IMPACT OF HEALTH EDUCATION ON ORAL HEALTH-RELATED QUALITY OF LIFE OF PEOPLE LIVING WITH HIV/AIDS IN NAIROBI.

Ph.D. Thesis

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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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DEDICATION

This work is dedicated to my husband Dr Peter Bundi Gichangi, my son John Gichangi and my daughter Caroline Nyawira

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ABBREVIATIONS

AC	Angular Chelitis
AIDS	Acquired Immunodeficiency Syndrome
APHIA II	The AIDS, Population and Health Integrated Assistance
ART	Antiretroviral therapy
ARV	Antiretroviral
CCC	Comprehensive Care Centre
CD4 count	Cluster Differentiation 4 count
CD8 count	Cluster Differentiation 8 count
CDC	Centres for Control of Diseases
DMFT	Decayed Missing Filled Teeth
DNA	Deoxyribonucleic Acid
EC	Erythematous Candidiasis
GDP	Gross Development Production
GI	Gingival Index
HAART	Highly Active Anti-Retroviral Therapy
HHV-8	Human Herpes Virus-8
HIV	Human Immunodeficiency Virus
HPV	Human Papilloma Virus
HSV	Herpes Simplex Virus
KEMRI	Kenya Medical Research Institute

KNH	Kenyatta National Hospital
KS	Kaposi's sarcoma
KSHV	Kaposi's Sarcoma-Associated Herpes Virus
MDH	Mbagathi District Hospital
MHP	Melanotic Hyperpigmentation
MoH	Ministry of Health
MoPND	Ministry of Planning and National Development
MSM	Men who have sex with men
NASCOP	National AIDS Control Programme
NCC	National AIDS Council
NCHS	National Centre for Health Statistics
NHANES	National Health and Nutritional Examination Survey
NOHP and SP	National Oral Health Policy and Strategic Plan
NUG	Necrotising Ulcerative Gingivitis
NUP	Necrotising Ulcerative Periodontitis
OHIP-14	Oral Health Impact Profile-14
OHRQoL	Oral Health-related Quality of Life
OHL	Oral Hairy Leukoplakia
PMC	Pseudo-membranous candidiasis
PLWHA	Persons Living With HIV/AIDS

RAU	Recurrent Aphthous Ulcerations
RNA	Ribonucleic Acid
SAPs	Structural Adjustment Programmes
SoSs	Shortage of Supplies
SPSS	Statistical Package for Social Sciences
UNICEF	United Nations Children Fund
UNSAID	United Nations Aid for International Development
USA	United States of America
VCT	Voluntary Counselling and Testing
WHO	World Health Organisation

Definition of terms

COMPREHENSIVE CARE CENTRE (CCC)	A private, not-for-profit outpatient medical facility dedicated to advancing and coordinating care, research and treatment of people living with HIV infection
ORAL HEALTH-RELATED QUALITY OF LIFE	A multidimensional construct that reflects (among other things) peoples discomfort when eating, sleeping and engaging in social interactions; self-esteem and their satisfaction with respect to their oral health
ORAL HYGIENE	The practice of keeping the mouth clean and healthy by brushing and flossing to prevent tooth decay and periodontal disease.
ORAL HEALTH	Absence of disease and the optimal functioning of the mouth and its tissues in a manner that preserves the highest level of self-esteem
DENTAL CARIES EXPERIENCE	Number of untreated decayed teeth (D), Missing (M) teeth extracted due to caries and Filled (F) restored teeth due to caries.
INTENTION TO TREAT ANALYSIS	Analysis based on outcomes that occurred during the whole follow-up period, in the subjects originally allocated to each group, whether they complied with the allocated intervention or not.

ABSTRACT

Background

Oral diseases and conditions affect every race worldwide. 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) seronegative persons. 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 seronegative individuals. Studies have found to a large extent, that oral diseases can be effectively prevented by oral health education among the general population. However, the impact of oral health education on oral diseases and conditions among PLWHA is unknown in Kenya.

Objective

To determine the impact of oral health education on the oral health status and Oral Health-Related quality (OHRQoL) of life among PLWHA.

Study Design: This was a quasi-experimental study

Study sites: The study was conducted at the Kenyatta National Hospital (KNH) (intervention group) and Mbagathi District Hospital (MDH) (non-intervention group) Comprehensive Care Centers (CCC).

Study population: The study population was composed of PLWHA seeking services at KNH and MDH CCCs.

Data collection: A total of 252 HIV infected persons, 141 from KNH (intervention group) and 111 from MDH (non-intervention group) were recruited into the study. At baseline, oral health knowledge, oral health seeking behaviour, dietary habits and oral health-related quality of life of the participants were assessed. Oral examination was done to determine the oral hygiene status and oral health status. After baseline data collection, the intervention group was given oral health education on one-to-one basis. This included knowledge on the causes and prevention of oral diseases and oral hygiene instructions. A dental model and a brush were used to demonstrate the brushing technique. A re-assessment was done at three (review 1) and six months (review 2) for all the baseline variables

Data on oral health knowledge, sugary intake, oral health seeking behaviour and oral hygiene practices were collected using an interviewer administered semi-structured questionnaire. Oral Health Impact Profile (OHIP-14) questionnaire was used to assess the oral Health-related Quality of Life (OHRQoL). The oral hygiene status and oral health status were recorded using a WHO clinical assessment form. The Ramfjords periodontal disease index plaque component 1961, Green and Vermillion calculus index, Loe and Silness gingival index 1963, DMFT indices, prosthetic status and the modified WHO adult screening of oral mucosa capture sheet for assessing oral lesions in the PLWHA were used to assess the oral health status.

Results

Out of 252 participants recruited, only the 195 who completed the study (102 from KNH and 93 from MDH) were included in the analysis. Of these, 129(66.2%) were female and 66(33.8%) were males. 38.8% of KNH and 30.0% of MDH participants had a CD4 cell count of less than 200 cell count. There was a significant decrease in the proportion of participants with a CD4 count of less than 200 cell count during the study period.

Knowledge on description, causes and prevention of dental caries and periodontal disease increased significantly for KNH participants ($p<0.05$) but not for MDH participants ($p>0.005$).The proportion of participants who brushed their teeth at least twice a day increased significantly from 50.0% to 86.3% for KNH participants ($p=0.00$) between baseline and review 2. There was no significant change in proportion of MDH participants who brushed their teeth at least twice a day during the study period.

The proportion of KNH participants who were taking sugary foods decreased significantly from 51.5% to 15% ($p=0.00$), while those taking sugary drinks decreased from 48.9% to 17.2% ($p=0.00$) between baseline and review 2. The change in sugary intake did not change significantly for participants from MDH ($p>0.05$) during the same period.

Approximately two thirds 67.5% of the participants said they had ever visited a dental clinic. Only 6.9% of the participants reported regular visits to a dental

clinic. The main reason for not vising a dental clinic among participants who had never visited a dental clinic was their HIV status.

The mean plaque score decreased significantly for the intervention group from 0.89 to 0.15 between the baseline and review 2 (t=7.51, p= 0.00), while the mean gingival score decreased from 0.66 at baseline to 0.11 at 6 months (t=7.82, p=0.00). There was no significant change in plaque scores for MDH participants. Regression model showed that reduction in plaque scores explained 76% of the reduction in the gingival score (r^2= 0.76, p=0.00). The DMT(T) for KNH was 1.97 and 1.81 for MDH participants at baseline There was the significant decrease in untreated dental caries during the study period.

At baseline, the major oral attribute was pain. After oral health education, the overall effect size was moderate (0.28) with a large effect size of 0.96 recorded in physical pain subscale while a moderate effect size (0.35) was recorded in social disability and (0.27) in the physical disability subscale for KNH participants at the end of the study. No effect size was recorded among participants from MDH. Odhams correlation demonstrated that psychological discomfort, psychological disability and functional limitations were significantly associated with change in the gingival scores.

Discussion

Knowledge on dental caries and periodontal diseases improved significantly after health education for the intervention group which led to a significant increase in the proportion of participants who brushed their teeth at least twice a day. This

showed that oral health education was a viable strategy in improving oral health knowledge and modifying brushing habits.

The decrease in plaque scores resulted in a decrease in gingival scores. This could be because plaque is the primary causative agent in gingival inflammation. However, only 76% of the reduction in gingival scores was explained by the reduction in plaque score showing that other factors may have been associated with the occurrence of gingival inflammation. There was no significant change observed in the dental caries unmet needs of the participants after intervention. This could have been related to the fact that the intervention period was relatively short (six months) and that only two participants visited a dental clinic during the study. There was improvement in OHRQoL of PLWHA at KNH mainly related to the physical pain sub-scale. The data demonstrated that this improvement was attributable to improved oral health knowledge and oral health status after intervention.

Conclusion

Oral health education is a worthwhile strategy in improving oral health knowledge, oral hygiene practices, reduction of sugary intake and gingival inflammation. These improvements have a positive impact on the OHRQoL of life of PLWHA.

Recommendation

Oral health education should be integrated in the health services delivered to PLWHA in the CCCs and at other programmes such as the HIV counseling and testing (VCT) centers.

CHAPTER 1

INTRODUCTION

This thesis consists of a study on the impact of oral health education on Oral Health-related Quality of Life (OHRQoL) among Persons Living with HIV/AIDS (PLWHA). This chapter describes the background on overview of oral disease, health services in Kenya, HIV/AIDS in Kenya and burden of oral diseases in Kenya

1.1 OVERVIEW OF ORAL DISEASES.

Oral diseases and conditions affect every race worldwide. Their prevalence has been found to vary from region to region[1]. Although the two major oral diseases (periodontal diseases and dental caries) are preventable, the National Oral Health Policy and Strategic plan of 2002-2012 (NOHP and SP 2002-2012)[2] recognizes that the prevalence of these diseases is still relatively high in Kenya. The severity and prevalence of these oral diseases have been reported to be higher among people infected with the Human Immuno-deficiency Virus (HIV), the virus that causes the Acquired Immuno-deficiency Syndrome (AIDS) than HIV sero-negative individuals [3]. Data from African studies show that the prevalence of oral diseases ranges from 15% to more than 90% among Persons Living with HIV/AIDS (PLWHA)[4, 5]. Some studies have reported cases of HIV gingivitis (HIV-G) and HIV-periodontitis (HIV-P) [6,7,8]. There is also reported association between dental caries with increasing severity of immunodeficiency [9].

PLWHA tend to suffer from oral diseases which are either very rare or do not normally occur in the oral cavity among HIV negative persons. Apart from the two major oral

diseases fore-mentioned, studies have found that up to 55% of the AIDS and AIDS-related complex patients suffer from other forms of oral lesions. These include oral candidiasis (55%), oral leukoplakia (21%), atypical (HIV) periodontal disease (14%)[10], oral Kaposi's sarcoma (KS) and Non-hodgkin's lymphoma[11]. Other lesions less strongly associated with HIV infection include melanotic hyper-pigmentation (MHP), mycobacterial infections, necrotizing ulcerative stomatitis, miscellaneous oral ulcerations and viral infections (Herpes-Simplex virus, Herpes-zoster, Condyloma acuminatum) [12]. Lesions seen in HIV-infected individuals of undetermined frequency include less common viral infection such as cytomegalovirus, molluscum contagiosum, recurrent aphthous stomatitis and the newly described angiomatous disorder, bacillary angiomatosis or epithelioid angiomatosis[13].

With an estimated 33.4 million people world-wide living with HIV, and of these, about 22.4 million living in the sub-Saharan Africa[14], we are likely to witness a change in the pattern of oral diseases and conditions with higher prevalence and severer forms of oral diseases. This is likely to increase the suffering of HIV positive individuals especially due to the fact that oral health services are not accessible to the majority of the population due to lack of appropriate technology, inadequate manpower and high cost of treatment[2]. Access to oral health care for PLWHA is also limited by the attitude and practice of dentists who are reluctant or unwilling to treat HIV infected persons[15]. Some believe that they would be stigmatised if they treated HIV patients[16]. In a study done in Nairobi, dentists preferred that these patients be treated in dedicated clinics or teaching hospitals [17]. Other factors that limit access to oral health care for this group include pressing needs for physical and mental health[18].

Untreated oral lesions have a negative impact on the overall health of the infected persons. In a study from Australia among HIV positive persons, 64.6% were suffering from toothache, 43.7% avoided foods and 16.7% avoided going out because of dental problems. Due to the bigger burden of oral lesions in PLWHA[19], there is need to focus on strategies which are likely to reduce this burden and alleviate their suffering. This should include oral health education and early treatment of the diseases.

Studies have shown that the knowledge of oral health among Kenyans is poor. In one study, only 12.4% of the urban population and 9.2% of the peri-urban population knew that dental caries is preventable [20]. Poor knowledge of oral diseases is likely to lead to poor oral hygiene status. Poor oral hygiene has been identified as a risk factor for poor dental health among PLWHA[21].

Although cross-sectional studies have reported a relationship between oral hygiene and dental health there is hardly any well-documented longitudinal studies on the relationship between oral hygiene and oral health among PLWHA after oral health education. Oral health education has been found to reduce the burden of oral lesions among HIV seronegative patients in other parts of the world[22]. However, the impact of oral health education among PLWHA is not well documented in the literature and no study has so far been done in Kenya.

This study was undertaken to determine the impact of oral health education on the knowledge, oral hygiene practices, intake of sugary diet, oral health seeking behavior, oral health status and quality of life of PLWHA. The data would hopefully aid in shaping policy regarding oral health care provision for PLWHA.

1.2 HEALTH SERVICES IN KENYA

Following the promulgation of the new constitution, Kenya has a federal government. At independence, the government promised to provide free health care and education to Kenyans. The health sector has continued to grow. Currently it is estimated that there are over 6194 health facilities 51% being ministry of health facilities while 49% are faith based organization and private facilities[23]. Despite the steady growth in the health sector, universal quality healthcare is not available to majority of the population. This is due to factors such as the high population growth rate, introduction of Structural Adjustment Programs (SAPs) and burden of disease such as the HIV/AIDS and other re-emerging diseases[24]. As a coping mechanism, the government introduced facility improvement fund (cost sharing) in 1989. This was meant to transform the patterns of government investments in the health sector from capital intensive projects for construction of new curative care facilities to cost effective investment promotive and preventive health care program[25].

The Kenyan health sector is characterized by Shortage of Supplies (SOSs): shortage of staff, space and supplies[26]. Although the government actual expenditure increased from 16 billion(2003/2004) to 32 billion (2007/2008), public expenditure tracking survey reveal that only 44% of resources earmarked for lower level health facilities actually reach these units. At the same time, 50% of the dispensaries have inadequate staff. Due to these challenges, there is uneven distribution of health services. Reports show that only 52% of Kenyans live within 5 kilometers of the health facilities which is the WHO recommended maximum distance[23].

The ministry of health has continued to receive an increase in budgetary allocation from the exchequer. However, even with the increase in the budgetary allocation, the oral health sector receives about 0.0016% of the ministry of health budget. This has led to understaffing and under-equipping of the oral health sector, thus making it impossible to provide adequate oral healthcare services. With the continued population growth, the introduction of user fees and diminishing capacity for the current health sector to provide services, the gap between demand and supply has continued to widen[26].

Kenya's oral health care delivery system has so far been borrowed from the Western model which emphasizes curative rather than preventive care. Little attention has been paid to the local environment within which the service is provided. The current demand for curative services by far outstrips the facilities available including human resources. The current Dental practitioners: Population ratio stands at 1:60,000. This is far below the recommended WHO ratio of 1:7000. This scenario is further exacerbated by a poor economy, high cost of oral health care, which has been compounded by the introduction of cost sharing in hospitals and the unwillingness of the insurance firms to insure oral health care[2].

1.3 HIV/AIDS IN KENYA

In Kenya, the first AIDS case was recognised in 1984. In 1985 the National AIDS Committee (NCC) was established by the Ministry of Health to advise the ministry on all matters pertaining to AIDS control[27]. However, despite all the efforts made, the epidemic continues unabated. Since 1990, HIV prevalence in the general population has been rising steadily to 7.4% in 2007 among Kenyans aged 15-64 years. The

prevalence is higher in females than males, with women being four times more likely to be infected than men (6.1% compared to 1.5%). Marital status can be a risk factor with men in union having a high prevalence (7.4%) than those who have never been in a union (2.8%)[28].

Currently, approximately 1.3-1.6 million Kenyans are HIV positive with a prevalence of 6.3%[28]. The large increase in the number of HIV infected persons presents a major challenge to the health services. These include shortage of drugs, inadequate diagnostic capabilities, overcrowding in health facilities, a high turn-over of qualified personnel and increase in cases of tuberculosis including the multi-resistant tuberculosis (MDR-TB). Drugs for managing opportunistic infections including MDR-TB are very expensive making them inaccessible to the majority of the PLWHA. Capacity building for preventive and control measures has been identified as an institutional framework to be pursued in the area of HIV/AIDS. This could go a long way in alleviating the suffering of PLWHA[25].

1.4 BURDEN OF ORAL DISEASES IN KENYA

The precise burden of oral diseases in Kenya is unknown partly because there has never been a national oral health survey. Since there is no precise knowledge on the distribution, pattern and magnitude of oral diseases, training of appropriate oral health personnel and its subsequent distribution are difficult to implement satisfactorily. Relatively few epidemiological studies on oral disease in Kenya have been carried out in the last few decades [29,30,31,32]. These will form the basis of a summary of the status of oral diseases in Kenya.

