%)	22 (6.0%)	13 (3.5%)

The mean number of healthy teeth was 2.36 (SD=1.82), teeth with bleeding gums 0.35 (SD=1.10), teeth with calculus 0.83 (SD=0.98), those with pockets (4-5mm) 2.19 (SD=1.73) and pockets 6mm or more 0.01 (SD=0.14).



#### **4.4 Oral mucosal conditions–oral Candidiasis**

When the respondents were examined for the condition of the oral mucosa and particularly for Candidiasis the study revealed that 6 (1.8%) of the respondents had oral Candidiasis. The majority 355(96.4%) of the respondents were found in the study to have no abnormal conditions (Table 4.8).

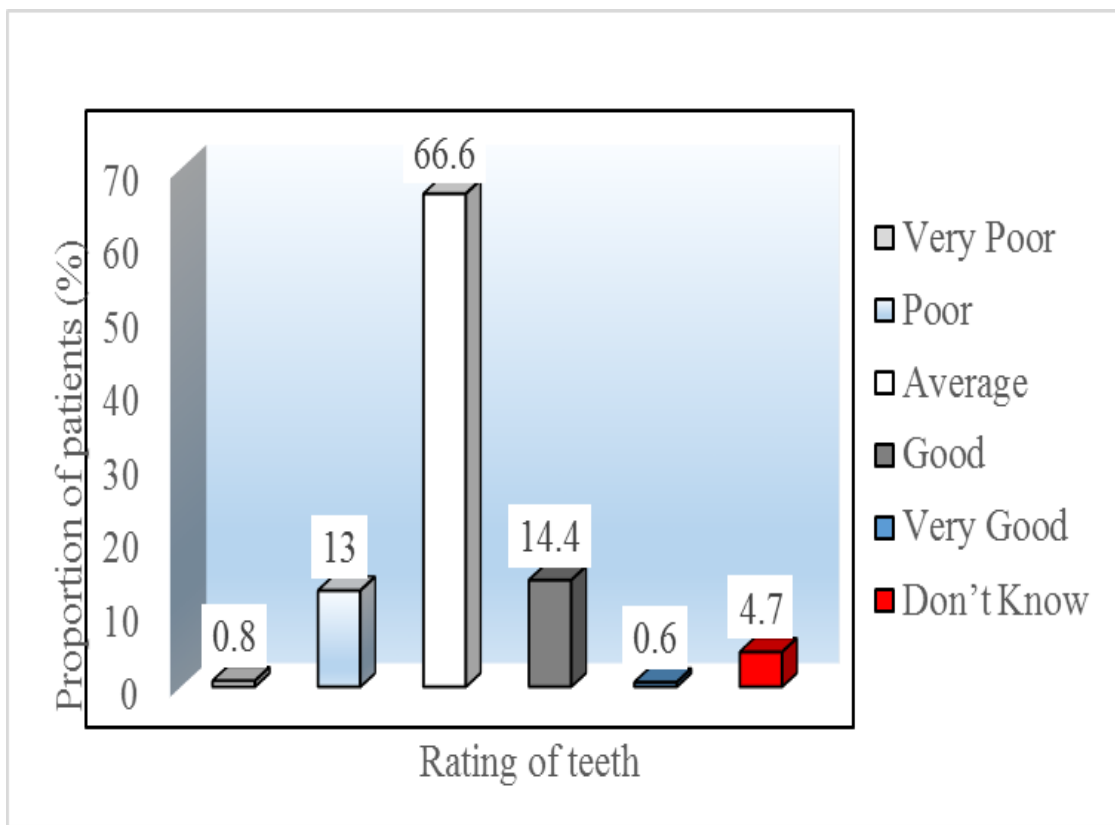
**Table 4.8: Proportion of respondents with oral mucosal conditions (N=368)**

<b>Oral mucosal conditions</b>	<b>Frequency</b>	<b>Percentage</b>
No abnormal conditions	355	96.4%
Leukoplakia	2	0.6%
Ulceration	2	0.6%
Candidiasis	6	1.8%
Abscess	1	0.3%
Other conditions	2	0.6%

#### **4.5 Oral Health Knowledge**

##### **4.5.1 Description of the health of the teeth and gums for selected participants**

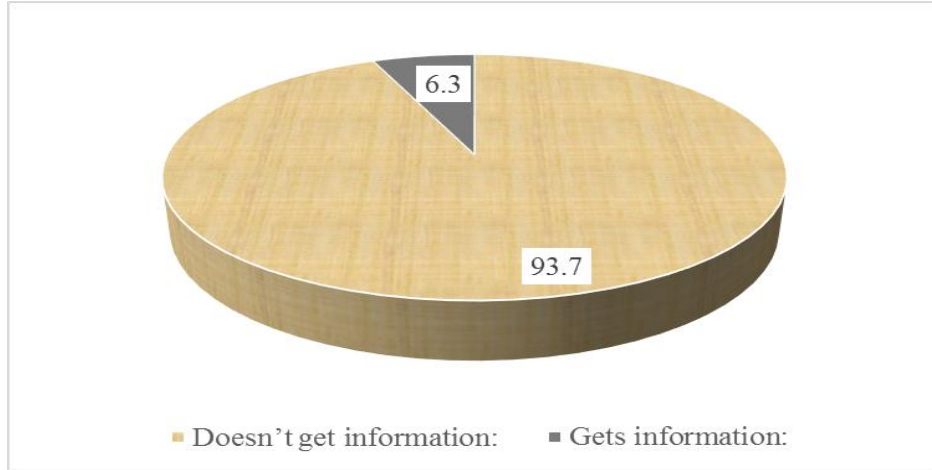
The study found that for the majority 241 (66.6%), the health of their teeth and gums was average, good 52 (14.4%) and poor 47 (13.0%) (Figure 4.1).



**Figure 4.1: Description of the health of patients' teeth and gums (N=368)**

#### **4.5.2 Access to information on HIV related oral diseases as part of health care education**

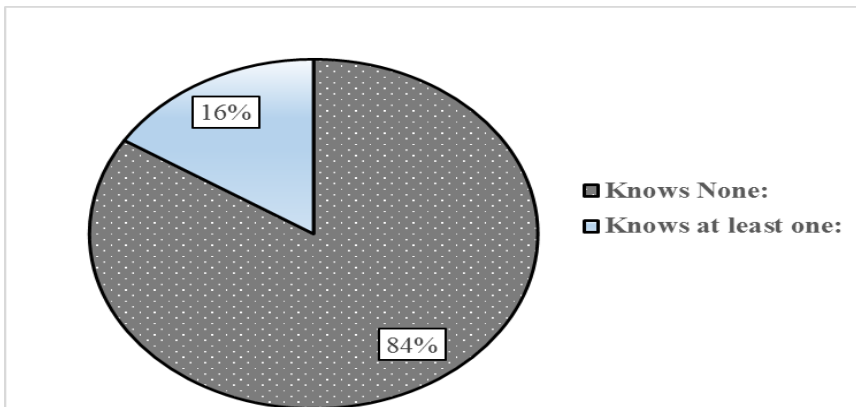
The study findings were that 341 (93.7%) of the patients did not have access to information on HIV related oral diseases as part of health care education while 23 (6.3%) of the patients had access to information (Figure 4.2).



**Figure 4.2: Access to information on HIV related oral diseases as part of health education (N=368)**

#### 4.5.3 Knowledge on oral diseases related to HIV

The study found that 310 (84.0%) did not know any oral diseases related to HIV while 58 (16.0%) of the patients knew at least an oral disease related to HIV (Figure 4.3).



**Figure 2.3: Status of patient's knowledge of oral disease related to HIV (N=368)**

#### 4.5.4 Types of oral diseases known

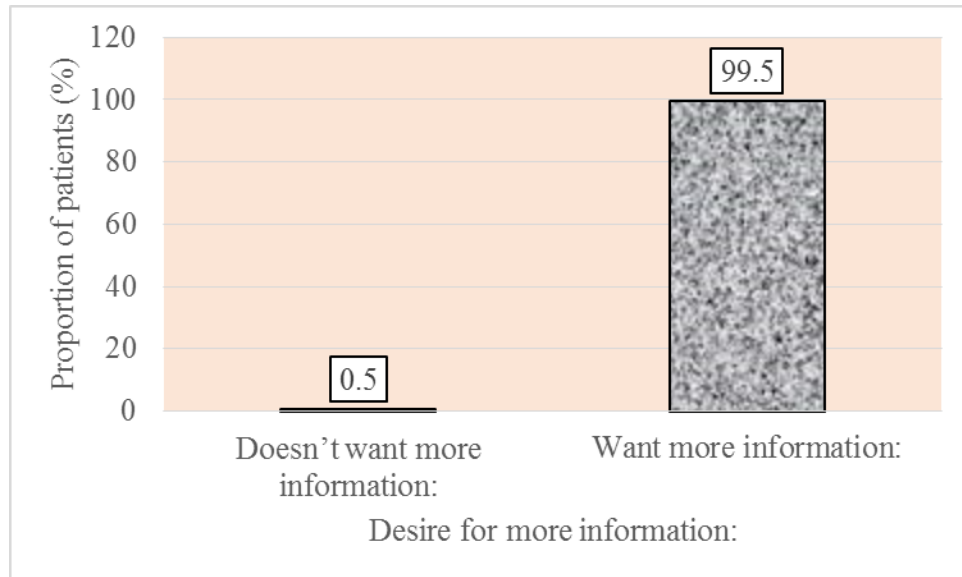
Of those respondents who knew oral diseases related to HIV, the commonest disease was bleeding gums 15 (28.3%), followed by cavities 9(17.0%) and ulcers 8(15.1%). Other diseases mentioned were decaying 4(7.5%), painful teeth 4(7.5%), sensitivity 3 (5.7%), toothache 3 (5.7%), gum disease 2(3.8%), bad breath 1(1.9%), dental pain 1(1.9%), fluorisis 1(1.9%) and rashes 1(1.9%) (Table 4.9)

**Table 4.9: Known oral diseases mentioned by selected participants (N=368)**

<b>Known oral diseases mentioned by selected participants</b>	<b>Proportion of patients (%)</b>
Bleeding Gums	15 (28.3%)
Cavity	9 (17.0%)
Ulcers	8 (15.1%)
Decaying	4 (7.5%)
Painful teeth	4 (7.5%)
Sensitivity	3 (5.7%)
Tooth Ache	3 (5.7%)
Gum disease	2 (3.8%)
Bad Breath	1 (1.9%)
Dental pain	1 (1.9%)
Fluorisis	1 (1.9%)
Rashes	1 (1.9%)

#### 4.5.5 Access to more information on HIV related oral diseases

The study findings showed that 362 (99.5%) of the patients wanted more information whereas 2(0.5%) patients did not need more information on oral diseases related to HIVs (Figure 4.4).

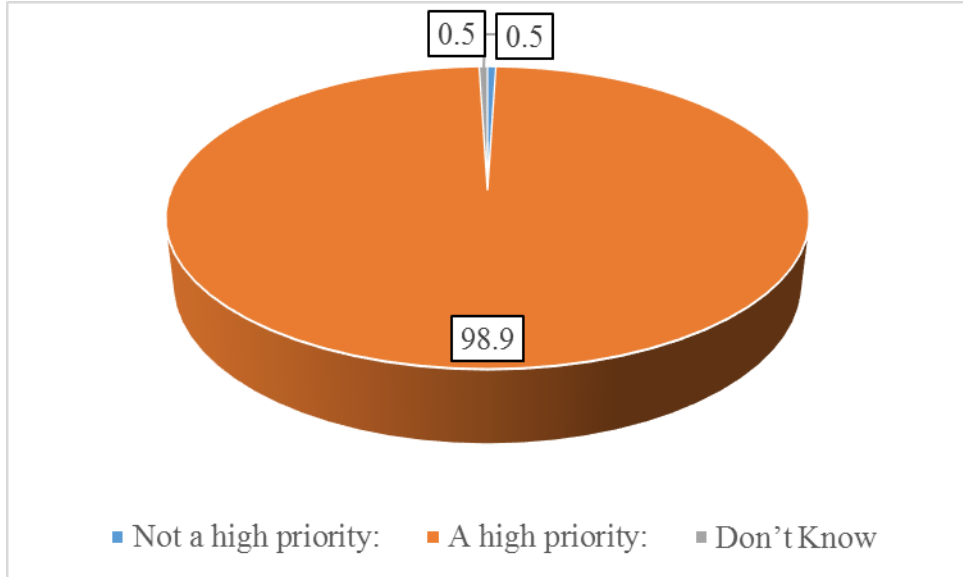


**Figure 4.4: Participant's desire for more knowledge on HIV related oral diseases (N=368)**

#### 4.6 Attitudes towards oral health

##### 4.6.1 Oral health care as a priority

The study indicated that for 361 (98.9%) of those interviewed, patients, oral health care was a priority whereas for 2(0.5%) of the patients oral health care was not priority. 2(0.5%) of the respondents were not sure whether if this was a high priority (Figure 4.5).



**Figure 4.5: Perception of patients towards oral health care: High priority or not?**  
(N=368)

On perception if treatment in the oral cavity is as important as treatment in other parts of the body 360 (98.9%) of the patients considered the treatment in the oral cavity as important as treatment in any other parts of the body while 4 (1.1%) of the patients could not tell whether or not treatment in the oral cavity was as important as treatment in any other part of the body.

**4.7 Oral Health Practices**

In order to find out the oral practices of the patients, the majority 235 (63.9%) of the patients confirmed cleaning their teeth more than once a day whereas 133(36.1%) cleaned their teeth once a day (Table 4.10).