Oral diseases are characterized by a change in the pattern, lifestyle and evidence-based linkages between oral and chronic systematic diseases[29]. The two main oral diseases in Kenya are dental caries and periodontal diseases. The prevalence of gingivitis varies between 0.2-90%[30] and chronic periodontitis between 1-10%[31]. The prevalence of periodontitis have been shown to increase with age, with 95% of adults above 50 years old having severe periodontal disease. The lowest socio-economic level groups have the more severe form of the disease[2].

Although a DMF(T) of 5.8 has been recorded among the rural population[32], most carious lesions are untreated or are eventually managed by tooth extraction. In the absence of follow-up reports, no definitive conclusions can be made regarding patterns of change in the prevalence of caries over the years, or changes due to preventive or curative dental services. The position as to whether the prevalence of dental caries in Kenya is increasing or decreasing cannot be stated categorically on the basis of the scientific evidence available to-date[31]. However, there is an indication that more edentulousness of people above 50 years old is mainly caused by dental caries in Kenya[2].

More reliable indications regarding the trend in caries experience would perhaps come from studies in which the same population groups or study areas have been examined on two or more separate occasions using similar diagnostic criteria. Moreover, analytical epidemiological studies as opposed to descriptive studies are necessary in order to determine the relative roles that the causative factors play under Kenyan conditions.

1.5 STRUCTURE OF THE STUDY

In the next Chapter the literature review is described. This gives way to the chapter on statement of the problem and justification. Chapter four describes materials and methods which is followed by a chapter 5 on results and chapter 6 on discussion. Lastly, chapter 7 looks at the study conclusion and recommendations.

CHAPTER 2

LITETATURE REVIEW

This Chapter looks at an overview of HIV infection oral health status as well as oral mucosal lesions among Kenyans. Other areas covered are Highly Active Anti-retroviral Therapy (HAART) and oral health, dental care and HIV infection, oral health education, oral health seeking behaviour, oral health quality of life and evidence based approach to oral health. Finally, a conceptual framework for determinants of oral diseases is given.

2.1 OVERVIEW OF HIV INFECTION AND ORAL HEALTH STATUS

Acquired immuno-deficiency syndrome (AIDS) is characterized by profound impairment of the human immune system. HIV has a strong affinity for cells of the immune system specifically those that carry the CD4 cell surface receptor molecule. Thus, the T-helper cells are most profoundly affected. Macrocytes, macrophages, langerhans cells, some neuronal and glial cells may also be involved. The overall effect of the virus is to gradually impair the immune system by interference with T-helper lymphocytes and other immune cell functions. B-lymphocytes are not affected, however, the altered functions of the T-lymphocytes result secondarily in B-cell dysregulation, which places HIV positive individual at a higher risk for malignancy and disseminated infections. At the same time, HIV positive individuals may be thrombocytopenic (platelet counts below 50 000 mm^3), due to the autoimmune disease resulting from type II immunopathologic reactions. Petechiae and ecchymoses have been reported to be indicative of a clotting disorder in the oral cavity[33].

Oral manifestations of HIV infection are a fundamental component of disease progression and occur in approximately 30%-80% of the affected patients[34,35,36]. Factors which predispose to oral lesions include viral load greater than 3000 copies/ml, xerostomia, poor oral hygiene and smoking [37,38]. The association between CD4 counts and inflammation still remains contradictory, with some studies reporting that a CD4 count of less than 200 cells/mm^3 is a predisposing factor to the development of oral lesions[37,38] , while others have found the severity of gingival inflammation to be less in the severely immunocompromised HIV positive patients[39]. Some studies have reported that there is no association between CD4 cell count and oral diseases[40].

Studies have reported poor oral hygiene status among PLWHA while others have reported it to be good. in a Zaire study reported that 69% of the PLWHA had poor oral hygiene[7]. Marcenes et al.[41] reported that the oral hygiene was good among this group of people.

It has been reported that HIV positive patients tend to be affected by dental caries and periodontal diseases than HIV negative persons [7,42]. In a study done among HIV positive drug users, the DMF(T), plaque score and gingival bleeding were reported to be higher among HIV positive than their HIV negative persons[43]. However, the studies did not compare whether there was a relationship between change in plaque score and oral health status of the participants. There is contrasting findings on the prevalence of periodontal disease in HIV infected persons. In a Kenyan study, 100% of the individuals examined had periodontal disease[5]. In contrast, periodontal disease was absent in two Tanzanian study[45] while the prevalence was 24% in an Indian study[46] and 7% in a Thai study [47].

Xerostomia or dry mouth is a common complaint among people living with the HIV disease. Approximately 29% of those participating in the HIV Cost and Utilization study cohort reported symptoms of xerostomia. Factors which proved to have been significant in the presentation of xerostomia included the previously referenced salivary gland disease, proliferation of CD8+ cells in the major salivary glands, use of medications such as didanosine to manage HIV infection and other conditions, smoking, and a viral load of > 100,000/mm^3 [48]. This change in the quantity and quality of saliva including diminished antimicrobial properties, lead to advancing tooth decay and periodontal disease. The use of methamphetamine is associated with 'meth' mouth. The primary factor being xerostomia with contributions from bruxism, poor diet, craving for sugar and the corrosive constituents of crystal methamphetamine such as lithium, muriatic and sulphuric acid and lye [49].

Kaposi's sarcoma (KS) is still the most frequent oral malignancy seen in association with HIV infection[38]. In African studies the highest prevalence value of 72% was recorded in Zimbabwe[50] whereas it was absent in South Africa [34]. For homosexual men with AIDS, the incidence of all presentations of KS is highest in the 30-39 age group with 5 cases/100 person-years[51]. Half (50%) of AIDS patients display KS as the first sign of HIV infection. Incidence and severity of oral and generalized lesions may increase as CD4+ cells are depleted. The mean survival rate after the onset of KS is 7-31 months. Kaposi's sarcoma-associated herpes virus (KSHV) has been implicated as a co-factor in the presentation of KS in persons living with the HIV disease[52].

The various forms of oral candidiasis are generally the most common oral lesions in PLWHA. In African studies, the prevalence ranged from 15%[44] to more than 80%[5] in HIV positive adults. The average prevalence in two Indian studies was 70%[46,53] and 66% in a Thai study[54]. Oral candidiasis was reported to have been higher in individuals who had AIDS[45,46,55]. Several studies have found that the pseudomembranous variant was associated with severe immunosuppression[40,44,53,55]. Whereas there has been a decline in the prevalence of pseudomembranous candidiasis (PC) in the HAART era, this is still one of the most common oral manifestations seen in the HIV disease[56].

Studies in Africa have reported oral hairy leukoplakia (OHL) prevalences ranging from 0% amongst Tanzanians[44] to 20% in Cape Town[34]. Studies have also shown a significant decrease in the incidence of OHL in the HAART era [36, 38]. This condition is normally asymptomatic and does not require therapy unless there are cosmetic concerns. Patients who present with this condition while on HAART may be experiencing a failure in their present antiretroviral regimen[38].

Recurrent aphthous ulcerations (RAU) are a common occurrence among PLWHA, with approximately 17% of the U.S. population reporting an episode within a twelve-month period of time [57]. In developing countries, co-infection with tuberculosis is high, particularly in Southern Africa. However, oral tuberculous lesions do not occur commonly and may have varying presentations[58], such as ulcerations related to tuberculosis[53,59].

2.2 ORAL MUCOSAL LESIONS IN KENYA

The prevalence of oral diseases and conditions in the general population in Kenya is not well documented. Currently, there is no national data from a National Oral Health Survey. However a few studies have been conducted on oral mucosal lesions in Kenya[4,5,60,61]. In a household survey involving 803 participants, leukoedema was the most frequent oral lesion (26%) while snuff dippers lesion was the least frequent (0.4%) (Table 2.1)[60]. A study on HIV seropositive patients found that over 73% had oral mucosal lesions[5]. However the study involved 61 hospitalised patients who were recruited on the basis of suspicion of immunosuppression. The reliability of the data is therefore questionable since some of the patients recruited may have been HIV negative.

Table 2.1: Prevalence of oral mucosal lesions in a Kenyan population (N=803)[60]

Lesion	Prevalence (%)
Leukoedema	26.0
Melanosis	12.7
Leukoplakia	10.6
Palatal Keratosis	6.4
Frictional Keratosis	5.5
Pre-leukoplakia	4.1
Borderline Leukoplakia	2.4
Cheek/Lip biting	1.3
Snuff dippers lesion	0.4

2.3 HIGHLY ACTIVE ANTIRETROVIRAL THERAPY (HAART) AND ORAL HEALTH

Highly Active Antiretroviral Therapy (HAART) has been reported to preserve the immune function and control AIDS-related symptoms in most HIV-infected people, probably decreasing the medical threat posed by oral infections[62]. In a randomized

clinical trial to access the impact of dental care in Portland, USA involving 376 HIV-infected patients aged 19 to 61, with CD4 counts between 100 and 750, both groups received dental and medical professional treatment and checkups for six months. In addition, the cases received HAART. There was improvement in active decay, gingivitis and oral pain among participants in both groups. However, the decrease in the mean depth of periodontal pockets and gingival inflammation was more in the cases than controls. The "standard care" group exhibited a greater trend towards improvement in sleeping, while the "enhanced care" group reported better overall functioning [62]. This study however, involved the use of treatment modalities which are inaccessible in developing countries due to cost and inadequate manpower. This makes it a difficulty strategy to adopt in the Kenyan set-up.

The use of HAART alone without other strategies has been found to reduce Human Herpesvirus-8 (HHV-8), the virus associated with KS. In a study done in Seattle USA, among HIV infected men who have sex with men (MSM), it was found that HHV-8 DNA was recovered more frequently from the oropharynx of men not receiving HAART (odds ratio 2.4)[63]. Studies have shown a significant decrease in the incidence of Oral Hairly Leukoplakia (OHL) in the HAART era [36,38]. However, oral warts have been reported to increase dramatically in the HAART era[64,65]. One study noted the risk of oral warts was associated with a $\geq$ one-$\log_{10}$ decrease in HIV RNA in the 6 months prior to oral HPV diagnosis. There has also been a reported increase in the presentation of salivary gland disease in the HAART era, which may be related to a reconstitution syndrome[36,64]. This suggests a need to explore other strategies, which may decrease the prevalence of all oral conditions.

Although HAART and other anti-HIV drugs have been found to help reduce HIV related morbidity and mortality in recent years, oral manifestations of HIV are still common and they can affect patients' quality of life[66]. Furthermore, PLWHA do not always fully comply in taking medication due to serious side effects. This makes it difficult to maintain low viral loads, which is related to the reduction in oral lesions[67]. HAART is not readily accessible to patients in developing countries. Therefore, there is need to explore other methods which may be cost-effective and which may ameliorate the morbidity associated with oral lesions among PLWHA. These methods should aim at reducing pain, loss of function and other symptoms for an overall improvement of quality of life[62].

2.4 DENTAL CARE AND HIV INFECTION

In the few studies available in the literature, oral health intervention programs have been found to have a positive impact on the oral health of PLWHA. In a study among HIV positive participants in tooth brushing instructions, topical fluoride application, patient motivation, treatment of oral pathologies, anamnesis and diet counseling strategies were used. The GI score decreased from 1.6 to 1.4 within 4 months[68]. It is noteworthy that this intervention included a multi-dimensional approach, which might not be available or sustainable in areas with constrained access to health care due to cost, inadequate manpower and poor infrastructure. The actual impact of patient education, motivation and oral hygiene instruction on oral health status, which may probably be a more feasible approach in resource-handicapped areas, needs to be assessed independently.

2.5 ORAL HEALTH EDUCATION

Oral health is defined as the "absence of disease and the optimal functioning of the mouth and its tissues, in a manner that preserves the highest level of self-esteem" (WHO, AFR/RC49/10) [69]. On the other hand, health education is defined as a process with intellectual, psychological or social dimensions relating to activities which increase the ability to make well informed decisions affecting the individual, family and community well being. It is a learning process designed to facilitate voluntary adaptation of behaviour, which will improve or maintain health. Although knowledge will ultimately help people change their behaviour, the relationship between the two is not simple. The chain of events leading from knowledge to behaviour change involves a number of steps (WHO 1989)[70].

Oral health is related to the well-being and quality of life as measured along functional, psychosocial and economic dimensions[66]. Although knowledge levels of oral health can be improved by oral health education initiatives, which in turn may lead to improved oral hygiene practices, good oral health practices are poor among dental patients[71]. A study done in China to assess the relationship between knowledge and behaviour following a community based oral health programme found that the improved knowledge led to positive change in tooth brushing among children aged 10-19 years[72]. It has been shown that dental caries and periodontal disease can be controlled by simple changes in patients' daily oral hygiene habits. In a study conducted among children aged 5-15 years to determine the effect of oral health education on plaque and gingival scores, there was 51% reduction in the GI index and 29% reduction in plaque after 4 weeks[73].

Studies have reported a decrease in the mean plaque scores after oral health education[74,75,76]. Slomkowska et al.[75] reported that the mean plaque reduced from 0.688 to 0.313 after three months while Fernandes et al.[76] reported an increase in plaque free surfaces from 2.3% to 36.2% for the experimental group and from 10.8 to 15.1% for the control group. In the same study, the GI score decreased from 28.1 to 10.0 for the experimental group and 29.9 to 24.4 for the controls.

From the aforegoing, oral health education initiatives appear to be viable intervention strategies in improving oral health knowledge and oral hygiene. However, most of the evaluations have been among school going children and have involved several intervention strategies. This makes it difficult to generalize the findings of these studies especially to include PLWHA. Efforts in the field with patients and public health education are not supported by research due to failure to include evaluation of these activities; enthusiasm often takes precedence over scientific assessment[77]. This has led to very few definite conclusions on the effectiveness of regular tooth-brushing on oral health. Even where evaluation has been done, a cost-effective method for reliably promoting such behaviour change has not yet been established[78]. There is need to evaluate the viability of this strategy to assess its effectiveness in the Kenyan set-up, where many people are unaware of the lifestyles and habits which predispose them to oral diseases[2].

2.6 ORAL HEALTH SEEKING BEHAVIOUR

Oral health care screening, regular dental check-ups and dental advice may prevent the occurrence of oral diseases and conditions. It also makes it possible to deal with a

problem in its earlier stages before it becomes painful or debilitating[79]. However, in sub-Saharan Africa, availability and accessibility of oral health care services are seriously constrained and the provision of essential care limited. Studies have reported low utilization of dental services and dental visits among the general population in this region. Most of the visits are due to symptoms such as pain, fever and abscesses. In a survey conducted in Tanzania[80] and Burkina Faso[81], 57% and 37% of the adults respectively were found to have ever consulted a dentist. In another study done in Abidjan, Ivory Coast[82], only 11.4% of the urban dwellers had visited a dentist while in Nigeria[83], 9% of the households had used dental services during the past one year. In Abidjan, only 27.7% of the patients with symptoms used health services while 47.7% reported self medication, 24.1% sought no treatment, and 1.3% of the patients saw a traditional healer[82].

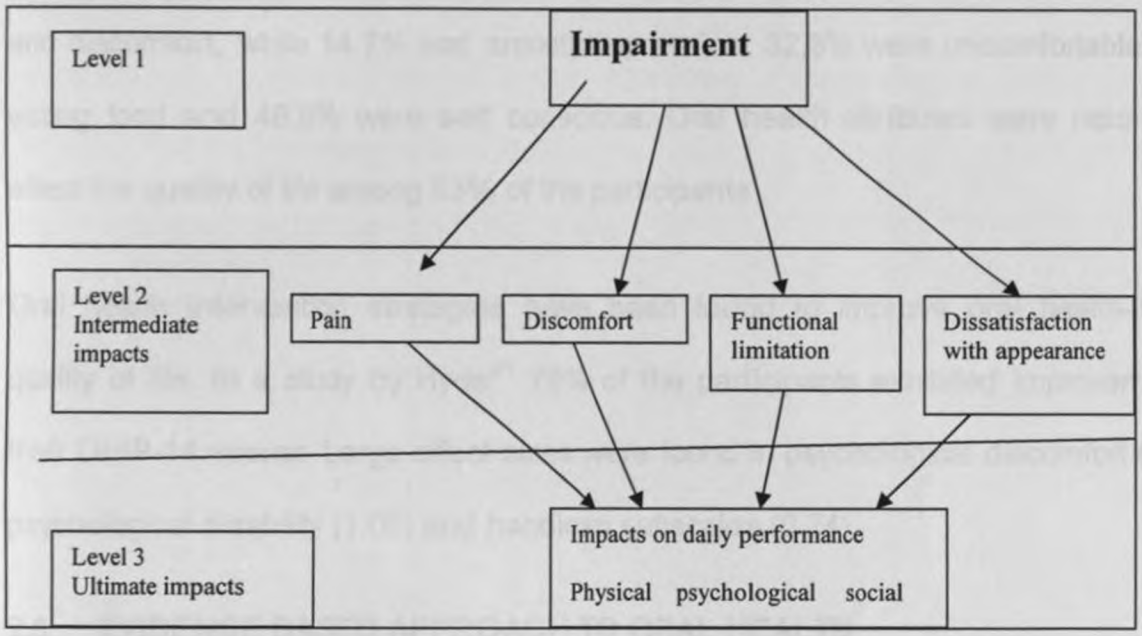
Studies have found that the proportion of persons seeking oral health among PLWHA is lower than HIV negative persons and decreases even further after diagnosis with HIV infection, despite the higher prevalence of oral diseases among this group of people. In a study by Shiboski[84] 43% of HIV positive persons had not visited a dentist within one year. Among those who had not visited a dental clinic, 78% wanted care but failed to get treatment. Despite high levels of dental attendance among 47 men with asymptomatic disease before diagnosis of HIV infection, 60% of the patients had not visited a dentist since the diagnosis, 15 of the 19 who had attended and disclosed their status had been declined treatment or deterred by the members of the dental team while 5 had attended without disclosing their HIV status[85]. This underutilization of oral health services is likely to lead to suffering among this group of people.