**Table 4.10: Frequency of cleaning teeth among study participants (N=368)**

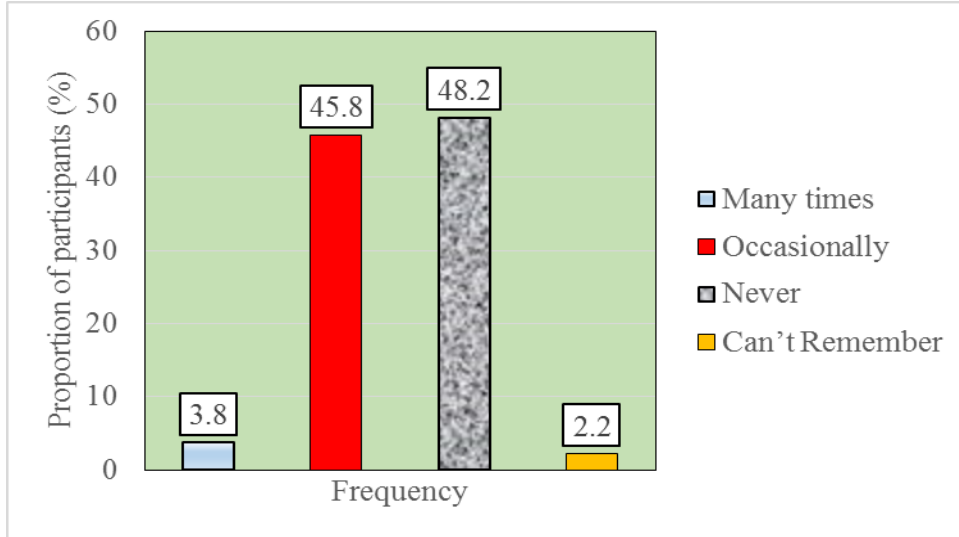
<b>Frequency of cleaning teeth in a week:</b>	<b>Number of patients</b>	<b>Proportion of patients (%)</b>
Once a day	133	36.1
More than once in a day	235	63.9

Irrespective of the frequency of cleaning teeth, it was established that majority (97%, 357) of the patients used tooth brush to clean their teeth and the remaining 3% (n=11) of the patients used charcoal to clean their teeth (Table 4.11).

**Table 4.11: Materials used by the study participants to clean their teeth (N=368)**

<b>Material used to clean teeth:</b>	<b>Number and proportion of patients, n (%)</b>
<b>Tooth brush</b>	357 (97%)
<b>Charcoal</b>	11 (3%)

With regards to frequency of pain and discomfort felt by study participants in the teeth and gums in the last 12 months preceding the study, 177 (48.2%) patients had never experienced pain or discomfort in their teeth and gums while 168(45.8%) had experienced pain or discomfort in their teeth and gums. For 14(3.8%) of the participants, this occurred many times in the 12 months before the study while 8 (2.2%) of the study participants could not remember how often they had experienced such pain and discomfort in the teeth and gums (Figure 4.6).



**Figure 4.6: Frequency of pain and discomfort felt by study participants in the teeth and gums in the last 12 months (N=368)**

As for the frequency of visits to the dentist by the participants in the 12 months before the study, it was established that 309 (84.0%) of the patients had never visited a dentist within that period while 51 (13.9%), 2 (0.5%) and 6(1.6%) of the patients had visited a dentist once, twice and more than twice respectively (Table 4.12).

**Table 4.12: Frequency of visit by the study participants to the dentist in the last 12 months (N=368)**

How often did you visit a dentist in the last 12 months?	Number and proportion of patients
Once	51 (13.9%)
Twice	2 (0.5%)
More than two times	6 (1.6%)
Never	309 (84.0%)



For the participants who had never visited a dentist in the last 12 months, some of the reasons were negligence on the part of the patients 182 (50.7%), tooth not being painful 68(18.4%) and participants not seeing the need for such a visit 46 (12.5%). The three least reasons given by the least number of patients were that they were too busy to visit a dentist 11 (2.9%), being on other medication 6 (1.5%) and participant’s preference for readily available pain killers in case of such pain 6 (1.5%) (Table 4.13).

**Table 4.13: Reasons for not visiting a dentist despite feeling dental pain in the last 12 months (N=368)**

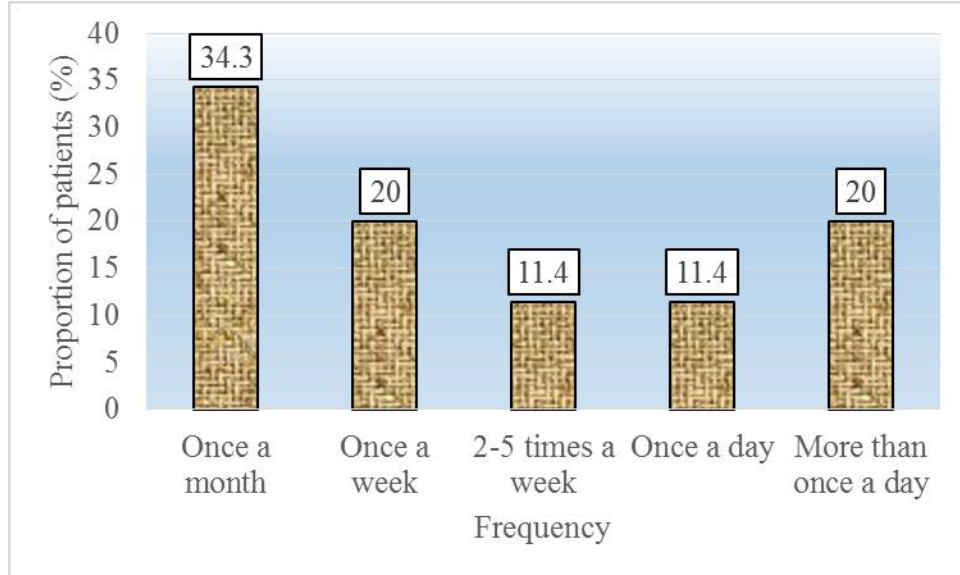
<b>Reasons why participants had never visited a dentist despite having tooth or gum pain in the last 12 months:</b>	<b>Proportion of patients (%)</b>
Negligence on the part of the patients	182 (50.7%)
Tooth not painful	68 (18.4%)
Didn’t see need to visit dentist	46 (12.5%)
Problem of the teeth known	19(5.1%)
Fear of extraction of the teeth	14 (3.7%)
Lack of money to pay the dentist	14 (3.7%)
Too busy	11 (2.9%)
On other medication	6 (1.5%)
Prefer pain killers	6 (1.5%)

On the respondents use of tobacco products, the study revealed that 10(24.4%) of the respondents had used cigarettes while 29 (70.7%) had used other products such as alcohol 16 (55.2%), bhang 2(6.9%) and miraa (khatt) 8(27.6%) (Table 4.14).

**Table 4.14: Proportion of study participants using tobacco containing products (N=368)**

<b>Variables:</b>	<b>Proportion of participants (%)</b>
<b><i>Tobacco containing products used:</i></b>	
Cigarettes	10 (24.4%)
Chewing Tobacco	2 (4.9%)
Other products	29 (70.7%)
<b><i>Names of the other products</i></b>	
Alcohol	16 (55.2%)
Alcohol, bhang	1 (3.4%)
Bhang	2 (6.9%)
Miraa	8 (27.6%)
Miraa/alcohol	2 (6.9%)

For the users of tobacco products, the study found the frequency of use as, once a month 12(34.3%), once a week 7(20.0%), many times in a week 4 (11.4%), once a day 4 (11.4%) and more than once in a day 7(20.0%) (Figure 8).



**Figure 4.7: Frequency of use of tobacco products by the study participants (N=368)**

The respondents were then exposed to 5 -3 point Likert scale statements. The study indicated that for 360 (99.4%) participants, teeth were an important part of the body whereas for 351(97.1%) daily cleaning of the teeth prevented dental caries. The study also found that for 347(95.9%) of the participants, regular visit to the dentist helped to keep teeth in healthy state and 322 (89.0%) stated that consuming sweetened food products or drinks could cause dental caries. When asked if using fluoridated toothpaste was good for the teeth 253(69.7%) said the statement was true though 101(27.8%) did not know whether or not using fluoridated toothpaste was good for their teeth (Table 4.15).