Treatment of the oral diseases seen in association with the HIV disease is reported to be very low. In a study involving 1424 adults only 9.1% reported treatment for oral manifestations[86]. After adjusting for CD4 count and other variables, African-Americans and Hispanics were significantly less likely to have received treatment. Factors which were significant with regard to receiving care for oral disease included more than a high school education, participation in clinical trials and utilization of counselling services[86].

2.7 ORAL HEALTH-RELATED QUALITY OF LIFE (OHRQoL).

OHRQoL indicators are to a certain extent based on the conceptual framework derived from the World Health Organization (WHO) international classification of impairment and disability (fig 2.1) [87] provides the basis for exploration of links between various dimensions or levels of consequences variables and consists of the following key concepts: functioning limitations, pain and discomfort, disability and handicap. Impairment refers to the immediate biophysical outcomes of disease, commonly assessed by clinical indicators. Functional limitations at the second level are concerned with functioning of the body parts whereas pain and discomfort refer to the experiential aspects of oral conditions in terms of symptoms. In addition to dissatisfaction with dental appearance, they comprise the intermediate impacts caused by oral health status. Any dimension at level 1 and 2 may lead to the third level of outcomes which refer to any difficulties in performing activities of daily living and to broader social disadvantages (level 3).

Figure 2.1: Theoretical framework of the consequence of oral impacts (modified WHO international classification of Impairment, Disability and Handicaps).WHO [87].



Measures of oral health perceptions is an important component in assessing oral health status of an individual, this includes integrating different components such as disease, functioning, symptoms and feelings[88]. The information is useful in the promotion of health, development of strategies to prevent diseases and allocation of resources[89]. Oral health affects people physically and psychologically, and influences how they enjoy speech, chew, taste food and socialize. The quality of life may be disrupted due to pain, discomfort, eating and sleep disruption.

Oral health attributes have been reported to be a common occurrence. In a study done in Burkina Faso, 27.7% of the adults said they had experienced an oral health problem

in the previous one year. Of these, 62.2% had a toothache due to hot, cold or sweet things while 43.6% had toothache when chewing. Over a quarter (27.3%) had trouble sleeping due to pain and 21% had fever and abscess formation[81]. In another study by Okunseri in Nigeria[90] ,it was reported that 25.7% of the participants said they had pain and discomfort, while 14.7% had anxiety/depression, 32.3% were uncomfortable when eating food and 48.8% were self conscious. Oral health attributes were reported to affect the quality of life among 53% of the participants

Oral health intervention strategies have been found to improve oral health-related quality of life. In a study by Hyde[91] 79% of the participants exhibited improvement in their OHIP-14 scores. Large effect sizes were found in psychological discomfort (1.09), psychological disability (1.00) and handicap subscales (0.74).

2.8 EVIDENCE BASED APPROACH TO ORAL HEALTH

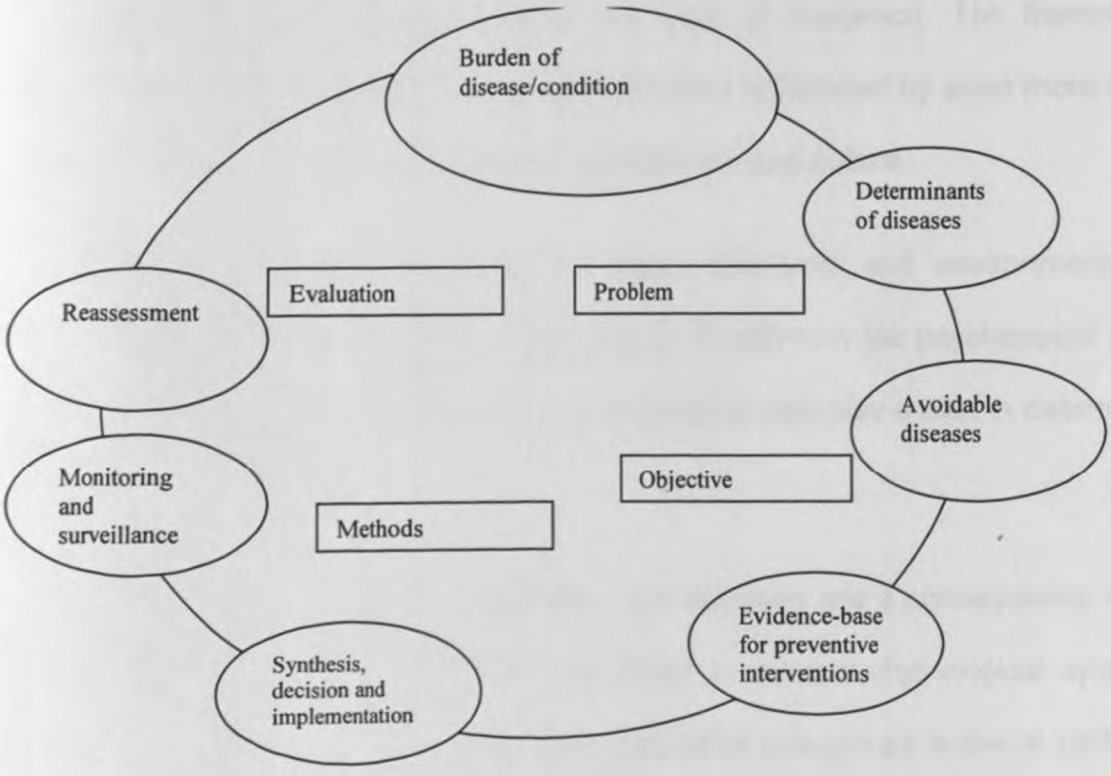
Evidence based approaches to oral health identify and define an oral health problem for which an oral health gain can be stated (Fig 2.2). Related evidence on the efficiency of the intervention is synthesized and assessed, after which an intervention plan is decided upon and implemented. Finally, oral health outcomes are monitored and re-assessed over-time. The model recognizes that some interventions might work less satisfactorily in different contexts[92].

In the current study, the effectiveness of oral health education on the improvement of oral health status of PLWHA was to be explored. The oral health knowledge is important in the improvement of oral health status of an individual or group. By educating the participants and equipping them with skills, it was hoped that this would improve their

oral hygiene status, which would in turn translate into better oral health and improved quality of life.

The first step was to assess the knowledge, oral health practices, oral hygiene status, oral health status and quality of life of the participants at baseline. After this, oral health education was to be used as an intervention strategy. Re-assessment was to be done at 3 and 6 months intervals to evaluate the impact of oral health education on oral hygiene practices, oral hygiene, oral health status and oral health-related quality of life. In the study, effect of mid-stream factors on downstream factors (dental caries, gingival inflammation, oral mucosal lesions) was explored.

Figure 2.2: Evidence based approach to oral health model (Spencer AJ 2003)[92]



2.9. CONCEPTUAL FRAMEWORK FOR DETERMINANT OF ORAL DISEASES

Oral health education intervention aims at prevention of oral diseases. Preventive programs for oral diseases should be based on conceptual and empirical evidence of determinants of variation in oral diseases among patients or population groups in order to identify more points of prevention. The conceptual model illustrated in Figure 2.3 identifies three discrete yet closely interrelated stages or levels of determinants: up-stream, mid stream and down-stream.

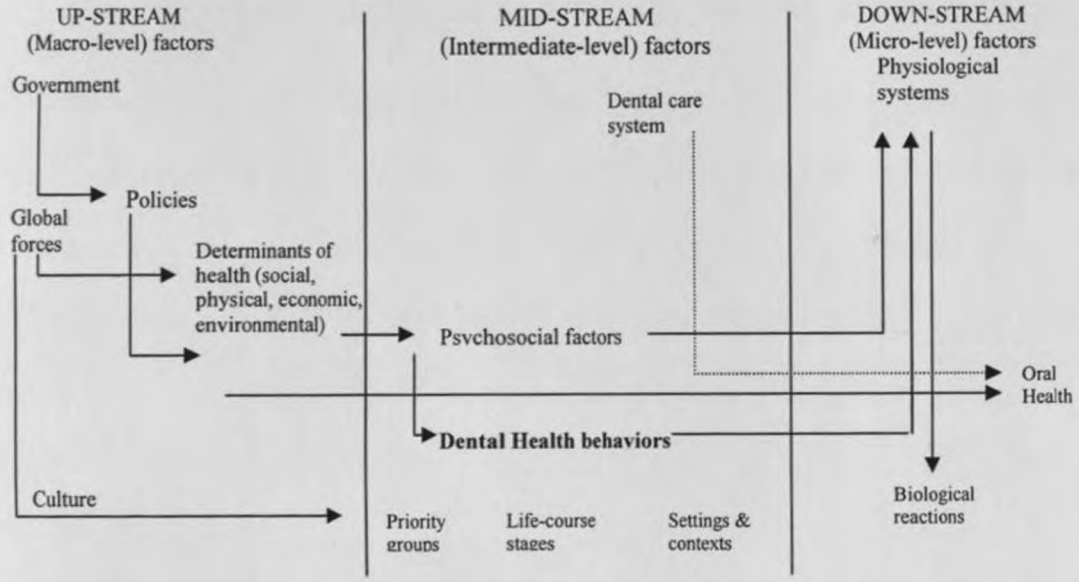
Up-stream factors level: The framework identifies social, physical, economic and environmental factors as being the most fundamental determinants of oral health. These include a range of interrelated factors such as education, employment and occupation, working conditions, income, housing and area of residence. The framework also indicates that these fundamentals are themselves influenced by even more up-stream factors, namely:- government policies, globalisation and culture.

Mid-stream level factors: social, physical, economic and environmental factors influence health throughout life, either directly or indirectly via psychosocial processes and dental health behaviour. Dental care systems also play a part in determining oral health within a society.

***Down-stream level factors*:** ultimately, oral diseases are a consequence of adverse biological reactions to changes or disruptions in various physiological systems. The poorer health profile of some patients or population sub-groups is due in part to longer-term adverse physiological and biological changes

The current study aimed at improving the oral health behaviour of the participants. The conceptual framework for the study was based on the mid-stream factors, which included the knowledge, oral hygiene practices, oral health-seeking behavior and sugary intake, which have a relationship with down-stream factors (oral health status and oral health quality of life).

Figure 2.3: Conceptual framework for the determinants of oral diseases. (Spencer AJ[92])



In summary, the prevalence of oral diseases such as periodontal diseases and dental caries has been reported to be higher among HIV infected persons even in the HAART era. Studies have found that majority of HIV positive persons have poor oral hygiene. Poor oral hygiene has been identified as a factor that may contribute to poor oral health among this group of people. At the same time, majority of the populace, PLWHA included, does not have adequate knowledge on oral health. Studies have reported that

good oral hygiene can be achieved through oral health education among the general population. However, the impact of oral health education among PLWHA has received little attention. Therefore, there is need, to investigate the viability of oral health education as a strategy in trying to improve the oral health of PLWHA, and subsequently their oral health-related quality of life.

CHAPTER 3

STATEMENT OF THE RESEARCH PROBLEM AND JUSTIFICATION

This chapter describes the statement of the research problem and justification, as well as the conceptual frame work guiding the study. The study objectives, hypothesis and variables are also listed.

3.1 STATEMENT OF THE RESEARCH PROBLEM AND JUSTIFICATION

Oral diseases remain a major public health problem affecting more than half of the population worldwide. It has been reported that the increase in the rate of dental caries in developing countries is "absolutely frightening"[93]. Though there has never been a National Oral Health Survey in Kenya, the prevalence of periodontal diseases and dental caries are estimated to be about 80% and 56% respectively among the adult population. About 40% of patients attended to in public hospitals outpatient clinics are dental patients.

Studies have reported a higher prevalence and more severe forms of oral diseases among HIV seropositive individuals than HIV negative individuals. Apart from the common oral diseases that affect the general population, the HIV infected group of individuals tend to also suffer from other forms of oral diseases which are rare or do not occur in the oral region in the HIV sero-negative individuals.

The major oral diseases namely dental caries and periodontal diseases are preventable. Yet the oral health delivery system in Kenya is mostly curative as opposed

to being preventive oriented. Currently, there is a relatively low budgetary allocation for dental services from the exchequer, high cost of dental treatment and inadequate manpower. Furthermore, in the public institutions, there are many challenges in terms of number and maintenance dental equipment as well as frequent shortages of dental materials. This makes delivery of satisfactory oral health a daunting task.

Though the NOHP&SP[2] recognizes PLWHA as a vulnerable group, there are no special mechanisms put in place to address the oral health needs of this group of people. Since common oral diseases are preventable, it is important to promote, advocate and conduct research on prevention strategies that may improve the oral health for PLWHA.

Majority of the people in the population lack adequate knowledge and skill on oral hygiene practice. Indifference to poor oral health may also be a barrier towards seeking dental treatment for PLWHA. Stigmatization and discrimination by oral health care providers could constitute other barriers. Oral health care providers have been reported to have a negative attitude or are unwilling to treat PLWHA[15]. Some providers also fear being stigmatized for treating PLWHA[16]. Research has also shown that PLWHA tend to underutilize dental services after diagnosis due to fear of discomfort during treatment, inability to get appointments and not knowing which dentist to visit. This leads to low treatment rates among this group. It is therefore clear that PLWHA are faced with special oral health as well as logistical challenges.

HIV infection leads to the suppression of immunity. HAART therapy preserves the immune functions and controls AIDS-related symptoms in most HIV-infected people in industrialized societies hence the medical threat posed by oral infections is probably

decreased in these countries. However, in the developing countries where HAART is not readily available, the threat remains enormous[94]. Even with the availability of HAART, the prevalence of oral diseases and conditions remains high[66]. Therefore, attention to oral health is important, since patients with HIV/AIDS have higher than average levels of dental and gingival diseases[3]. The associated pain, loss of function, and other symptoms can impair their overall quality of life.

Studies have shown that oral health education can reduce the burden of disease in the general population. The NOHP and SP[2] identified oral health education as one of the viable strategies of reducing the burden of oral diseases in Kenya. Currently there are no well-organized oral health education intervention programs in Kenya. The impact of oral health education on oral hygiene and oral health status of PLWHA is not clear. Furthermore, the impact of oral health education on OHRQoL of PLWHA has not been documented in the East African region.

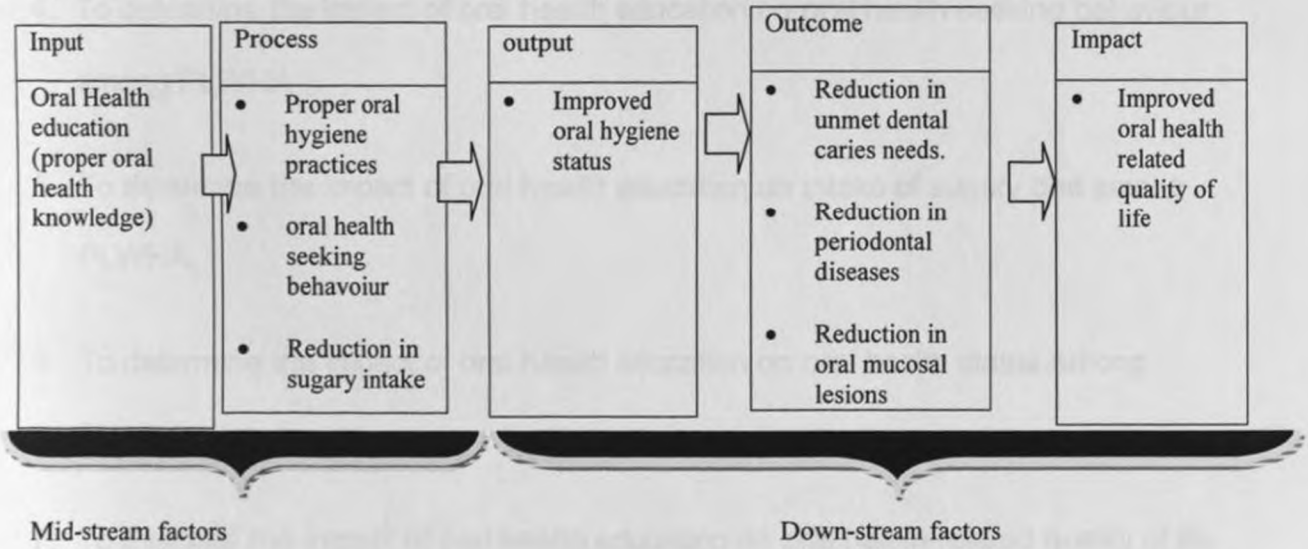
The purposes of this study was therefore to evaluate the impact of oral health education on OHRQoL of PLWHA.