**Table 4.15: Selected participant’s responses regarding dental practices (N=368)**

<b>Statement related to dental practices:</b>	<b>True (%)</b>	<b>False (%)</b>	<b>Don’t know (%)</b>
Teeth are an important part of the body:	360 (99.4%)	2 (0.6%)	
Daily cleaning of the teeth can prevent dental caries:	351 (97.0%)	4 (1.1%)	7 (1.9%)
Regular visit to dentist helps to keep your teeth in a healthy state:	347 (95.9%)	4 (1.1%)	11 (3.0%)
Consuming sweetened food products or drinks doesn’t cause dental caries:	17 (4.7%)	322 (89.0%)	23 (6.4%)
Using fluoridated toothpaste is good for your teeth:	253 (69.7%)	9 (2.5%)	101 (27.8%)

In regard to the quality of life affected by the oral health status in the 6 months preceding the study, majority 289 (78.3%) did not experience any difficulty in eating and chewing food while 329 (89.4%) did not experience problems with cleaning their teeth. The study found that 322 (87.7%) had no difficulty in sleeping and relaxing and 352 (96.2%) were able to smile and show their teeth without embarrassment. 296 (80.9%) of the respondents had no difficulty maintaining usual emotional state, 352 (95.9%) enjoyed contact with other people and 328(89.4%) carried out major work and social roles.

The study however found that 40 (10.8%) had difficulty in eating and chewing food on a daily basis, 14 (3.8%) of the participants less than once in a month, 14 (3.8%) once or twice a week and 12 (3.3%) once or twice a month within the 6 months before the study. Difficulty in cleaning teeth were experienced by 23 (6.3%) of the participants on a daily basis, 8 (2.2%) of the participants less than once a month, 6 (1.6%) once or twice a month and 2 (0.5%) once or twice a week. The study showed that difficulty in sleeping and relaxing were experienced by 14 (3.8%) of the respondents on a daily basis, 12 (3.3%) less than once a month, 13 (3.5%) once or twice a month and 6 (1.6%) once or twice a week. Difficulty in smiling and showing teeth without embarrassment were

experienced by 9 (2.5%) of the participants on a daily basis, by 3 (0.8%) less than once a month, 1 (0.3%) once or twice a month and by 1 (0.3%) once or twice a week.

Problems in maintaining usual emotional state were experienced by 30 (8.2%) of the study participants on a daily basis, 9 (2.5%) less than once a month, 18 (4.9%) once or twice a month and 13 (3.6%) once or twice a week. When asked about difficulty in enjoying contact with other people caused by mouth and teeth problems, 5 (1.4%) experienced this on a daily basis, 3 (0.8%) less than once a month, 3(0.8%) once or twice a month and 4 (1.1%) once or twice a week Finally difficulty in carrying out major work and social roles were experienced by 10 (2.7%) of the participants on a daily basis, 11 (3.0%) of the respondents less than once a month, 9 (2.5%) once or twice a month and 9 (2.5%)s once or twice a week (Table 4.16).

**Table 4.16: Frequency of difficulties on various issues caused by mouth/teeth problems in the last 6 months among selected participants (N=368)**

<b>Difficulties in the last 6 months of difficulty in:</b>	<b>Never</b>	<b>&lt; once a month</b>	<b>1-2 a month</b>	<b>1-2 a week</b>	<b>Daily</b>
Eating and chewing food	289 (78.3%)	14 (3.8%)	12 (3.3%)	14 (3.8%)	40 (10.8%)
Cleaning teeth	329 (89.4%)	8 (2.2%)	6 (1.6%)	2 (0.5%)	23 (6.3%)
Sleeping and relaxing	322 (87.7%)	12 (3.3%)	13 (3.5%)	6 (1.6%)	14 (3.8%)
Smiling and showing teeth without embarrassment	352 (96.2%)	3 (0.8%)	1 (0.3%)	1 (0.3%)	9 (2.5%)
Maintaining usual emotional state	296 (80.9%)	9 (2.5%)	18 (4.9%)	13 (3.6%)	30 (8.2%)
Enjoying contact with other people	352 (95.9%)	3 (0.8%)	3 (0.8%)	4 (1.1%)	5 (1.4%)
Carrying out major work and social roles	328 (89.4%)	11 (3.0%)	9 (2.5%)	9 (2.5%)	10 (2.7%)

The study established that 349(94.6%) patients were on ART while 20(5.4%) of the patients were not yet enrolled on ART. On average, the patients had been on ART for

4.5 years with 57(16.7%) of the patients having started ART in the year of the study (2015). The participants in the study who had been on ART for the longest was for 29 years before the study.

Most of the participants who had access to information on HIV related oral disease as part of healthcare education also knew at least some oral disease related to HIV (52.4%, 11) while those who had no access to such information did not also know any oral disease related to HIV (86.5%, 295). Patients who had access to information on HIV related oral diseases as part of healthcare education had the highest number also seeing oral health care as a priority (91.3%, 21) compared to those who had no such access and also did not see oral healthcare as a priority (0.3%, 1) and finally, the highest number of participants were established to have the habit of brushing their teeth more than once daily irrespective of whether or not they had access to information on HIV oral diseases as part of healthcare education.

Bivariate analysis (chi square test) was then carried out to establish if there was any significant relationship between access to information on HIV related oral diseases as part of health care education and knowledge of any oral disease related to HIV, perception towards oral healthcare as a priority, perceptions towards treatment of oral cavity, frequency of maintaining hygiene of the teeth, various methods used to clean teeth. Access to information was established to be significantly related to knowledge of oral diseases related to HIV ( $\chi^2 (1) = 22.553, p=0.00$ ), perceptions of patients towards oral healthcare as a priority ( $\chi^2 (1) = 29.873, p=0.00$ ) and the frequency of cleaning teeth ( $\chi^2 (2) = 15.645, p=0.00$ ). There was no significant relationship between access to information on HIV related oral diseases as part of healthcare education and perceptions of patients towards treatment of oral cavity compared to other parts of the body ( $\chi^2 (1) = 0.261, p=0.609$ ), use of tooth brush to clean teeth ( $\chi^2 (1) = 0.235, p=0.628$ ) and use of charcoal to clean teeth ( $\chi^2 (1) = 0.337, p=0.562$ ) (Table 4.17).

**Table 4.17: Test of significance between knowledge factors and access to information on HIV related oral diseases (N=368)**

<b>Factors considered:</b>	<b>Have access to information on HIV related oral diseases as part of health care education?</b>		
	<b>Yes</b>	<b>No</b>	<b>Significance test</b>
<b>Knows any oral disease related to HIV?</b>			
Yes	11 (52.4%)	46 (13.5%)	$\chi^2 (1)=22.553,$ p=0.00
No	10 (47.6%)	295 (86.5%)	
<b>See oral health care as a priority?</b>			
Yes	21 (91.3%)	340 (99.7%)	$\chi^2 (1)=29.873,$ p=0.00
No	2 (8.7%)	1 (0.3%)	
<b>Considers treatment in the oral cavity as important as treatment in other parts of the body?</b>			
Yes	22 (100.0%)	337 (98.8%)	$\chi^2 (1)=0.261,$ p=0.609
No	0 (0.0%)	4 (1.2%)	
<b>Frequency of cleaning teeth</b>			
Few times in a week	1 (4.3%)	0 (0.0%)	$\chi^2 (2)=15.645,$ p=0.00
Once a day	6 (26.1%)	126 (37.1%)	
More than once in a day	16 (69.6%)	214 (62.9%)	
<b>Uses Tooth brush to clean teeth?</b>			
Yes	22 (95.7%)	332 (97.4%)	$\chi^2 (1)=0.235,$ p=0.628
No	1 (4.3%)	9 (2.6%)	
<b>Uses Charcoal to clean teeth?</b>			
Yes	1 (4.3%)	26 (7.6%)	$\chi^2 (1)=0.337,$ p=0.562

## CHAPTER FIVE

### DISCUSSION, CONCLUSIONS AND RECOMMENDATIONS

#### 5.1 Discussion

##### 5.1.1 Socio Demographic Characteristics of the patients

The study revealed that in Port Reitz Hospital, there were twice as many female as male HIV patients who visited the facility to seek comprehensive care. Majority of these patients were aged between 45 and 54 years while more than 6 out of 10 were married. The results of the present study showed two trends of the AIDS epidemics: the aging of the infected population due to higher survival rates (Stoff *et al.*, 2004) and the feminization (Fonseca & Bastos; 2007). Similar to other studies in Africa (Butt, 2001; Adurogbangba, 2004), the study showed a higher proportion of females than males. The study showed that majority of the respondents were in some form of employment, full time, part time or business. More than half of the respondents had gone up to primary level of education compared to the few who have gone beyond primary and secondary level of education.

##### 5.1.2 Dental caries among HIV positive patients

Most of these patients had sound teeth translating into low DMFT index (3.98) with the majority of the patients having lower than 5 decayed, missing and filled teeth due to caries. On average just 3.12 (SD=2.45) teeth were decayed, 2.56 (SD=1.98) teeth were missing teeth and 1.33 (SD=0.58) teeth had been filled due to caries among all the patients whose teeth were examined. This is in contrast to a study in Brazil by Silveira & Rangel (2004) which observed a high prevalence of caries with a mean DMFT = 23 in 123 adult patients of both sexes.



On the periodontal index, the study revealed that a large number of the respondents had no abnormal conditions, while a lower percentage had bleeding gums, calculus on their teeth, and gingival pockets 4.5mm. The majority had pockets more than 6mm and thus the majority had periodontitis. The study revealed that a low proportion of respondents had oral candidiasis. The majority of the clients had no abnormal conditions detected. The introduction of highly active antiretroviral therapy may have led to the decreased incidence of oral candidiasis (Challacombe & Sweet, 2002).

### **5.1.3 Oral Health Knowledge, Attitude and Practice (KAP) among HIV positive patients**

Majority of the patients were already on ART at the time of the study. Majority of the patients considered the health of their teeth and gums as average with a few of the patients having access to information on HIV related oral diseases as part of health care education. Majority of the respondents had no knowledge of any oral diseases associated with HIV. A study by Saad *et al.*, 2012) showed that 37 % of patients were reported as knowledgeable while 63% of patients were non knowledgeable on HIV associated oral diseases.

The three most commonly known oral disease related to HIV is bleeding gums cavity and ulcers though mention was made of decaying, painful teeth, sensitivity, tooth ache, gum disease, bad breath, dental pain, fluorosis and rushes. Close to all the patients desired more information on oral diseases related to HIV. Majority of the participants considered oral health care as a high priority with a similar proportion considering treatment in the oral cavity as important as treatment in other parts of the body. For the majority of the respondents, cleaning of teeth was something they did more than once a day using tooth brush as opposed to other methods such as charcoal.

The study shows that the majority of the participants had in the previous 12 months before the study not visited a dentist, with the three main reasons being their own neglect of the pain they experienced, while some said they had not experienced painful

teeth and others did not see the need to visit a dentist. A study in Malaysia on people living with HIV associated oral lesions found that two thirds of patients (66%) reported that they would seek professional care while 34% patients reported not seeking professional care (Saad *et al.*, 2012). This is in contrast to this study finding which may be attributed to lack of knowledge on the part of the respondents.

The respondents who used tobacco products were 11% while 7.8% used other products such as alcohol, bhang and miraa. Studies done in the pre ART era had demonstrated increased HIV related complications in HIV positive smokers (Nieman *et al.*, 1993). The impact of tobacco use on outcome in HIV patients has not been examined post ART era. (Mocroft *et al.*, 2002). Cessation of smoking and other related products by HIV patients would however result in improved outcomes (Palella *et al.*, 1998).

Majority of the patients felt that teeth are an important part of the body and daily cleaning of the teeth could prevent dental caries. Regular visit to the dentist helped to keep their teeth in healthy state while consuming sweetened food products or drinks caused dental caries and finally that using fluoridated toothpaste was good for teeth. Oral health is seen from a health perspective as a balance between destructive factors such as sugar-rich diet, tobacco use, and poor oral hygiene versus protective factors including good oral hygiene and the application of fluoride, whether in toothpaste, rinses or varnishes, or in community drinking water (Sgan-Cohe & Mann., 2007).

Access to information was significantly related to knowledge of oral diseases related to HIV perceptions towards oral healthcare as a priority and to frequency of cleaning teeth. Most of the patients who had access to information on HIV related oral disease as part of healthcare education knew at least some oral disease related to HIV and treated oral health care as a priority. Those who did not have access to information did not know any oral disease related to HIV. Empowering patients with knowledge is associated with adherence to a variety of medical recommendations, including those for HIV clients. Providers should ensure that each patient has the information needed for reasoned decision-making (Weiss, 2003).

## **5.2 Conclusion**

1. For the majority of the respondents 80.1%. The prevalence of decayed teeth was 13.2% whereas for filled and missing teeth was 0.07% and 5.7% respectively. The overall decayed, missing, filled teeth index was 18.97%
2. The common periodontal conditions were bleeding gums 5.9%, and periodontal pockets 37.3% found in a high number of participants. These were conditions that could be prevented with patient education on appropriate oral practices. The fewer number of respondents with oral candidiasis 1.8%, may be attributed to the use of HAART for management of HIV virus.
3. A large percentage of the participants, 84%, had no knowledge of oral diseases related to HIV while 93.7% had no access to information on HIV related oral diseases. Oral health care was a priority for 98.9% of the respondents while the same percentage felt that treatment of oral diseases was a priority. In regards to practice 63.9% cleaned their teeth more than once a day, 97% used toothbrushes as a mode of cleaning their teeth and 84% had never visited a dentist even though they 49.6% experienced pain and discomfort.

## **5.3 Recommendations**

1. This study was an effort at determining the oral Health status of Human Immunodeficiency virus positive patients attending Port Reitz Hospital. HIV infection predisposes individuals to increase oral diseases. If findings correlate with expected decline in oral health of HIV patients attending CCC at Port Reitz, then measures need to be put in place to integrate oral health clinics as part of the care process to detect and manage oral health diseases and improve overall health of the patient.
2. Structured educational programs that can empower patients with knowledge and ensure that the patient has an access to the right information needed for

decision-making should be developed. It is recommended to provide the PLWHA with the proper knowledge in regards to the HIV/AIDS associated oral lesions and oral health. Improving knowledge for the respondents would lead to improved attitudes and practice towards oral health care.

3. A more detailed study should be carried out among the HIV patients at Port Reitz Hospital to establish the clinical factors that may have contributed to the patients on ARV having lower rates of oral conditions.