3.2 CONCEPTUAL FRAMEWORK GUIDING THE STUDY

The conceptual frame work for determinants of oral diseases (fig 2.3) forms the basis of development of the conceptual frame work guiding the study (fig 3.1). The intervention involved mid-stream factors (oral hygiene practices, oral health seeking behavior and intake of sugary diet, oral hygiene status) and down-stream factors.

In the current study, the effectiveness of the oral health education on the improvement of oral health status and Oral Health-related Quality of Life (OHRQoL) of PLWHA were explored. By educating the participants and equipping them with skills to brush their teeth, reduction in sugary intake and patients would visit an oral health care provider. It was hoped oral hygiene status would improve, which would translate to better oral health status and subsequently to improved OHRQoL (fig 3.1). The first step was to assess the knowledge, oral health practices, oral hygiene status, oral health status and oral health-related quality of life of the participants. After this, oral health education was used as an intervention strategy. Re-assessments were done at three and six months to evaluate the impact of oral health education on knowledge, oral health practices, oral hygiene status, oral health status and oral health-related quality of life of the participants.

Figure 3.1: Conceptual framework guiding the study (adapted from Spencer AJ[92])



3.2 OBJECTIVES

3.2.1 Broad objectives

To determine impact of oral health education on quality of life of PLWHA in two Comprehensive Care Centres in Nairobi.

3.2.1.1 Specific objectives

1. To establish the impact of oral health education on the knowledge among PLWHA.
2. To determine the impact of oral health education on the oral hygiene practices among PLWHA.
3. To determine the impact of oral health education on oral hygiene status among PLWHA.
4. To determine the impact of oral health education on oral health seeking behaviour among PLWHA
5. To determine the impact of oral health education on intake of sugary diet among PLWHA.
6. To determine the impact of oral health education on oral health status among PLWHA.
7. To evaluate the impact of oral health education on oral health-related quality of life among PLWHA.

3.3 HYPOTHESIS

Null hypothesis

Oral health education is not a viable strategy in improvement of Oral Health-Related Quality of Life of PLWHA.

Alternative hypothesis

Oral health education is a viable strategy in improvement of Oral Health-Related Quality of Life of PLWHA.

3.4 VARIABLES

Table 3.1. Study variables

Variable	Measurement
Socio-demographic variables	
• Age	Number of years since birth
• Gender	Whether male or female
• Education	Highest level of education attained
• Marital status	Whether married, single, divorced/separated
• Residence	Where participants live
• Occupation	Type of work done
Independent variables	
Effect of oral health education on:	
• Knowledge on oral health	Level of oral health awareness
• Oral hygiene practices	Oral hygiene habits and techniques
• Oral health seeking behavior	Whether participants have had treatment or not
• Oral hygiene status	Presence or absence of plaque on their teeth
• CD 4 count	Level of CD4 cells/mm^3
• ARV treatment	Whether the patient is on ARV therapy or not
Dependent variables	
Oral health status	
Effect of oral health education on:	
• Caries experience	Decayed, Missing, Filled Teeth
• Periodontal status	Present or absence of gingival bleeding, calculus
• Oral Mucosal lesions	Presence or absence of sores, ulcerations, malignant tumours, leukoplakia, Acute Necrotising Ulcerative Gingivitis (ANUG), candidiasis, abscess, lichen planus, other mucosal lesions
• Oral health-related quality of life	OHIP-14 subscales

CHAPTER 4

MATERIALS AND METHODS

This chapter describes systematically the study methodologies that were used. It discusses the plan adapted in collecting data so that information could be obtained with sufficient precision. The methodologies for this thesis were dictated by the scope of the work, study areas and specific objectives. Choices in methodology included study area, and design, study population, sampling, sample size, data collection tools and techniques and data analysis. Ethical considerations are also described.

4.1 STUDY AREA

The current study was conducted at the Kenyatta National Hospital (KNH) and Mbagathi District Hospital (MDH). The two study areas were chosen due to certain similarities. Both hospitals are in Nairobi and have well established CCCs. CCC activities include provision of ART and treatment of opportunistic infections, psycho-social support and counseling for people infected and affected by HIV/AIDS, palliative medical care, training and supervision of staff involved in counseling, nutritional counseling, referral and home care services. The PLWHA also get free ARV drugs and subsidized support. The two study areas were therefore likely to attract patients with a lot of similarities.

The CCC at **KNH** is under the department of internal medicine. The patients seen in the clinic are drawn from the wards, voluntary counseling and testing centres (VCTs) and referrals from other health facilities in Kenya. The departments of laboratory medicine

and diagnostic radiology provide investigations for the centre. About 200 patients visit the clinic every day.

The CCC at MDH was established in 2003. Though originally ran by MSF-Belgium it is currently under the Ministry of Medical Services and The AIDS, Population and Health Integrated Assistance (Aphia II) project. The APHIA II framework is designed to contribute substantively to the United States Government (USG) and Government of Kenya (GOK) goals in HIV and AIDS, TB, and to a more limited extent, Reproductive Health/Family Planning (RH/FP), malaria and maternal and child health (Maternal Child Health). The activity objective of APHIA II is Healthier behaviors and increased use of high quality HIV/AIDS, RH/FP and MCH services. The patients seen in the clinic are HIV positive and are drawn from the wards, voluntary counseling and testing centres (VCTs) and referrals from other health facilities in the country. It is considered the best CCC facility in the country.

4.2 STUDY DESIGN

This was a quasi-experimental study design. The study population was divided into two groups; the intervention and the non-intervention groups.

Intervention group: KNH. At enrolment, a questionnaire (Appendix 1) was used to assess the dental knowledge, oral hygiene practices, oral health seeking behaviour, sugary intake and oral health-related quality of life (OHRQoL). An oral examination to determine the oral hygiene and oral health status was also done and recorded in a clinical examination form (Appendix 2). Further, a standardized oral health education lesson was given to the participants on a one-on-one basis. The education was given by

the principal investigator. The education included knowledge on causes, prevention and control of dental caries and periodontal diseases. Oral hygiene instructions were given using a model mouth and a model toothbrush. The cohort was reviewed at three and six months intervals. During these two reviews, the same questionnaire was administered and an oral examination using the same clinical examination forms conducted.

Non-intervention group: MDH. At enrolment, a standard questionnaire (appendix 1) was used to assess the knowledge, oral hygiene practices, sugary intake, oral health seeking behaviour and OHRQoL. Oral examination was done to assess the oral hygiene and oral health status and the findings recorded in similar clinical examination forms to those used for the intervention group. No oral health education was given to this group. The cohort was reviewed at three and six month's intervals. During these two reviews, the same questionnaire was administered and an oral examination using the standard clinical examination procedures was done.

4.3 STUDY POPULATION

The study participants were all adult HIV seropositive persons attending the Comprehensive Care Centre in both hospitals.

4.3.1 Inclusion criteria

1. Persons who were HIV positive and had been confirmed through serology. An ELISA test and western blot results were retrieved from CCC records (patient files).

2. Persons who consented to the study.

3. Persons above the age of 18 years since they are legally in a position to consent to the study.

4.3.2 Exclusion criteria

1. Persons whose serology results were not known.
2. Persons who did not consent to the study.
3. Persons who were too ill to have oral examination or to perform self oral hygiene measures.
4. Persons who were below 18 years, since they could not consent to the study.

4.4 SAMPLE DESIGN AND PROCEDURE

This section comprises of sample size determination and sampling procedures.

4.4.1 Sample Size Determination

The formula used in determining the sample size when there is change in mean was used in the current study;

$$n = \frac{2\sigma^2(Z_{\alpha}+Z_{1-p})^2}{(\mu_1-\mu_2)^{-2}}$$

Where

n =sample size,

σ = expected variance,

Z_{α} = Standard normal deviate at 95% confidence level

$Z_{1-\beta}$ = power

μ_1 = mean after intervention

μ_2 = mean before intervention

A study by Hofer et al. 2002[68] reported a reduction of GI score from 1.6 to 1.4 among persons living with HIV/AIDS after health education with a power of 80% and 5% level of significance.

$$n = \frac{2(0.468)^2(1.96+0.84)^2}{(1.6-1.4)^2}$$

$= 85.85 \approx 86$

The calculated minimum sample size was therefore 86 per centre giving a total of 172. However, due to anticipated attrition during the study, 252 participants were recruited at baseline, 141 at KNH and 111 at MDH.

4.4.2 Sample selection

Systematic random sampling method was used to select the participants. This method was adapted because of good spread across the population and its simplicity. The systematic random sampling method is useful when units in sampling frame are not numbered serially and when the sampling frame consists of a very long list. At the time of the study, in 2008, the number of patients registered at the KNH CCC was about 2000 and 750 at MDH. The calculated minimum sample size targeted was 86 per site.

An extra 30% of the participants were to be recruited giving a sample size of 112 participants. The additional number was to take care of anticipated attrition. Hence a total of 228 participants were to be recruited at both sites. For KNH participants, the interval for the current study was 2000/144=17. Thus every 17th patient who reported to the clinic every day was included in the study. At the MDH District Hospital every seventh patient was recruited in the study (750/112=7). However, to protect the data against maturation of the diseases, recruitment was done during the same period for the two study site. Thus, a total, 141 participants from KNH and 111 from MDH were enrolled at baseline.

4.5 DATA COLLECTION INSTRUMENTS AND TECHNIQUES

Data were collected using various tools and techniques described in section 4.5.1 to 4.5.5

4.5.1 Data collection instruments

1. A clinical examination form was used to record data on oral hygiene and oral health status of the patients. The following indices were used to assess the oral hygiene and oral health status;

Table 4.1: Indices used for various oral diseases during data collection (Appendices 3)

Index	Oral disease/ condition(s)
Ramfjords periodontal disease index plaque component-1961	Oral hygiene status
Loe and Silness gingival index- 1963	Periodontal status
Green and Vermillion calculus index	Calculus
DMF(T)	Caries experience
WHO assessment form	Oral manifestations of HIV/AIDS

2. A WHO level 7 questionnaire which is designed for population surveys was used to collect quantitative information of knowledge on the prevention of dental caries and periodontal disease, oral hygiene practices, sugary intake and oral health seeking behavior among PLWHA (Appendix 2).
3. Oral Health Impact Profile (OHIP-14) questionnaire was used to assess the oral health-related quality of life of the respondents (appendix 2).

4.5.2 Preliminary phase

A preliminary visit was made to each of the selected study sites in order to confirm relevant information, address logistics issues and for geographical mapping.

4.5.3 Pilot phase

Questionnaire

A total of 25 (10%) questionnaires (Appendix 1) were filled during the pre-test. The questionnaire was composed of a standard WHO[96] and OHIP-14[97] questionnaires both of which have been used across the world and found to be appropriate and reliable in achieving the objectives of studies similar to the present one. This notwithstanding, however, the questionnaire was still pre-tested to assess the suitability of the items, opinion on whether key words in the items and response categories were un-ambiguous. In the current study, the questionnaire was understood clearly. All the participants answered all the questions adequately. Hence no adjustment was deemed necessary.

4.5.4 *Calibration*

To determine intra-examiner reproducibility, twenty five participants were re-examined. A WHO clinical examination from (Appendix 2) was used to record the information of the participants.

4.5.5 *Actual data collection phase*

Data were collected in three phases: baseline, review 1 after three months and review 2 after six months. The baseline data collection phase took about three months. Data on CD4 cell counts and ARV therapy was retrieved from the file. Socio-demographic data, knowledge, oral hygiene practices, oral health seeking behaviour, sugary intake and oral health-related quality of life were collected using an interviewer administered, semi-structured questionnaire. A clinical examination was then conducted to determine oral hygiene and oral health status. The data was recorded in accordance with WHO guidelines[98]. Other sets of data on all the variables investigated at baseline were collected at three and six month intervals for each of the participants using the same tools. All the data were collected by the principal investigator with the assistance of a trained assistant who recorded them in the data collection tools. The principal investigator counter-checked the records after every participant and at the end of each day to ensure that all relevant information was captured accurately.

4.5.6 *Oral health education*

Oral health education was provided using a standard method for all the participants (Appendix 4). This included giving knowledge verbally about tooth decay and gum

diseases (what they are, their causes and prevention). After the teaching, a demonstration on brushing was given using a mouth model and a tooth brush (appendix 4). Emphasis was laid on thorough brushing of teeth at least twice daily (after breakfast and before going to bed). Participants were also shown pictures of healthy periodontium and teeth, inflamed gingival, decayed teeth, and calculus (appendix 4). Using a face mirror, the participant was asked to look at their gums and comment on whether they thought their gums were healthy or not, after which the correct position was given on the state of their gums by the principal investigator.

4.5.6 Oral examination.

This was done with the patient lying on a coach. Intra-oral examination was conducted under natural light. Gingival inflammation was assessed using the WHO probe. Presence of calculus, decayed, missing, filled teeth and oral mucosal lesions were recorded. The patients were given disclosing tablets and rinsed the mouth once after which the plaque scores were recorded. The detailed process of clinical examination and recording of data followed the sequence shown in appendix 2.

Infection control: disposable mouth masks, disposable cups and gloves were used during the study. The instruments were pre-sterilized in an autoclave.

4.5.7 Minimizing error and biases

The study population was selected using systematic random sampling method. This ensured that each participant in the group of PLWHA had an equal chance of being included in the study. Only the respondents who met the inclusion criteria were enrolled

into the study. All data collection tools were pre-tested. All instruments used were calibrated. Double entry was done to reduce transcription errors. Regression analysis was used to control for confounders. To minimize contamination of the data, the study was conducted between 9am-11am at KNH and 11.30am -1pm at MDH on a daily basis.

4.6 DATA ANALYSIS AND PRESENTATION

Data from the questionnaire and clinical examination forms were coded and processed with Statistical Packages for Social Sciences (SPSS) 12.0 (SPSS inc. Chicago, Illinois, USA) and STATA.

After completion of data entry, data cleaning was performed. Comparison of means and proportions was done using the t-test and Pearson's chi-square test(X^2) where appropriate. Where the number of observations was less than five in one cell, Fisher's exact test was performed. Paired t-test and the McNamer test of association were used for continuous and categorical data for paired observations respectively. Linear regression models included variables which were of clinical importance and those that were significant in the bivariate analysis. In the current study, model for response y_i for the i^{th} individual with explanatory variables

$x_i, x_{ii,..} \ldots\ldots, x_p$ is given as $y_i = \alpha + \beta_1 X_{1i} + \beta_2 x_{2i} + \ldots\ldots + \beta_p x_{pi} + \xi_i$

where α, β_1 ,β_2..... β_p are the unknown regression parameters to be estimated. ξ_i is the random error term depicting the fluctuation of the observed y_i from the hypothesized model value.

Oldhams correlation[98] was done to assess how much the changes in dependent variables could be explained by the changes observed in independent variables. P value <0.05 was considered significant. Oldhams method was chosen in the current study to overcome baseline interactions.

4.6 MAIN OUTCOME MEASURES

Effect of health education on:

1. Knowledge on oral health among PLWHA.
2. Oral hygiene practices of PLWHA.
3. Oral health seeking behaviour of PLWHA.
4. Oral hygiene status of PLWHA.
5. Sugary intake of PLWHA.
6. Oral health status of PLWHA.
7. Oral health-related quality of life of PLWHA.
8. Oral mucosal lesions of PLWHA.
9. Effect of oral health education on oral health of PLWHA.
10. Impact of oral health education on Oral Health-Relates Quality of Life (OHRQoL) of PLWHA.

4.8 ETHICAL CONSIDERATIONS

The proposal for the study was approved by the Kenyatta National Hospital and the University of Nairobi ethics and research committee. Permission was granted by the Medical Superintendent, MDH, Director KNH and head of the Comprehensive Care Centre at the Kenyatta National Hospital. The purpose of the study, the expected benefits and risks were explained to the participants clearly in a language they understood. Any questions/queries regarding the study were answered appropriately. Before enrolling in the study, a written informed consent was obtained from each participant (Appendix 3). Each subject meeting the inclusion criteria had an equal chance of being included in the study. The participants were at liberty to terminate participation at any time without victimization. All information collected was treated confidentially. Emergency treatment was given to any participant needing it and referrals were given to those requiring them.

CHAPTER 5

RESULTS

Chapter 5 presents the results of the study. Section 5.1 gives the findings from the pilot phase. In section 5.2 the respondents' socio-demographic variables, CD4 cell counts and ARV therapy are described. In section 5.3 the results of the effect of health education on oral health knowledge, oral hygiene practices and sugary intake are presented. This gives way to section 5.4 which shows the data for oral health seeking behaviour. The findings on the impact of health education on oral hygiene and oral health status are described in section 5.5. Section 5.6 sheds light on the oral mucosal lesions. The chapter ends with Section 5.7 which demonstrates the impact of health education on the Oral Health-Related Quality of Life (OHRQOL) of PLWHA.

5.1 Results of the pilot phase

The Kappa values obtained were 0.93 for plaque score, 0.97 for gingival inflammation and 1.00 for calculus and caries experience. Before calibration, the Kappa value of ≤ 0.4 was set to indicate poor to fair agreement, 0.41-0.60 moderate agreement, 0.61-0.80 substantial agreement and 0.8-1.00 almost perfect agreement. Therefore, the kappa scores achieved in the study showed an almost perfect agreement.