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## APPENDICES

### Appendix I: KAP Questionnaire

#### Introduction:

My name is Mary Adhiambo Ochola, a dentist working for Mombasa County Department of Health – Kenya and a student studying for a degree of Master of Science in Public Health at the Jomo Kenyatta University of Agriculture and Technology (JKUAT) Mombasa Campus. I am going doing a research for my thesis titled *“Oral Health Status in Human Immunodeficiency Virus Positive Patients Attending Port Reitz Hospital”*. You have been sampled to be included in this research study by signing the consent form which details the purpose and procedure of this study. As part of the study, I am supposed to interview you using this tool and later on have your mouth examined as well. If you have a dental problem then you will be referred to the dental clinic within the hospital for immediate treatment. Do you agree to proceed in the study?

Yes .....

No.....

#### SECTION A: SOCIO DEMOGRAPHIC CHARACTERISTICS

1. Date of birth .....

2. Gender

Male

Female

3. Marital status:

Married

Single

Divorced

Separated

Widowed

4. Employment status:

Employed Part Time       Employed Full Time

Unemployed       business

Retired       Student

5. Occupation.....

6. Highest Level of education:

No formal education

Primary level

Secondary level

Diploma

Degree

7. Residence .....

**SECTION B**

**Knowledge about HIV related oral diseases**

8. How would you describe the health of your teeth and gums?

Very good	<input type="checkbox"/>	Good	<input type="checkbox"/>	Average	<input type="checkbox"/>
Poor	<input type="checkbox"/>	Very poor	<input type="checkbox"/>	Don't know	<input type="checkbox"/>

9. Do you get any information on HIV related oral diseases as part of health care education?

Yes No

10. Do you know of any oral diseases related to HIV?

Yes	<input type="checkbox"/>	No	<input type="checkbox"/>
-----	--------------------------	----	--------------------------

Specify which ones you know-----

11. Would you like to have more information on HIV related oral diseases?

Yes	<input type="checkbox"/>	No	<input type="checkbox"/>
-----	--------------------------	----	--------------------------

**SECTION C**

**Personal attitudes concerning oral Health**

12. Do you see oral health care as a high priority?

Yes

No

I don't know

13. Do you consider treatment in the oral cavity as important as treatment in other part of the body?

Yes

No

I don't know

**SECTION D**

**Practice**

14. How often do you clean your teeth?

Never

Once in a week

Many times in a week

Once in a day

More than once in a day

15. Which material/s do you use for cleaning your teeth?

Tooth brush

Tooth picks

Dental floss or thread

Charcoal

Chew stick

Other

Please specify.....

16. How often in last 12 months did you experience pain or discomfort in your teeth and gums?

Many times

Occasionally

Never

Don't remember

17. How often did you visit the dentist in the last 12 months?

Once

Twice

More than two times

Never



18. If answer to Q17 is never, what is the reason for not visiting the dentist?

-----  
-----  
-----  
-----

19. Do you use any of these tobacco containing products?

Cigarette	<input type="checkbox"/>	Cigars	<input type="checkbox"/>
A pipe	<input type="checkbox"/>	chewing tobacco	<input type="checkbox"/>
Use snuff	<input type="checkbox"/>	others	<input type="checkbox"/>

Specify .....

20. If yes, how often do you use it?

Once in a month	<input type="checkbox"/>
Once in a week	<input type="checkbox"/>
Many times in a week	<input type="checkbox"/>
Once in a day	<input type="checkbox"/>
Many times in a day	<input type="checkbox"/>

21. Select the one answer for the following sentences.

Teeth are an important part of your body

True                      false                      don't know  
                                           

Daily cleaning of teeth can prevent dental caries

True                      false                      don't know  
                                           

Regular visit to dentist helps to keep your teeth in a healthy state

True                      false                      don't know  
                                           

Consuming sweetened food products or drinks does not cause dental caries

True                      false                      don't know  
                                           

Using fluoridated toothpaste is good for your teeth

True                      false                      don't know

**22. Quality of life**

**Select the most appropriate answer for the following questions**

During the past 6 months how often have problems with your mouth and teeth caused you any difficulty with the following					
	Never affected	Less than once a month	Once or twice a month	Once or twice a week	Every day or nearly everyday
Eating and chewing food					
Cleaning teeth					
Sleeping and relaxing					
Smiling and showing teeth without embarrassment					
Maintaining usual emotional state					
Enjoying contact with other people					
Carrying out major work and social roles					

23 Are you on anti retroviral therapy?

Yes  No

24 When did you start the therapy?

-----

-----

*Thank you for your time and co-operation*

## **Appendix II: Informed Consent Form**

### **PART A:**

Title of the Research Study: **“Oral Health Status in Human Immunodeficiency Virus Positive Patients Attending Port Reitz Hospital”**.

Researcher:

Mary A. Ochola, Dentist, Mombasa County Department of Health - Kenya.

Supervisors:

1. Professor S. M. Karanja
2. Dr. Rahma Udu M. Yusuf

Introduction:

My name is Mary Adhiambo Ochola, a dentist working for Mombasa County Department of Health - Kenya. I am also studying for a degree of Master of Science in Public Health at the Jomo Kenyatta University of Agriculture and Technology (JKUAT) Mombasa Campus. I am going to do an academic research on dental/oral diseases. I will give you information and invite you to be part of this research. Should you agree to take part in the study, you will be asked to answer questions in questionnaires and have your mouth examined as well. If you have a dental problem then you will be referred to the dental clinic within the hospital for immediate treatment.

### **Purpose of the Research:**

The purpose of this study is to find out the oral (dental) diseases/conditions that affect adult patients attending CCC at Port Reitz Hospital. The results will be used to increase awareness about dental problems of CCC clients at the hospital and to communicate the

importance of increasing support to oral health to health managers, politicians, community and other health workers.

### **Research Procedure**

The Researcher will educate the selected potential participants about the study and give them a chance to ask questions that will be answered fully. The potential participants will be reminded of the importance of understanding the information as explained in this informed consent so that they are fully aware of its content before signing. If the participant agree and consent to participate, the Researcher will take time to introduce the questionnaire and address issues that are not clear. Thereafter the Researcher will use the questionnaire to interview and record the answers as you respond. The Researcher will then carry out a clinical examination of your mouth to see which conditions are present in different parts of the mouth. The examination will be according to methods and standards as recommended by the World Health Organization (WHO). The time set for both interview and examination of the mouth is approximately 45 minutes per participant. If the researcher finds you have a dental problem you will be referred to the hospital dental clinic for treatment. By the end of the study, we expect to have interviewed and examined the mouth of 385 participants in a period of three months.

### **Risks:**

There will be no known harm or risk to you in this study. The nature of questions to be asked will not hurt your feelings and the dental examination will not cause harm to your mouth

**Potential benefits:** This research is purely academic and there are no direct benefits to you, however we shall make you aware of diseases found in your mouth and treatment choices that are available at the hospital dental clinic. The research results will show dental problems that patients at the CCC unit suffer from, so that better planning for increased awareness, prevention and treatment can be realized.

**Confidentiality:**

A room with lockable cabinet will be set aside during the study for your privacy and security of research materials. We shall not use your names, as you will be assigned a unique identification number so that your answers are linked to you in anonymous way. Except for written answers, all others will be coded or in number form. Only the Researcher, Supervisors and authorized representatives of Pwani University Ethical Review Committee will have access to any information that can identify your answers. When we publish any results from this study, we will do so in a way that does not identify you. We may also share the data with other researchers so that they can check the accuracy of our conclusions but will only do so if we are confident that your confidentiality is protected.

**Voluntary Participation/Right to withdrawal from Study:**

Your participation in this study is completely voluntary. You are free to refuse to participate, to end participation at any time for any reason, or to refuse to answer any individual question without penalty or loss of compensation. In other words, you are free to make your own choice about being in this study or not, and may quit at any time without penalty

**PART B:**

If you agree to participate in the study, please put your signature or thumbprint below, confirming that you have read and understood the nature of the study, your responsibilities as a study participant, the inconveniences associated with voluntary participation in the study and that all your questions and concerns concerning the study have been answered satisfactorily.

You will receive a copy of this signed consent form to take away with you.

**Participant's Statement:**

I ..... do hereby give consent to participate in this study that is aimed at finding out the Oral Health Status or dental diseases/conditions that affect adult patients attending CCC at Port Reitz Hospital. I have read or have been taken through the information in this informed consent as well as having all my queries answered and I fully understand my role as a participant. I also understand that withdrawal from the study at any point is voluntary and not subject to penalty. I understand that I will be interviewed and have my mouth/teeth examined and thereafter the results of the study will be published without reference to my identity.

\_\_\_\_\_

\_\_\_\_\_

Signature of Study Participant

Date

Thumbprint of Study Participant

\_\_\_\_\_

Signature of Person Obtaining Consent Date

\_\_\_\_\_

Signature of Witness Date

# Appendix III: WHO Oral Health Assessment Form

## WHO ORAL HEALTH ASSESSMENT FORM (1997)

Country.....

Leave blank (1) <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> (4)	Year (5) <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> (8)	Month (9) <input type="text"/> <input type="text"/> (10)	Day (11) <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> (14)	Identification number (15) <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> (16)	Examiner (17) <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> (18)	Original/duplicate (19) <input type="checkbox"/> (20)
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**GENERAL INFORMATION**

Name ..... (29)

Date of birth: Year (17)     (20), Month (21)   (22)

Age in years (23)  (24)

Sex (M = 1, F = 2) (25)  (26)

Ethnic group (27)  (28)

Occupation (29)  (30)

Geographical location (26)  (27)

Location type: 1 = Urban (28)  (29), 2 = Periurban (30)  (31), 3 = Rural (31)  (32)

**OTHER DATA (specify and provide codes)** (33)  (34)

**CONTRAINDICATION TO EXAMINATION** Reason: (35)  (36) 0 = No (37)  (38), 1 = Yes (39)  (40)

**CLINICAL ASSESSMENT**

**EXTRA-ORAL EXAMINATION**

0 = Normal extra-oral appearance  
 1 = Ulceration, sores, erosions, fissures (head, neck, limbs) (41)  (42)  
 2 = Ulceration, sores, erosions, fissures (nose, cheeks, chin) (43)  (44)  
 3 = Ulceration, sores, erosions, fissures (commissures) (45)  (46)  
 4 = Ulceration, sores, erosions, fissures (vermilion border) (47)  (48)  
 5 = Cancrum oris (49)  (50)  
 6 = Abnormalities of upper and lower lips (51)  (52)  
 7 = Enlarged lymph nodes (head, neck) (53)  (54)  
 8 = Other swellings of face and jaws (55)  (56)  
 9 = Not recorded (57)  (58)

**TEMPOROMANDIBULAR JOINT ASSESSMENT**

**SYMPTOMS**

0 = No (59)  (60)  
 1 = Yes (61)  (62)  
 9 = Not recorded (63)  (64)

**SIGNS**

0 = No (65)  (66)  
 1 = Yes (67)  (68)  
 9 = Not recorded (69)  (70)

Clicking (71)  (72)  
 Tenderness (on palpation) (73)  (74)  
 Reduced jaw mobility (< 30 mm opening) (75)  (76)

**ORAL MUCOSA**

**CONDITION**

0 = No abnormal condition (77)  (78)  
 1 = Malignant tumour (oral cancer) (79)  (80)  
 2 = Leukoplakia (81)  (82)  
 3 = Lichen planus (83)  (84)  
 4 = Ulceration (aphthous, herpetic, traumatic) (85)  (86)  
 5 = Acute necrotizing gingivitis (87)  (88)  
 6 = Candidiasis (89)  (90)  
 7 = Abscess (91)  (92)  
 8 = Other condition (specify if possible) ..... (93)  (94)  
 9 = Not recorded (95)  (96)

**LOCATION**

0 = Vermilion border (97)  (98)  
 1 = Commissures (99)  (100)  
 2 = Lips (101)  (102)  
 3 = Sulci (103)  (104)  
 4 = Buccal mucosa (105)  (106)  
 5 = Floor of mouth (107)  (108)  
 6 = Tongue (109)  (110)  
 7 = Hard and/or soft palate (111)  (112)  
 8 = Alveolar ridges/gingiva (113)  (114)  
 9 = Not recorded (115)  (116)

**ENAMEL OPACITIES/HYPOPLASIA**

Permanent teeth

0 = Normal (117)  (118)  
 1 = Demarcated opacity (119)  (120)  
 2 = Diffuse opacity (121)  (122)  
 3 = Hypoplasia (123)  (124)  
 4 = Other defects (125)  (126)  
 5 = Demarcated and diffuse opacities (127)  (128)  
 6 = Demarcated opacity and hypoplasia (129)  (130)  
 7 = Diffuse opacity and hypoplasia (131)  (132)  
 8 = All three conditions (133)  (134)  
 9 = Not recorded (135)  (136)

**DENTAL FLUOROSIS**

0 = Normal (137)  (138)  
 1 = Questionable (139)  (140)  
 2 = Very mild (141)  (142)  
 3 = Mild (143)  (144)  
 4 = Moderate (145)  (146)  
 5 = Severe (147)  (148)  
 8 = Excluded (149)  (150)  
 9 = Not recorded (151)  (152)

**COMMUNITY PERIODONTAL INDEX (CPI)**

0 = Healthy (153)  (154)  
 1 = Bleeding (155)  (156)  
 2 = Calculus (157)  (158)  
 3\* = Pocket 4-5 mm (black band on probe partially visible) (159)  (160)  
 4\* = Pocket 6 mm or more (black band on probe not visible) (161)  (162)  
 X = Excluded sextant (163)  (164)  
 9 = Not recorded (165)  (166)

**LOSS OF ATTACHMENT\***

0 = 0-3 mm (167)  (168)  
 1 = 4-5 mm (cementoamel junction (CEJ) within black band) (169)  (170)  
 2 = 6-8 mm (CEJ between upper limit of black band and 8.5-mm ring) (171)  (172)  
 3 = 9-11 mm (CEJ between 8.5-mm and 11.5-mm rings) (173)  (174)  
 4 = 12 mm or more (CEJ beyond 11.5-mm ring) (175)  (176)  
 X = Excluded sextant (177)  (178)  
 9 = Not recorded (179)  (180)

\* Not recorded under 15 years of age



Identification number

**DENTITION STATUS AND TREATMENT NEED**

	18	17	16	15	14	13	12	11	21	22	23	24	25	26	27	28	
Crown (66)																	(81)
Root (82)																	(97)
Treatment (98)																	(113)

	48	47	46	45	44	43	42	41	31	32	33	34	35	36	37	38	
Crown (114)																	(129)
Root (130)																	(145)
Treatment (146)																	(161)