5.2 Socio-demographic characteristics, CD4 cell counts and ARV therapy of the participants

This section describes the demographic characteristics (age, gender, marital status, level of education, geographical location and occupation) as well as the CD4 cell counts and ARV therapy of the study sample.

5.2.1 Socio-demographic characteristics

At enrolment 252 participants were recruited into the study, 141 from KNH (intervention group) and 111 from MDH (non-intervention group). The overall completion rate was 195 (77.4%) at 6-month (review 2), with 102 (72.3%) respondents from KNH and 93(83.8%) from MDH. Table 5.1 compares the demographic variables at baseline and at review 2 for both study areas. There was no statistically significant difference between baseline and review 2 findings for the characteristics assessed.

Table 5.1: Comparison of socio-demographic variables at baseline and at review 2 for KNH and MDH participants

Site	*Variable*		*Baseline* *n* %	*Review 2* *n* %	X^2	*p value*
KNH	**Age (years)**	19-30	22 (17.5)	20 (20.8)		
		31-40	56 (44.4)	42 (43.8)	0.48	1.00
		41-50	28 (22.2)	21 (21.5)		
		>50	20 (15.9)	13 (13.5)		
	Gender	Male	47 (33.6)	34 (33.3)	0.96	0.99
		Female	93 (66.4)	68 (66.7)		
	Marital	Single	41 (30.4)	25 (25.3)	0.84	0.93
		Married	81 (60.0)	64 (64.6)		
		Ever married	13 (9.6)	10 (10.1)		
	Education	None	-	-	0.02	0.99
		Up to 8 years	21 (25.9)	20 (25.6)		
		More than 8 years	60 (74.1)	58 (74.4)		
	Geographical location	Nairobi	93 69.9%)	71 (72.4)	0.01	1.00
		Outside Nairobi	40 30.1%)	27 (27.6)		
MDH	**Age (years)**	19-30	36 (32.7)	33 (35.9)		
		31-40	38 (34.5)	33 (35.9)	0.40	1.00
		41-50	31 (28.2)	22 (23.9)		
		>50	5 (4.5)	4 (4.3)		
	Gender	Male	37 (33.3)	33 (35.5)	0.07	0.93
		Female	74 (66.7)	60 (64.5)		
	Marital	Single	33 (30.3)	28 (30.8)	0.24	
		Married	71 (65.1)	60 (65.9)		0.99
		Ever married	5 (4.6)	3 (3.3)		
	Education	None	6 (5.6)	4 (4.5)		
		Up to 8 years	58 (54.5)	47 (52.8)	0.24	0.99
		More than 8 years	43 (40.2)	38 (42.7)		
	Geographical location	Nairobi	87 (79.8)	74 (80.7)		
		Outside Nairobi	22 (20.2)	18 (19.6)	0.10	0.95

There were no significant differences between any socio-demographic variables at baseline and at the end (review 2) of the study for both study areas

Of the participants who completed the study, 129(66.2%) were females and 66(33.8%) were males. The age ranged between 19-73 years with a mean age of 36.78±9.52 years and a median age of 36 years. The participants from MDH (mean age 35.50±9.22 years) were slightly younger than those from KNH (mean age 38.00±9.70 years). However, the difference was not statistically significant t=1.81, p=0.07).

Overall, slightly below two thirds 124(65.3%) of the participants were married, 53(27.9%) were single and 13(6.8%) had either been divorced, separated or widowed. There were 145(74.4%) participants from Nairobi and 50(25.6%) were from outside Nairobi. With regard to education, 77(45.8%) had attained secondary education, 58(35.1%) primary education, 28(16.7%) tertiary education while 4(2.4%) had never been to school. Table 5.2 compares the socio-demographic characteristics of the participants for the two study areas at the end of the study. There were significantly more participants from KNH in formal employment as compared to those from MDH (X^2=9.85, p=0.01). All participants from KNH had attended school while 4.5% of the MDH participants had never been to school.

Table 5.2: Comparison of the socio-demographic characteristics of the participants who completed the study at KNH with those at MDH.

Characteristic	*Variable*	*Site*		X^2	*P value*
		KNH(n=102) %	MDH(n=93) %		
Gender	Male	32.4	35.5		
	Female	67.6	64.5	0.213	0.64
Marital status	Single	25.3	30.8		
	Married	64.6	65.9	3.74	0.15
	Ever married	10.1	3.3		
Education level	None	0*	4.5		
	Up to 8 years	26.6	42.7	-	-
	More than 8 years	73.4	52.8		
Geographical location	Nairobi	72.4	80.4		
	Outside Nairobi	27.6	19.6	1.68	0.20
Occupation	Formal	24.2	7.8		
	Informal	63.9	73.3	9. 85	0.01*
	Unemployed	12.1	18.9		

* at least one cell has a value of zero thus no statistical test computed

5.2.2: CD4 cell count.

All the participants in the study were confirmed to have been PLWHA at baseline from the records. At baseline, the CD4 cell count ranged between 2-1211 cells/mm^3 with a mean of 321± 220.24SD cells/mm^3. The mean CD4 cell count for KNH and MDH was 302.90±233.13 SD cells/mm^3 and 342.65±203.70SD cells/mm^3 respectively. The mean CD4 cell count for KNH and MDH were 316.20+240.06 cells/mm^3 and 306.08+232.75 cells/mm^3 at review 1 and 345.69+203.30 cells/mm^3 and 342.43+209.65 cells/mm^3 at review 2 respectively.

Table 5.3 shows the proportion of participants with a CD4 cell count of <200 cells/mm^3. Results from KNH showed a higher proportion of participants with a CD4 cell count of <200 cells /mm^3 as compared to those from MDH at baseline, review 1 and at review 2. However, the difference was statistically significant at baseline (X^2=5.86, p=0.02) but not at review 1 and review 2. There was a decrease in the proportion of participants with a CD4 cell count of <200 cells/mm^3 for KNH participants between all the three phases while for MDH participants a decrease in CD4 cell count was observed between baseline and review 1 only.

Table 5.3: Proportion of participants with CD4 counts <200 cells /mm3 at KNH and MDH by phase of study

	KNH(n=102) %	MDH(n=93) %	X^2	*p-value*
Baseline	38.8	20.3	5.86	0.02*
Review 1	30.0	18.2	1.93	0.16
Review 2	22.2	18.2	1.81	0.18

*significant value

5.2.4: ARV therapy.

Table 5.4 shows the proportion of participants on ARV therapy at KNH and MDH at baseline, review 1 and review 2. KNH had a higher proportion of participants on ARV therapy than from MDH. The percentage of participants on ARV therapy increased for KNH participants between baseline, review 1 and review 2. For participants from MDH, the increase was between review 1 and review 2 only. There was no statistically

significant difference in the number of participants on ARV therapy between the two sites during all the phases. All the participants were on the first line regimen.

Table 5.4: Proportion of participants on ARV therapy at KNH and MDH by phase of study

Phase	KNH(n=102) %	MDH(n=93) %	X^2	p- value
Baseline	52.9	46.2	0.88	0.35
Review 1	54.9	46.2	1.46	0.28
Review 2	55.9	48.4	1.10	0.30

5.3 Oral health Knowledge, oral hygiene practices and sugary intake among PLWHA

This section describes the oral results of health knowledge, oral hygiene practices and sugary intake of the participants.

5.3.1 Oral health knowledge and oral hygiene practices.

At baseline, 191(97.9%) of the participants said their teeth were important to them. Fig 5.1 shows participants' perception of the importance of natural teeth. At baseline, there was a statistically significant difference in the perceived comparative functioning of natural teeth and artificial teeth by study site, with statistically more participants from KNH 95(93.1%) than MDH 52(55.9%) saying artificial teeth were less functional than natural teeth (X^2=41.10, p=0.00).

Figure 5.1: Perceived importance of teeth by site and phase of study (KNH n=102, MDH n=93)

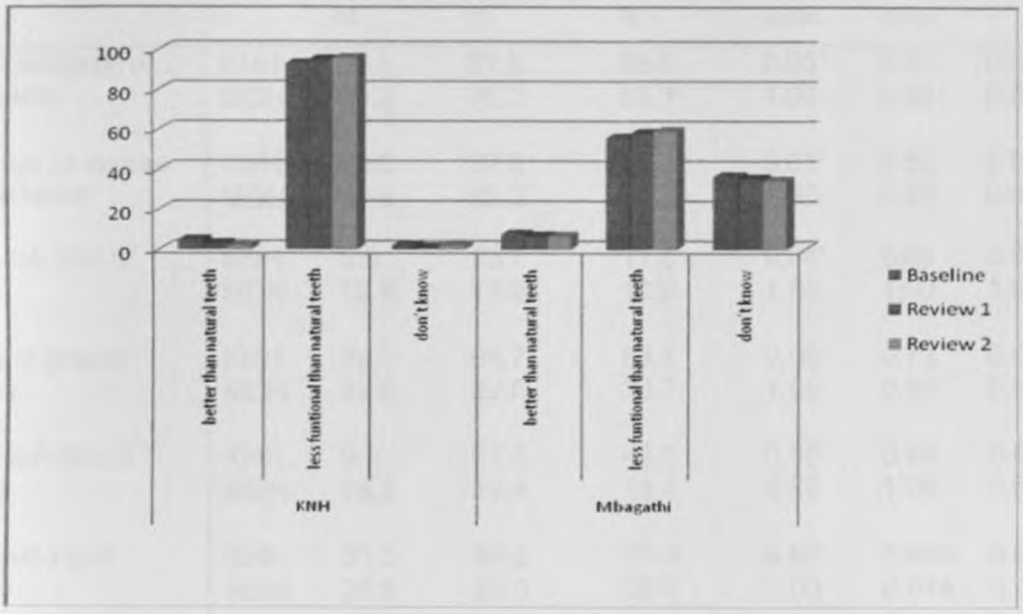


Table 5.5 shows participants' knowledge on the description as well as causes of dental caries. It also shows results of the knowledge on the definition of plaque and calculus, causes of gingival bleeding and how healthy gum appears. The proportion of participants with proper knowledge increased significantly between baseline and review 1 for KNH participants (McNemar $p<0.05$). However, there was no statistically significant difference in the knowledge between review 1 and review 2 for KNH participants (McNemar $p>0.05$). For MDH participants, there was no statistically significant difference in knowledge between the three phases of the study (McNemar $p>0.05$).

Table 5.5: Participants' knowledge on description and causes of dental caries and periodontal diseases for KNH and MDH by phase of study (KNH n=102, MDH n=93)

Attribute	*Site*	*Baseline* %	*Review 1* %	*Review 2* %	P_1- *value*	P_2- *value*	P_3-*value*
Proper description of dental caries	KNH	52.5	67.6	66.3	0.03*	0.84	0.04*
	MDH	60.2	60.2	61.3	1.00	0.88	0.88
Knowledge on causes of dental caries	KNH	49.0	67.6	66.3	0.01*	0.52	0.04*
	MDH	34.4	60.2	61.3	1.00	0.88	0.88
Proper definition of plaque	KNH	5.9	15.7	17.6	0.04*	0.68	0.00*
	MDH	12.9	12.9	12.9	1.00	1.00	1.00
Causes of gingival bleeding	KNH	34.7	65.7	63.4	0.00*	0.73	0.00*
	MDH	22.6	22.6	23.7	1.00	0.86	0.86
Proper definition of calculus	KNH	9.8	41.3	42.6	0.00*	0.94	0.00*
	MDH	18.3	19.4	19.4	0.85	1.00	0.85
How healthy gum appears	KNH	31.0	58.8	70.3	0.00*	0.088	0.00*
	MDH	25.8	25.8	28.0	1.00	0.074	0.74

*P_1: Baseline and review 1, P_2 : review 1 and review 2, P_3 :Baseline and review2 . *significant finding*

Table 5.6 shows the change in the knowledge on prevention and control of dental caries, plaque and calculus by site and phase. There were significant changes in the knowledge on prevention and control of caries, plaque and calculus among the KNH participants between baseline and review 1 but no significant change was observed between review 1 and review 2. There was no statistically significant difference in this knowledge among MDH participants between the three phases of the study.

Table 5.6: Knowledge on prevention and control of dental caries plaque periodontal disease and calculus for KNH and MDH participants by phase of study (KNH, n=102, MDH, n=93)

Proper knowledge on:-	*Site*	*Baseline %*	*Review 1 %*	*Review 2 %*	*P_1-value*	*P_2-value*	*P_3-value*
when to change toothbrush	KNH	72.2	96.9	97.9	0.00*	0.66	0.00*
	MDH	57.0	81.7	81.7	0.85	1.00	0.85
Prevention of tooth decay	KNH	83.0	96.1	96.0	0.00*	0.99	0.00*
	MDH	75.3	75.3	75.3	1.00	1.00	1.00
Best method for removal of Plaque	KNH	69.6	85.3	88.2	0.00*	0.55	0.00*
	MDH	18.3	19.4	20.4	1.00	0.86	0.86
Removal of calculus	KNH	30.0	62.7	54.5	0.00*	0.23	0.00*
	MDH	16.1	16.1	15.1	1.00	0.84	0.83

P_1 : baseline and review 1, P_2 : review 1 and review 2, P_3 :Baseline and review2 . *there were significant changes in knowledge of when to change toothbrush, prevention of decay, best way to remove plaque and how to remove calculus for KNH participants after health education.

Table 5.7 summarizes the brushing habits for the two study areas at the three phases. Most of the participants brushed their teeth in the morning. There was a significant increase in the proportion of participants who brushed their teeth in the morning and evening between baseline and review 1 as well as between baseline and review 2 (McNemar $p<0.05$) for KNH participants. Among the MDH participants, no statistically significant change in brushing habits was observed between the three phases.

Table 5.7: Brushing habits of KNH and MDH participants by phase of study (KNH n=102: MDH n=93)

	Site	*Baseline %*	*Review 1 %*	*Review 2 %*	*P_1-value*	*P_2-value*	*P_3-value*
Brushed two times or more a day	KNH	50.0	82.4	86.3	0.00*	0.33	0.00*
	MDH	26.9	28.0	29.0	0.87	0.87	0.74
Brushed teeth previous evening	KNH	47.0	77.5	83.2	0.00*	0.31	0.00*
	MDH	30.1	31.2	32.3	0.87	0.88	0.75
Brushed teeth previous morning	KNH	88.1	96.1	97.0	0.04*	0.72	0.02*
	MDH	79.6	80.6	81.7	0.85	0.86	0.71
Brushed their teeth previous afternoon	KNH	15.8	11.8	15.8	0.40*	0.40	1.00
	MDH	5.4	5.4	5.4	-	-	-
Brushed teeth that morning	KNH	78.0	91.2	92.1	0.00*	0.30	0.01*
	MDH	79.6	80.6	80.6	0.85	1.00	0.85

*P_1 : Baseline and review 1, P_2 : review 1 and review 2, P_3 :Baseline and review2. *there was significant change in knowledge on description and causes of dental caries, description of plaque and calculus and how a health gum appears after health education for KNH participants.*

Table 5.8 shows the association between the change in KNH participants' knowledge on description, causes, prevention and control of dental caries and periodontal diseases and change in the proportion of those who brushed at least twice a day between baseline and review 2. Increase in the proportion of participants' knowledge of dental caries and periodontal diseases were significantly associated with change in the proportion of participants who brushed their teeth at least twice a day. Knowledge on causes of dental caries did not change significantly (X^2=5.11, p=0.09).

Table 5.8: Relationship between change in knowledge on dental caries and periodontal diseases with change in brushing habits among KNH participants between baseline and review 2(n=102)

Variable	X^2	P value
Proper description of dental caries	14.47	0.00*
Knowledge on causes of dental caries	5.11	0.09
Proper definition of plaque	27.38	0.00*
causes of gingival bleeding	8.43	0.00*
Proper definition of calculus	18.80	0.00*
How health gum appears	19.07	0.00*
when to change tooth brush	13.49	0.00*
Prevention of tooth decay	9.57	0.04*
Plaque best removed by	32.29	0.00*
Removal of calculus	21.11	0.00*

*statistically significant; There were statistically significant association between change in knowledge on dental caries , plaque and calculus and change to brushing at least twice a day for KNH participants except change in knowledge on causes of dental caries.

Tables 5.9, 5.10 and 5.11 show the logistic regression analysis between change to proper knowledge and change in brushing teeth to at least twice a day for KNH and MDH participants. Chronbach's alpha test of reliability was used to assess the independence of questions on knowledge. In the current study, the computed Chronbach's alpha was 0.78 showing dependence of the questions. Thus the questions could not be entered in the model independently. Therefore the variable used was change or no change in knowledge.

The regression model:

$$y=\alpha+\beta_i x_i+\beta_2 x_2+\beta_3 x_3+\xi$$

Where

y=1 if change to brushing at least twice a day, 0 if no change in brushing habits a day=0.

X_1 = 1 if change to proper knowledge, 0 if no change to proper knowledge

X_2 = actual age in years

X_3 = 1 if male, 0 if female

Binary logistic regression after controlling for age and gender, change in knowledge was significantly associated with change to brushing at least twice a day. From the regression model, the variables explained 70.3% of the change in brushing habits.