Primary teeth	Permanent teeth	STATUS	TREATMENT
Crown	Crown/Root		
A	0	0	0 = None
B	1	1	P = Preventive, caries-arresting care
C	2	2	F = Fissure sealant
D	3	3	1 = One surface filling
E	4	—	2 = Two or more surface fillings
—	5	—	3 = Crown for any reason
F	6	—	4 = Veneer or laminate
G	7	7	5 = Pulp care and restoration
—	8	8	6 = Extraction
T	T	—	7 = Need for other care (specify).....
—	9	9	8 = Need for other care (specify).....
			9 = Not recorded

PROSTHETIC STATUS	Upper	Lower	PROSTHETIC NEED	Upper	Lower
	(162)	(163)		(164)	(165)
0 = No prosthesis			0 = No prosthesis needed		
1 = Bridge			1 = Need for one-unit prosthesis		
2 = More than one bridge			2 = Need for multi-unit prosthesis		
3 = Partial denture			3 = Need for a combination of one- and/or multi-unit prostheses		
4 = Both bridge(s) and partial denture(s)			4 = Need for full prosthesis (replacement of all teeth)		
5 = Full removable denture			9 = Not recorded		
9 = Not recorded					

**DENTOFACIAL ANOMALIES**

**DENTITION**  
 (166)   (167) Missing incisor, canine and premolar teeth—maxillary and mandibular—enter number of teeth

**SPACE**

<input type="text"/> (168) Crowding in the incisal segments: 0 = No crowding 1 = One segment crowded 2 = Two segments crowded	<input type="text"/> (169) Spacing in the incisal segments: 0 = No spacing 1 = One segment spaced 2 = Two segments spaced	<input type="text"/> (170) Diastema in mm	<input type="text"/> (171) Largest anterior maxillary irregularity in mm
			<input type="text"/> (172) Largest anterior mandibular irregularity in mm

**OCCLUSION**

<input type="text"/> (173) Anterior maxillary overjet in mm	<input type="text"/> (174) Anterior mandibular overjet in mm	<input type="text"/> (175) Vertical anterior openbite in mm	<input type="text"/> (176) Antero-posterior molar relation: 0 = Normal 1 = Half cusp 2 = Full cusp
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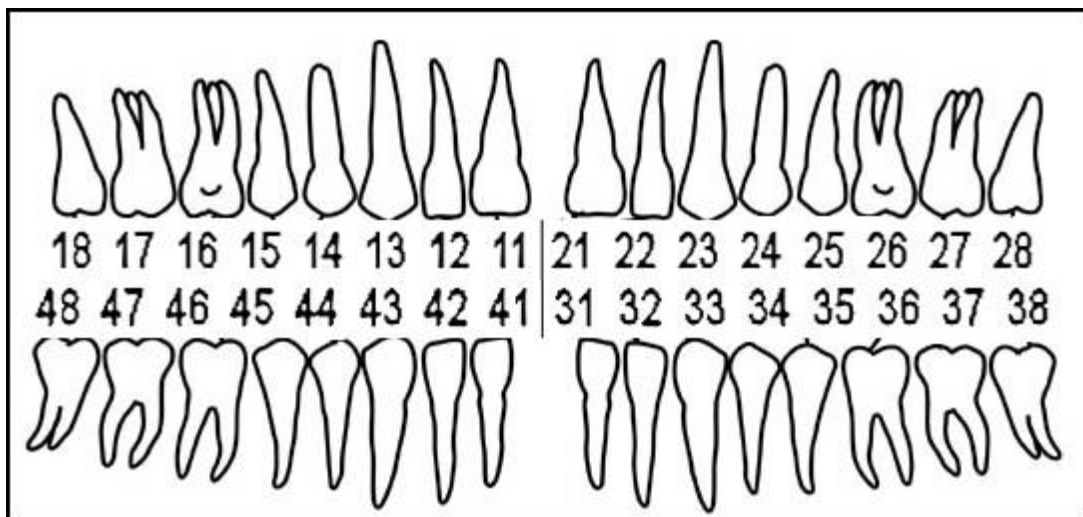
  

NEED FOR IMMEDIATE CARE AND REFERRAL		Referral
Life-threatening condition <input type="text"/> (177)	0 = Absent 1 = Present 9 = Not recorded	<input type="text"/> (180)
Pain or infection <input type="text"/> (178)		0 = No 1 = Yes 9 = Not recorded
Other condition (specify)..... <input type="text"/> (179)		

**NOTES**

## Appendix IV: Tooth Numbering System

A two-digit system proposed by Fédération Dentaire Internationale (FDI) for permanent dentitions, adopted by the World Health Organization and accepted by other organizations such as the International Association for Dental Research. The FDI system of tooth notation is as follows:



In the two-digit FDI system for the permanent dentition, the first digit indicates the quadrant: 1 to 4 for the permanent dentition. The second digit indicates the tooth within a quadrant: 1 to 8 for the permanent teeth (Stanley & Ash, 2010).

### KEY

11 - Upper right central incisor

21 - Upper left central incisor

12 - Upper right lateral incisor

22 - Upper left lateral incisor

13 - Upper right canine

23 - Upper left canine

14 - Upper right first premolar

24 - Upper left first premolar

15 - Upper right second premolar

25 - Upper left second premolar

16 - Upper right first molar

26 - Upper left first molar

17 - Upper right second molar

27 - Upper left second molar

18 - Upper right third molar

28 - Upper left third molar

### **Lower teeth**

41 – Lower right central incisor

31 – lower left central incisor

42 – Lower right lateral incisor

32 – lower left lateral incisor

43 – Lower right canine

33 – lower left canine

44 – Lower right first premolar

34 – lower left first premolar

45 – Lower right second premolar

35 – lower left second premolar

46 – Lower right first molar

36 – lower left first molar

47 – Lower right second molar

37 – lower left second molar

48 – Lower right third molar

38 – lower left third molar

## Appendix V: Certificate of Ethical Approval

NACOSTI ACCREDITED



ERC/MSc/043/2014

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### ETHICS REVIEW COMMITTEE

ACCREDITED BY THE NATIONAL COMMISSION FOR SCIENCE, TECHNOLOGY  
AND INNOVATION (NACOSTI, KENYA)

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# CERTIFICATE OF ETHICAL APPROVAL

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THIS IS TO CERTIFY THAT THE PROPOSAL SUBMITTED BY:

**MARY ADHIAMBO OCHOLA**

---

REFERENCE NO:  
**ERC/MSc/043/2014**

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ENTITLED:  
**Oral health status and Human Immunodeficiency Virus positive patients  
attending Port Reitz Hospital**

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TO BE UNDERTAKEN AT:  
**MOMBASA COUNTY, KENYA**

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FOR THE PROPOSED PERIOD OF RESEARCH  
HAS BEEN **APPROVED** BY THE ETHICS REVIEW COMMITTEE  
AT ITS SITTING HELD AT PWANI UNIVERSITY, KENYA  
ON THE 9<sup>th</sup> DAY OF MARCH 2015

CHAIRMAN

SECRETARY

LAY MEMBER

Three handwritten signatures in blue ink, corresponding to the Chairman, Secretary, and Lay Member positions listed above.

PTO



Pwani University, [www.pw.ac.ke](http://www.pw.ac.ke), email: [r.thomas@pwaniuniversity.ac.ke](mailto:r.thomas@pwaniuniversity.ac.ke), tel: 0719 182218.  
The ERC, Giving Integrity to Research for Sustainable Development

**Appendix VI: Map of Changamwe Sub-County**