Table 5.9: Logistic regression for change in oral health knowledge and change in proportion brushing at least twice a day for KNH participants (r^2=0.70) n=102

Variable	*B*	*SE*	*Wald*	*P value*
Change to proper knowledge	2.85	0.47	36.29	0.00*
Age	0.04	0.02	2.45	0.12
Gender	0.08	0.47	0.03	0.87
Constant	-4.31	1.27	11.46	0.00

*Change in knowledge was significantly associated with change in proportion of participants who brushed at least twice a day

A repeat of the model showed that change in knowledge was still significantly associated with change to brushing at least twice a day after adding the geographical location, level of education and marital status. This indicated that change in knowledge was statistically associated with change in brushing to at least twice a day for various models (Table 5.10).

Table 5.10: Logistic regression for change in oral health knowledge and change in proportion brushing at least twice a day for KNH participants after controlling for all demographic variables (r^2=0.70) (n=102)

Variable	*B*	*S.E*	*Wald*	*Sig*
Change in knowledge	0.06	0.12	26.04	0.00*
Age	0.04	0.03	2.29	0.13
Gender	0.09	0.50	0.03	0.87
Geographical location	-0.03	0.04	0.53	0.47
Level of education	0.45	0.52	0.74	0.39
Marital status	0.17	0.45	0.15	0.70
Constant	-6.75	2.26	8.94	0.00

*change in oral health knowledge was significantly associated with change to brushing at least twice a day.

Table 5.11 shows binary logistic regression for the association between change in knowledge and change to brushing at least twice a day after controlling for age and gender. There was no association between change in knowledge and change to brushing at least twice a day for MDH participants.

Table 5.11: Logistic regression for change in oral health knowledge and change in proportion brushing at least twice a day for MDH participants (r^2=0.01) n=93

Variable	*B*	*SE*	*Wald*	*P value*
Change to proper knowledge	18.63	3988.35	0.000	0.996
Age	17.33	5718.45	0.000	0.998
Gender	0.041	0.17	0.055	0.815
Constant	-93.86	16551.90	0.000	0.995

5.3.2 Sugary intake

At baseline, about one third, 134(66.9%) of the participants said they consumed sugary foods. Table 5.12 shows intake and willingness to stop consumption of sugary diet among participants. Few participants from KNH 52(51.5%) as compared to those from MDH 82(88.2%) consumed sugary foods. At review 1, 16(16.7%) and 88(89.8%) of

participants from KNH and MDH consumed sugary foods. At review 2, only 10(10.9%) of the participants from KNH and 83(89.2%) from MDH reported consuming sugary food. Of the participants who consumed sugary foods, 137(80.6%) consumed sometimes, 9(5.3%) once a day, 17(10%) 2-3 times a day and 4(2.4%) between 4-6 times a day. There were significant changes in the proportion of participants from KNH who consumed sugary food (McNemar P=0.00), those who consumed sugary drinks (p=0.00) and those who were willing to stop taking sugary drinks. More participants from MDH 90(96.8%) were willing to stop consuming sugary foods as compared to 91(89.2%) of those from KNH. The change in the willingness to stop consuming sugary foods was not statistically significant for both study areas (p=0.63 for KNH and 1.00 for MDH).

Table 5.12: Percentage of KNH and MDH participants' consuming sugary foods and drinks by phase of study (KNH n=102, MDH n=93)

Attribute	*site*	*Baseline %*	*Review 1 %*	*Review 2 %*	*P_1-value*	*P_2-value*	*P_3-value*
Consumes sugary foods	KNH	51.5	19.8	15.0	0.00	0.37	0.00*
	MDH	88.2	87.1	87.1	0.82	1.00	0.82
Finds it necessary to consume sugary foods	KNH	14.8	18.8	23.1	0.75	1.00	0.47
	MDH	49.8	47.7	46.6	0.88	1.00	0.70
Willing to stop consuming sugary food	KNH	89.8	92.9	84.6	1.00	0.60	0.63
	MDH	96.6	96.6	96.6	1.00	1.00	1.00
Consumes sugary drinks	KNH	34.8	19.8	16.8	0.00	0.47	0.00*
	MDH	65.2	80.2	83.2	0.79	0.80	0.60
Finds it necessary to consume sugary drinks	KNH	7.2	4.5	0	1.00	-	-
	MDH	48.9	49.5	48.9	0.94	0.94	0.88
Willing to stop consuming sugary drinks	KNH	79.7	90.9	94.4	0.25	1.00	0.00*
	MDH	94.4	94.5	94.4	0.99	0.99	0.97

P_1 : Baseline and review 1, P_2 : review 1 and review 2, P_3 :Baseline and review 2 . * there were significant change in the proportion those taking and willing to stop taking sugary food and drinks for KNH participants

5.4 Oral health seeking behaviour

This section shows the changes in oral health seeking behavior of the participants. The results relate to whether a participant had ever visited a dental clinic, whether they were satisfied with the treatment they received, what they did not like about the visit and the reasons why some participants would not visit a dental clinic.

At baseline, 131(67.5%) of the participants said they had visited a dental clinic. More KNH participants 72(71.3%) as compared to MDH 59(63.4%) had visited a dental clinic. Only two KNH participants and none from MDH visited a dental clinic during the study period. There was no statistically significant difference in the proportion of participants who had ever visited a dental clinic between the two study sites at either baseline (X^2=1.36, p=0.24), review 1(X^{-2}=2.36, p=0.15) or review 2 (X^2=0.62, p=0.10).

Table 5.13 shows the demographic characteristics of participants who had ever visited a dentist by site and phase. There was no significant difference between the socio-demographic characteristics and visitations to a dental clinic at baseline and at review 2.

Table 5.13: Demographic characteristics of participants who had ever visited a dental clinic by phase of study for both study areas (n=131).

Variable	Baseline n %	Review 1 n %	Review 2 n %	X^2	p-value
Gender					
Male	39 (60.0)	41 (63.1)	41 (63.1)	0.46	0.81
Females	92 (71.3)	92 (71.3)	92 (71.3)	-	-
Geographic location					
Nairobi	94(65.3)	96(66.69)	96 (66.7)	0.31	0.87
Outside Nairobi	33(73.3)	33(73.3)	33 (73.3)	-	-
Level of education					
None	4(100)	4(100)	4 (100)	-	-
Upto 8 years	31(52.5)	32(54.2)	32 (54.2)		
More than 8 years	72 (69.2)	73(70.1)	73 (70.1)		
Marital status					
Single	33 (62.3)	33 (62.3)	33 (62.3)	-	-
Married	82 (66.7)	84 (68.3)	84 (91.7)	0.21	0.90
Ever married	12 (92.3)	12 (92.3)	112 (92.3)	-	-
Age group					
19-29 years	29 (63.0)	29 (63.0)	29 (63.0)	-	-
30-39 years	50 (67.6)	50 (67.6)	50 (67.6)	-	-
40-49 years	35 (70.0)	37 (74.0)	37 (74.0)	0.15	0.93
>50 years	14 (82.4)	14 (82.4)	14 (82.4)	-	-

Of the participants who had ever visited a dental clinic, only 9(6.9%) said they visited the clinic regularly. Less than half 57(43.5%) of the participants who had ever visited a dental clinic said they were satisfied with the treatment they had received.

Fig 5.2 shows the reasons for satisfaction with the dental visits by site. The main reason for satisfaction with treatment was explanation by the clinician about what was going on 40(71.4%). Other reasons included pain relief 24(42.9%), treatment done quickly 12(21.4%), dental filling done instead of extraction 7(12.5%), only advice given 7(12.5%), no bleeding after treatment 2(3.5%), treatment done without injection 2(3.5%)

and where no problem was discovered 1(1.8%). The main reason for satisfaction for both study areas was explanation of what was going on.

Figure 5.2: Reasons for satisfaction with the dental visit at baseline by site of study (KNH n=31, MDH n=25)

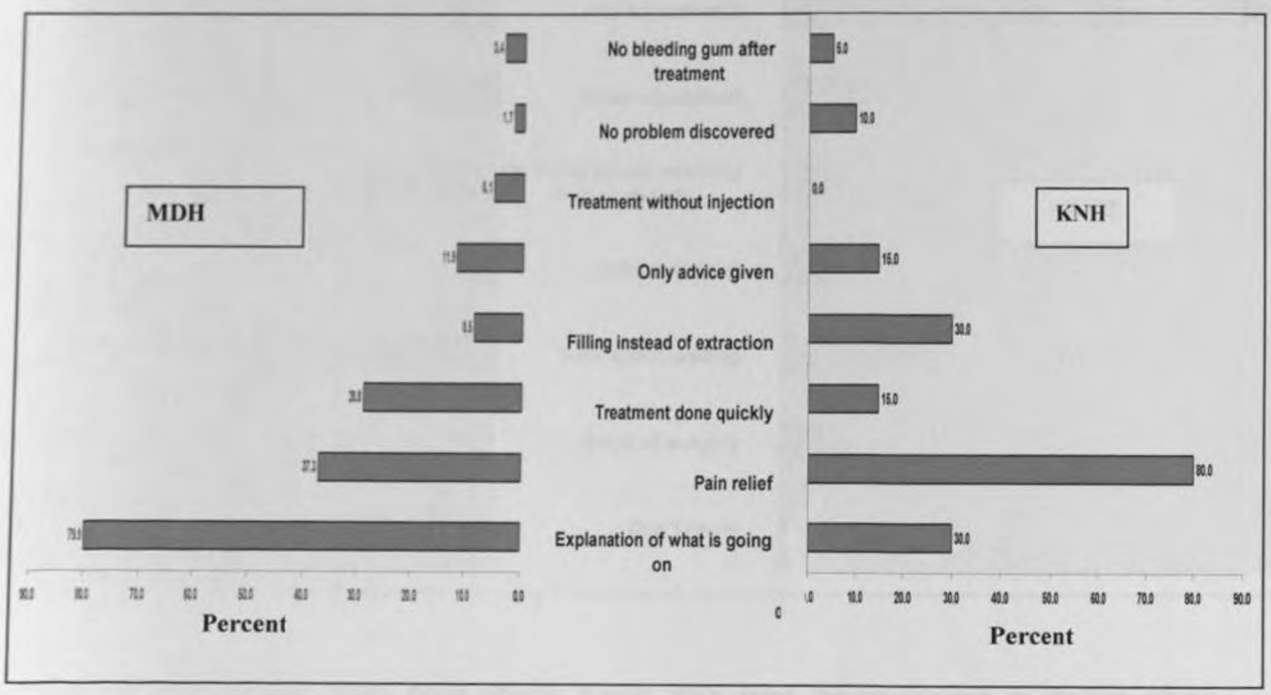
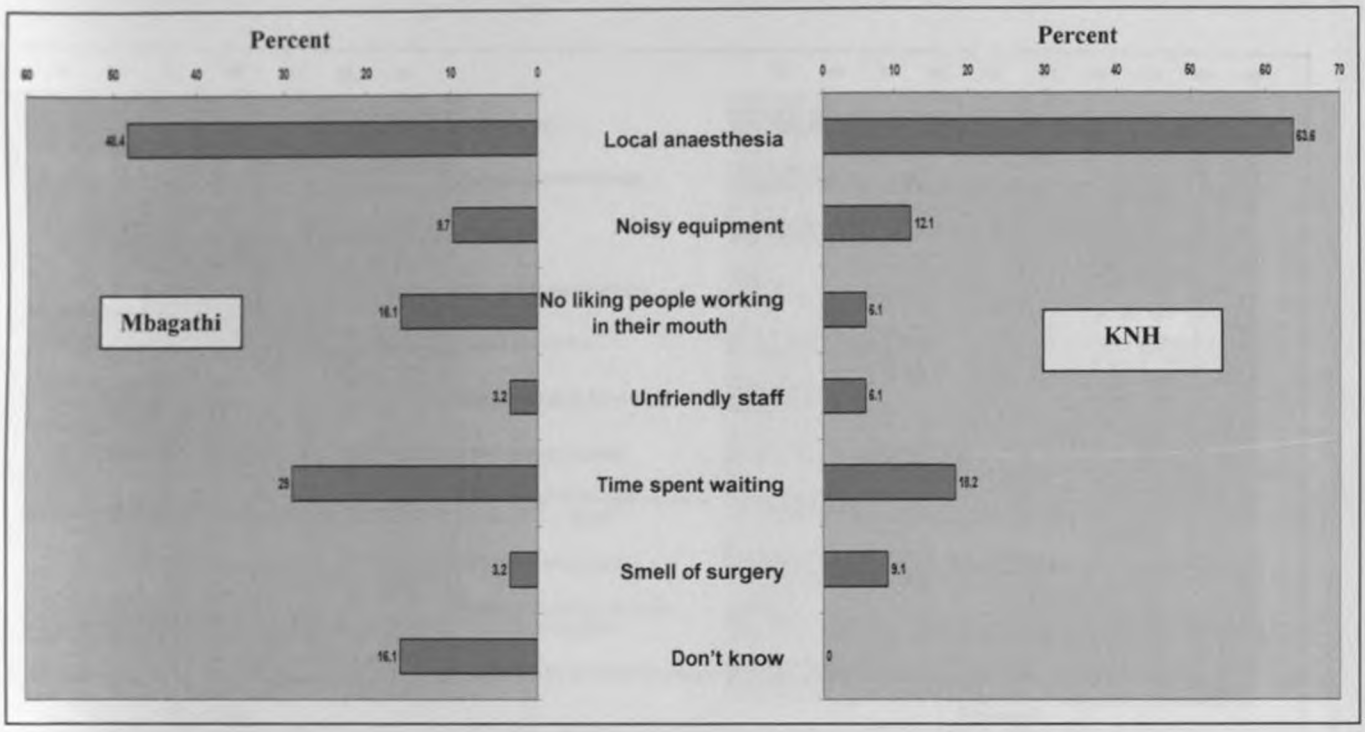


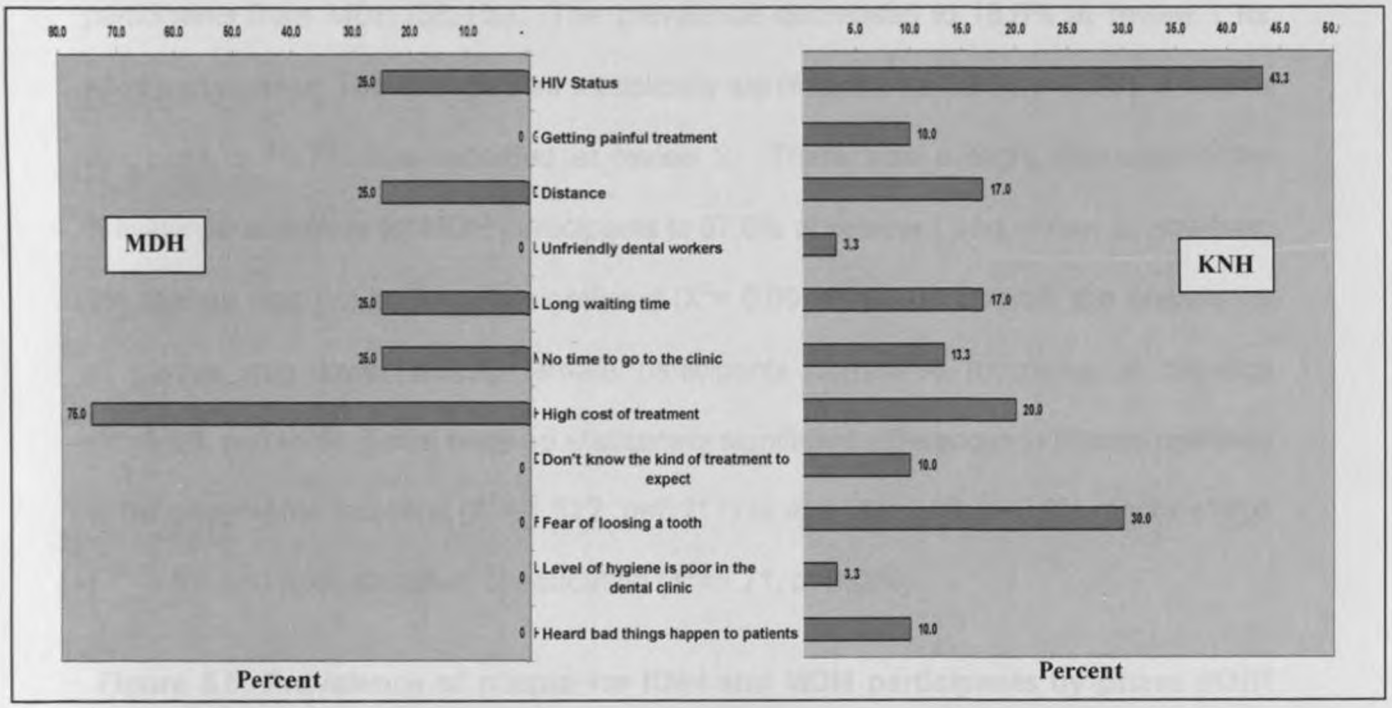
Fig 5.3 shows the reasons for dissatisfaction with the dental visit for the participants at KNH and MDH who had visited a dental clinic. Use of local anaesthesia was the main reason for dissatisfaction with treatment 40(54.1%). Others included noisy equipment 12(16.2%), not liking people working in their mouth 9(12.1%), time spent waiting 6(8.1%) and smell of the surgery 13(17.6%). The main reason for dissatisfaction with dental treatment for both site areas was use of local anaesthesia.

Figure 5.3: Reasons for dissatisfaction with visit by site at baseline (KNH n=11, MDH n=34)



Of the participants from both study areas who had never visited a dental clinic, 22(34.5%) said they had not done so because of their HIV status. Other reasons for not visiting a dental clinic included distance 14(22.6%), painful treatment 3(4.8%), unfriendly staff (1(1.6%), long waiting time 14(22.6%), no time to go for treatment 13(21.0%), high cost of treatment 32(51.6%), fear of losing teeth 9(14.5%), poor hygiene in the clinic 1(1.6%) and not knowing the treatment to expect 3(4.8%). (Fig 5.4) shows the reasons for not visiting a dental clinic by site at baseline. The main reason for not visiting a dental clinic for KNH participants was their HIV status 13(43.3%), while for MDH participants it was the high cost of treatment 26(75%).

Figure 5.4: Reasons for not visiting a dental clinic for participants at baseline (KNH n=30 and MDH n=32)



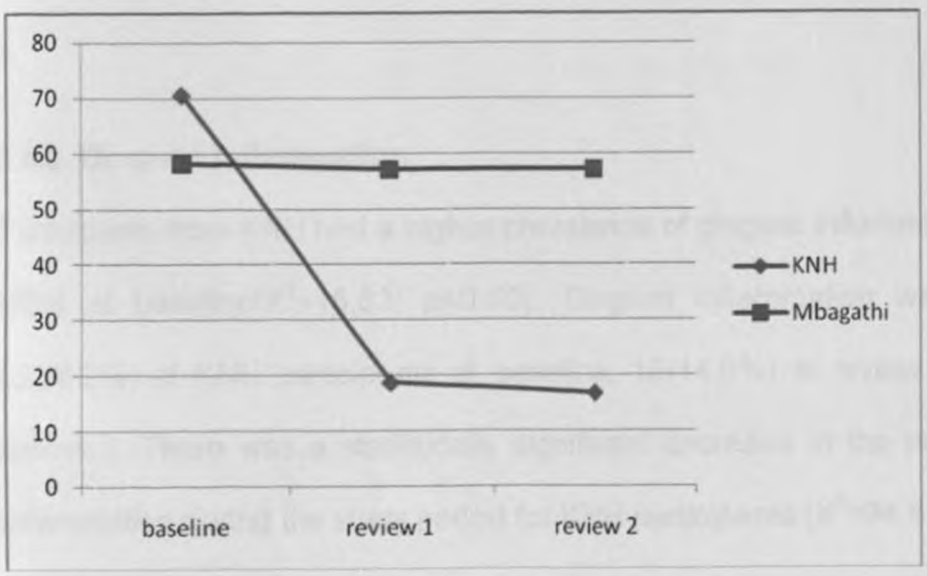
5.5: Oral hygiene, oral health status and oral mucosal lesions.

Section 5.5 gives the results of oral hygiene and gingival inflammation. The association between oral hygiene practices, oral hygiene status and gingival inflammation is also shown. Data for dental calculus, caries and prosthesis status of the participants are also provided.

5.5.1 Oral hygiene status

Fig 5.5 shows the prevalence of plaque for the two sites by phase. At baseline, participants from KNH had a higher prevalence of plaque (70.6%) as compared to participants from MDH (58.1%). The prevalence decreased to 18.6% at review 1 for KNH participants. The change was statistically significant (X^2= 83.54 p=0.00). A further decrease to 16.7% was recorded at review 2. There was a slight decrease in the prevalence of plaque for MDH participants to 57.0% at review 1 and review 2. However, the change was not statistically significant (X^2= 0.00, p=1.00). Overall, the prevalence of plaque was lower among female participants compared to males at baseline (X^2=5.00, p=0.025). There were no statistically significant differences in plaque levels by either geographic locations (X^2= 1.522, p=0.217) or age (X^2=1.00, p=0.80) marital status (X^2=5.81, p=0.055) and level of education (X^2=5.71, p=0.058).

Figure 5.5: Prevalence of plaque for KNH and MDH participants by phase (KNH n=102, MDH n=93)



At baseline the participants from KNH had a higher mean plaque score than those from MDH. Table 5.14 shows the mean plaque scores at baseline, review 1 and review 2. The mean plaque scores decreased significantly (t=7.51, p=0.00) for the KNH participants between baseline and review 2. There was no statistically significant difference in the mean plaque scores for MDH participants between baseline and at review 2. There was an association between the change in plaque scores and change in the number of participants who brushed at least twice a day (t=-8.29, p=0.00). Significantly more reduction in the mean plaque score was observed among the participants who changed their brushing habits to brushing at least twice a day than those who did not change to this routine.

Table 5.14: Mean plaque scores for KNH and MDH participants by phase (KNH n=102, MDH n=93)

Site	*Baseline Mean (SD)*	*Review1 Mean (SD)*	*Review2 mean (SD)*	*t-test*[+]	*P value*	*CI (95%)*
KNH	0.889(0.90)	0.17(0.46)	0.15(0.42)	7.51	0.00*	0.55-0.94
MDH	0.61(0.73)	0.58(0.75)	0.60(0.76)	0.00	1.00	-0.22-0.21

*[+]Paired t-test between baseline and review 2, * there was a significant reduction in mean plaque scores between baseline and review 2.*

5.5.2 Gingival inflammation

Participants from KNH had a higher prevalence of gingival inflammation than those from MDH at baseline(X^2=15.63, p=0.00). Gingival inflammation was observed among 82(58.2%) of KNH participants at baseline, 15(14.0%) at review 1 and 13(12.7%) at review 2. There was a statistically significant decrease in the prevalence of gingival inflammation during the study period for KNH participants (X^2=94.81, p=0.00). For MDH,

35(31.5%) participants had gingival inflammation at baseline, 32(31.1%) at review 1 and 32(34.4%) at review 2. The difference was not statistically significant between baseline and review 2 (X^2=0.00, p=1.00). Table 5.15 shows the prevalence of gingival inflammation by various demographic variables at baseline. On taking into account the site, 33(70.2%) of males from KNH as compared to 14(37.8%) of those from MDH had gingival inflammation. Among the female respondents, 49(53.7%) of the KNH and 21(28.4%) of MDH had gingival inflammation. There was a statistically significant association in the presence of gingival inflammation by age of the participants (X^2=9.18, p=0.03) and marital status (X^2=8.47, p=0.02). There was no statistically significant association between the occurrence of gingival inflammation and whether a patient had a CD4 count of $\geq$ or < 200 cells/mm^3 (X^2=3.05, p=0.08). Two (1.03%) participants had linear gingival erythema and had no plaque.

Table 5.15: Combined results for gingival inflammation by demographic characteristics at baseline for KNH and MDH participants.

		Inflammation		X^2	*P-value*
		Absent	Present		
		n %	n %		
Gender of respondent	Male	28 (28.3)	38 (39.6)	2.78	0.10
	Female	71 (71.7)	58 (60.4)		
Residence	Nairobi	74 (77.9)	71 (74.7)	0.262	0.61
	Outside Nairobi	21 (22.1)	24 (25.3)		
Age group	19-29 years	31 (33.0)	15 (16.0)	9.18	0.03*
	30-39 years	34 (36.2)	41 (43.6)		
	40-49 years	24 (25.5)	26 (27.7)		
	>=50 years	5 (5.3)	12 (12.8)		
Marital Status	Single	32 (33.0)	21 (22.6)	8.47	0.02*+
	Married	63 (64.9)	61 (65.6)		
	Separated/divorced	2 (2.1)	11 (11.8)		
Education	None	2 (2.4)	2 (2.4)	0.138	0.93
	Upto 8 years	31 (36.5)	28 (33.7)		
	>8 years	52 (61.2)	53 (63.9)		
Occupation	Formal employment	16 (16.7)	15 (16.1)	0.303	0.86
	Informal employment	64 (66.7)	65 (69.9)		
	Un-employed	16 (16.7)	13 (14.0)		
Site	KNH	38 (38.4)	64 (66.7)	15.63	0.00*+
	MDH	61 (61.6)	32 (33.3)		
CD4 count	< 200 cells/mm^3	18 (23.1)	23 (36.5)	3.05	0.08
	≥200 cells/mm^3	60 (76.9)	40 (63.5)		
ARV therapy	On ARV therapy	48 (48.5)	49 (51.0)	0.13	0.72
	Not on ARV therapy	51 (51.5)	47 (49.0)		

**significant, *Fishers exact test* . There was a significant association between gingival inflammation with age, marital status and site.

The participants from MDH had a statistically significant lower mean gingival score (0.341 ± 0.602) at baseline than those from KNH (0.69±0.73) (t=3.65, p=0.00). Table 5.16 shows the results for the mean gingival scores by site and phase. The mean gingival score decreased significantly for the KNH participants between baseline and

review 2. There was no statistically significant change in the mean plaque scores among the MDH participants between baseline and review 2.

Table 5.16: The mean gingival score variation for KNH (n=102) and MDH (n=93) by phase of study

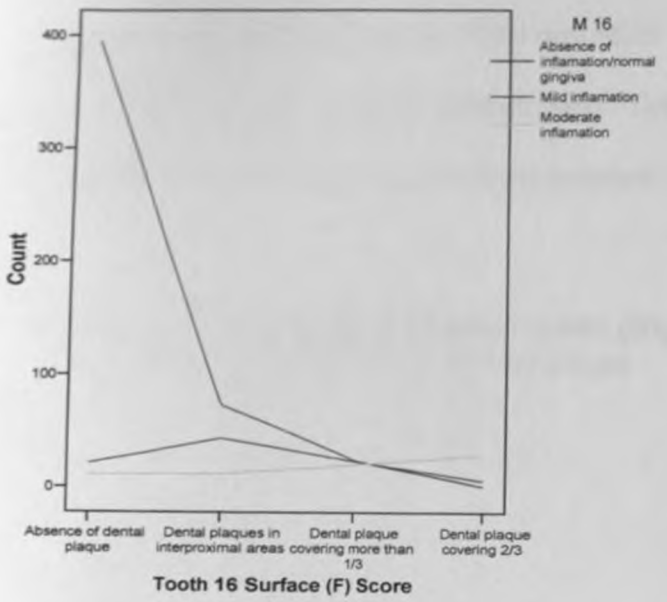
Study area	*Mean gingival scores (standard deviation)*					
	Baseline	Review 1	Review 2	t-test	95% CI	p-value
KNH	0.66 (0.75)	0.12(0.36)	0.11(0.36)	7.82	0.42-0.74	0.00*
MDH	0.341(0.60)	0.32(0.59)	0.34(0.60)	0.00	-0.17-0.18	1.00

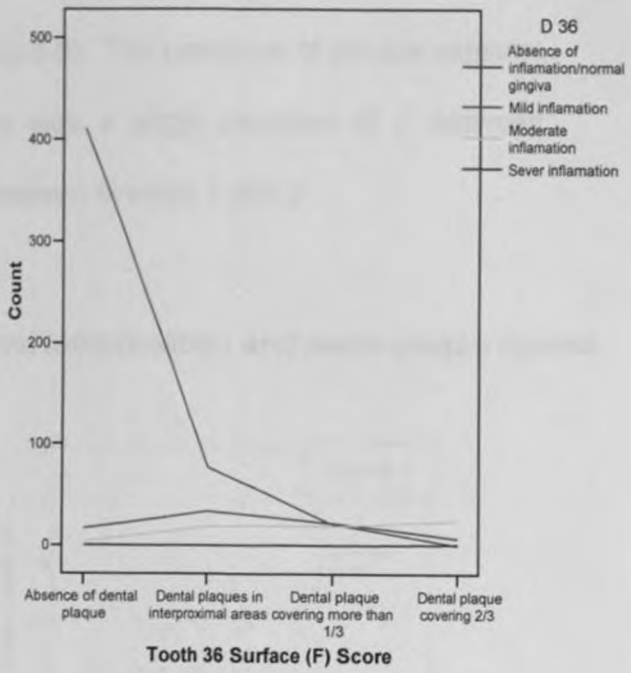
t test, CI and P-value computed between baseline and at 6 months. There was a significant change in the mean gingival scores with change in the mean plaque scores.

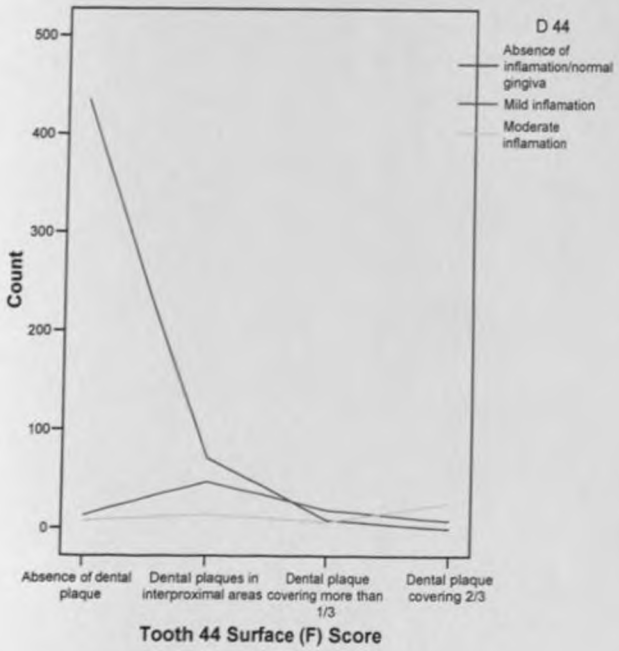
5.5.3 Oral hygiene status and gingival inflammation.

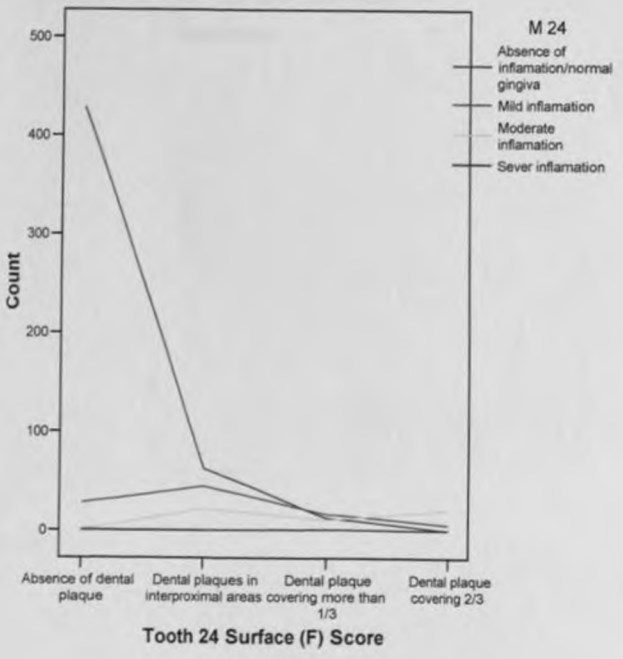
Fig 5.7 shows the relationship between plaque scores and severity of gingival inflammation for the facial surfaces of teeth numbers 16, 36 44 and 24 for all the participants at baseline. There was a statistically significant association between plaque scores and gingival score for 16 (t=0.57.p=0.00), 36 (t=0.62, p=0.00), 44 (0.61, p=0.00) and 24(t=0.62, p=0.00).

Figure 5.6: Relationship between plaques scores and severity of gingivitis for facial surface of 16, 36 44 and 24 for all the participants at baseline



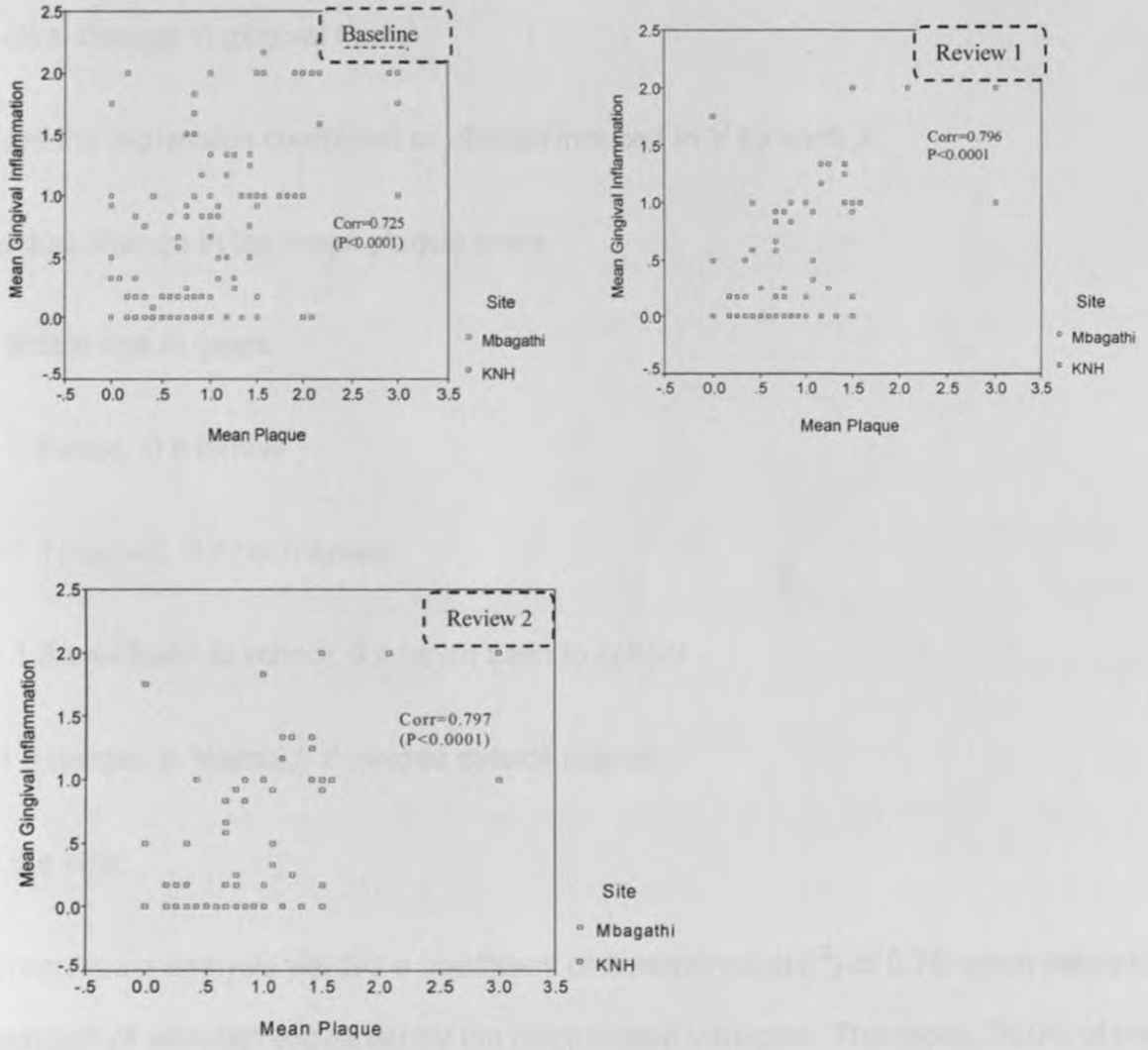






There was a positive correlation between the mean gingival score and mean plaque score in the three phases for KNH and MDH (fig 5.8). The presence of plaque explains over 70% of the gingival inflammation. There was a slight increase of r^2 between baseline and review 1 but remained constant between reviews 1 and 2.

Figure 5.7: Association between mean gingival inflammation and mean plaque scores for KNH and MDH participants by phase



Odham's linear regression analysis model was used to evaluate the association between change in gingival score and change in plaque score after controlling for age, education, marital status and gender for KNH respondents. The model used was

$$Y= \alpha + \beta_1X_1+ \beta_2X_2 + \beta_3X_3 + \beta_4X_4 + \beta_5X_5 +\xi$$

Where,

α -is the constant or intercept

Y- Actual change in gingival score

β_{i-n}- are the regression coefficient or change induced in Y by each X.

X_i = actual change in the mean plaque score

X_2 = actual age in years

X_3 = 1 if male, 0 if female

X_4 =1 if married, 0 if not married

X_5 = 1 if ever been to school, 0 if never been to school

X_6=1 if resides in Nairobi,0 if resides outside Nairobi

ξ- is the error

The regression analysis yielded a coefficient of determination (r^2) of 0.76 which refers to the amount of variation explained by the independent variables. Therefore, 76.0% of the variation in change in gingival score is explained by the variables in the equation. Only

change in mean plaque score was a significant predictor of the change in gingival score (t=6.13, p<0.00) (Table 5.17).

Table 5.17: Results of multiple linear regression analysis to predict change in gingival score from change in plaque scores for KNH participants (r^2=0.76, standard error of the estimate=0.41)

Variable	*B*	*t value*	*95% CI*		*p-value*
			Upper	Lower	
Change in plaque scores	0.63	14.59	0.55	0.76	0.00*
Gender	0.31	0.46	-0.10	0.17	0.65
Geographical location (rural or urban)	0.01	0.15	-0.14	0.38	0.89
Age in years	0.00	0.89	-0.01	0.16	0.38
Marital status group	0.02	0.24	-0.13	0.17	0.81
Level of education	-0.01	-0.28	-0.10	0.07	0.78
Constant	-0.25	-0.99	-0.75	0.25	0.32

There was a significant association between change in plaque scores and change in gingival scores

5.5.4: Calculus.

At baseline, 75(38.5%) of all participants had calculus. Participants with calculus 63(50%) were likely to have plaque compared to those without calculus 12(23.08%) (X^2=20.03, p=0.00). More participants 48(50%) with calculus had gingival inflammation than those without calculus 27(37.50%). Table 5.18 shows change in the mean plaque score between baseline and review 2. The difference was statistically significant (X^2=10.67, p=0.00). There was a statistically significant change in the mean plaque score for the KNH participants between baseline and review 2(t=2.79, p=0.00). The change for MDH participants was not statistically significant during the same period (t=1.00, p=0.32).

Table 5.18: Mean calculus scores by site and phase of study (KNH n=102, MDH n=93)

	Mean calculus scores				
	Baseline	*Review 1*	*Review 2*	*t-value*	*p-value*
KNH	1.28	0.37	0.43	1.00	0.32
MDH	2.52	2.52	2.42	2.79	0.00*

Paired t-test between baseline and review 2. *there was a significant change in mean calculus scores for the KNH participants

5.5.5. Caries experience

At baseline 107 (54.7%) of the participants had dental caries. More participants from KNH 67(65.7%) than MDH 40(43.0%) had dental caries. This difference was statistically significant (X^2=10.10, p=0.00). Table 5.19 shows the mean DMFT for the two study sites by phase. The mean DMF(T) was higher for KNH than for MDH participants at baseline, review 1 and 2. For MDH participants, the major component of the DMF(T) was decay while for KNH the decayed and missing components were almost equal. The mean DMFT did not vary significantly for both KNH and MDH participants throughout the study period (t=-1.09, p= 0.28, for KNH participants and t=-0.50, p=0.62 for MDH participants)

Table 5.19: Caries experience among participants by site and phase (KNH n=102, MDH n=93)

		Decayed	Missing	Filled	DMF(T)	t-test	CI (95%)	P value
KNH	Baseline	1.97± 2.54	1.81± 2.96	0.13± 0.69	3.91±4.86	-1.09	-0.94-0.27	0.28
	Review 1	1.88± 2.68	2.02± 3.11	0.18± 0.74	4.08± 5.26			
	Review 2	1.86± 2.60	2.18± 3.19	0.21± 0.76	4.25±5.14			
MDH	Baseline	1.81± 4.93	0.67± 1.74	0.05± 0.31	2.53± 5.23	-0.50	-0.11-0.06	0.62
	Review 1	1.81± 4.93	0.67± 1.74	0.05± 0.31	2.53± 5.23			
	Review 2	1.83± 4.94	0.67± 1.74	0.05± 0.31	2.55±5.20			

Table 5.20 shows the distribution of the mean DMF(T) of the participants by demographic characteristics for the two sites at baseline. At both sites, females had a statistically higher mean DMF(T) than males (t=2.16, p=0.03). The mean DMF(T) was highest among participants who had never been to school when compared to those who had gone to school, the difference being statistically significant (F=5.06, p=0.00).

Table 5.20: Mean DMF(T) by demographic characteristics of the participants by site at baseline*(KNH n=102, MDH n=93)*

Variable		*KNH Mean*	*MDH Mean*	*Overall mean*	*t- test*	*P value*
Gender	Male	2.55± 2.83	1.79±2.23	2.17±2.56	t=2.16	0.03*
	Female	4.57± 5.47	2.93±6.29	3.81±5.90		
Marital status	Single	2.44±2.47	1.12±1.69	1.79±2.35	F=2.62	0.11
	Married	4.17±4.54	2.11±4.28	3.18±4.77		
	Ever married	7.38±6.61	10.00±6.63	8.53±6.92		
Level of education	None	-			-	-
	Up to 8 years	3.05±3.58	7.67±7.42	7.50±7.00		
	More than 8 years	3.93±3.88	1.47±2.79	2.05±3.25		
			1.72±2.28	2.75±3.41		
Residence	Nairobi	4.21 ±5.04	2.43±5.52	3.30±5.35	t=0.35	0.73
	Outside Nairobi	3.00±3.92	3.00±4.13	3.00±3.96		
Age	19-29 years	2.18±2.17	1.36±2.43	1.71±2.50	F=1.95	0.13
	30-39years	3.17±3.25	4.42±7.45	3.71±5.67		
	40-49years	5.04±6.82	1.70±3.07	3.26±5.78		
	>50	4.75+3.39	0.40±0.55	3.71±4.09		

***Females had a significantly higher mean DMF(T) than males**

5.5.9: Prosthesis status

None of the participants examined from MDH had prosthesis. Four (3.2%) participants from KNH wore partial dentures in the upper jaw. None of the participants had a prosthesis fabricated during the study period.

5.5.10 Oral mucosal lesions

Melanotic hyperpigmentation was the commonest lesion. It was observed among 10.8% of all the participants (Table 5.21). The lesion was more common among KNH than MDH participants. The prevalence of pseudombraneous candidiasis was higher among MDH than KNH participants. For KNH participants, the lesions decreased at subsequent phases except for melanotic hyperpigmentation and Kaposis Sarcoma. While the prevalence of glossitis decreased between baseline and review 1, it increased at review 2. For the MDH participants the prevalence of erythematous candidiasis was noted to decrease between review 1 and review 2

Table 5.21: Prevalence of oral mucosal lesions for KNH and MDH participants by phase (KNH n=102, MDH n=93)

		Baseline %	*Review 1 %*	*Review 2 %*
Pseudomembranous Candidiasis	KNH	4.90	1.96	1.96
	MDH	9.68	9.68	9.68
Erythmatous candidiasis	KNH	0.98	0.98	0.00
	MDH	0.98	0.98	2.15
Hyperplastic candidiasis	KNH	0.98	0.98	0.00
	MDH	0.00	0.00	0.00
Angular chelitis	KNH	1.96	0.00	0.00
	MDH	1.08	0.00	0.00
Glossitis	KNH	1.96	0.98	1.96
	MDH	2.08	2.08	0,00
Kaposis sarcoma	KNH	1.96	1.96	1.96
	MDH	1.08	1.08	1.08
Melanotic hyperpigmentation	KNH	27.45	27.45	27.45
	MDH	10.75	10.75	10.75
Atrophy	KNH	3.92	3.92	1.96
	MDH	2.15	4.30	0.00

5.6: Oral Health-Related Quality of Life (OHRQoL)

This section shows the results of Oral Health-Related Quality of Life (OHRQoL). This was measured using Oral Health Impact profile (OHIP-14) index sub-scales. The results of demonstrating the correlation between change in gingival scores and OHIP-14 scores is also given.

5.6.1 Oral attributes

Table 5.22 the prevalence of oral attributes among the KNH participants. There were statistically significant changes observed for painful ache in the mouth (McNemar $p<0.05$) and sleep disruption (McNemar $p<0.05$) among between baseline and review 2.

Table 5.22: Attributes to the effect dimensions of oral health-related quality of life for KNH by phase (n=102)

	Phase			
Attribute	**Baseline %**	**Review 1 %**	**Review 2 %**	**P value**
Difficulty with speech	6.7	6.7	4.6	0.64
Sense of taste worse	13.6	9.0	9.2	0.12
Painful aching in the mouth	34.8	16.9	13.8	0.00*
Sleep interruption	22.5	5.6	4.6	0.00*
Uncomfortable to eat food	11.2	5.6	2.3	0.13
Self-conscious	7.9	3.4	1.1	0.22
Felt tense	5.6	3.4	2.3	0.63
Difficult relax	4.5	3.4	1.1	0.59
Embarrassed	4.5	3.4	2.3	0.84
Life less satisfactory	4.5	3.4	0	-
Avoid smile because of teeth	5.6	3.4	0	-
Diet less satisfactory	8.0	3.4	0	0.15
Interrupted meals	10.1	2.2	0	-
Irritable to others	0	3.4	1.1	-
Difficulty doing usual jobs	2.2	2.2	0	-
Reduced participation in social activities	4.5	2.2	0	-
Days off	2.2	2.2	0	0.71
Total unable to function	1.1	2.2	0	-

McNemar p-value between baseline and review 2. There was a statistical change in the prevalence of Painful aching in the mouth and sleep interruption between baseline and review 2.

Table 5.23 shows the prevalence of oral attributes for MDH by phase. There was no significant change in the oral attributes during the study period.

Table 5.23: Attributes to the effect dimensions of oral health-related quality of life for MDH by phase (n=93)

	Phase			
Attribute	**Baseline %**	**Review 1 %**	**Review 2 %**	**P value**
Difficulty with speech	8.6	7.7	7.6	0.66
Sense of taste worse	38.7	38.5	39.1	0.96
Painful aching in the mouth	37.6	38.5	38.0	0.99
Sleep interruption	26.9	26.4	27.2	1.00
Uncomfortable to eat food	19.4	18.7	18.5	1.00
Self-conscious	8.6	7.7	8.7	1.00
Felt tense	7.5	7.7	7.6	1.00
Difficult relax	6.5	6.6	6.5	1.00
Embarrassed	6.5	6.6	6.5	1.00
Life less satisfactory	4.4	3.9	2.2	1.00
Avoid smile because of teeth	5.4	5.5	5.4	1.00
Diet less satisfactory	4.3	4.4	3.3	1.00
Interrupted meals	3.2	3.3	4.4	1.00
Irritable to others	3.2	3.3	3.3	1.00
Difficulty doing usual jobs	3.3	3.3	3.3	1.00
Reduced participation in social activities	3.2	3.3	3.3	1.00
Days off	2.2	2.2	2.2	1.00
Total unable to function	2.2	2.2	2.2	1.00

5.6.4: Oral health Impact Profile (OHIP-14) change scores

Overall, the effect size for the KNH participants was 0.28 and zero for MDH participants. A large effect size was observed in the physical pain subscale which was large (0.96). The social disability and physical disability subscales showed moderate effect size (0.35 and 0.27 respectively for KNH participants. There was only a small effect size of 0.02 in the functional limitations subscale for MDH participant (Table 5.24).

Table 5.24: Change in Oral Health Impact Profile scores by site between baseline and review 2 (KNH n=102, MDH n=93)

OHIP-14 subscales and questions	*Site*	*Baseline mean(SD)*	*Follow up mean(SD)*	*Change Score(SD)*	*Effect Size*
Psychological discomfort	KNH	0.17(0.51)	0.08(0.37)	0.09	0.18
Self conscious	MDH	0.16(0.05)	0.16(0.05)	0.00	0.00
Felt tense					
Psychological disability	KNH	0.13(0.46)	0.08(0.37)	0.05	0.11
Difficult relax	MDH	0.13(0.47)	0.13(0.47)	0.00	0.00
Felt embarrassed					
Handicap	KNH	0.06(0.46)	0.01(0.10)	-0.04	0.09
Life less satisfying	MDH	0.65(0.29)	0.65(0.29)	0.00	0.00
Totally unable to function					
Physical pain	KNH	0.47(0.27)	0.21(0.48)	0.26	0.96
Painful ache in the mouth	MDH	0.57(0.77)	0.57(0.77)	0.00	0.00
Uncomfortable to eat food					
Social disability	KNH	0.03(0.17)	0.20(0.48)	-0.17	0.35
Irritable to others	MDH	0.65(0.36)	0.65(0.36)	0.00	0.00
Difficulty doing usual jobs					
Physical disability	KNH	0.17(0.49)	0.04(0.24)	0.13	0.27
Diet less satisfactory	MDH	0.08(0.37)	0.08(0.37)	0.00	0.00
Interrupted meals					
Functional limitations	KNH	0.20(0.47)	0.14(0.35)	0.06	0.13
Trouble pronouncing words	MDH	0.48(0.64)	0.47(0.68)	0.01	0.02
Sense of taste worse					
Total OHIP-14 score	KNH	1.10(2.11)	0.50(1.33)	0.6	0.28
	MDH	1.55(2.61)	1.53(2.56)	0.02	0.00

There was a moderate effect size for KNH participants

Table 5.25 gives Oldham's correlation between change in gingival inflammation and change in Oral Health-Related-Quality of Life subscales for intervention group. Psychological discomfort, psychological disability handicap and functional limitations displayed significant correlation with change in gingival scores. All the other sub-scales did not display significant correlation.

Table 5.25 : Oldham's correlation for oral health impact profile of life and gingival score among KNH participants

OHIP-14 subscales	r^2	*P=value*
Psychological discomfort	0.219	0.00*
Psychological disability	0.211	0.00*
Physical pain	0.001	0.99
Handicap	0.200	0.01*
Social disability	0.086	0.24
Physical disability	0.038	0.60
Functional limitations	0.244	0.00*

* There was a significant correlation between change in gingival inflammation and *psychological discomfort* , psychological disability, handicap and functional limitations

CHAPTER 6

DISCUSSION

This chapter discusses the methodologies used and the results obtained on the impact of oral health education on oral health factors relating to Oral Health-Related Quality of Life (OHRQoL) of persons living with HIV/AIDS (PWLHA). Section 6.1 looks critically at the study methodologies, while section 6.2 discusses the study findings.

6.1 Overview of the study methods

6.1.1 Sample size determination and study design

Determining a minimum sample size is important to avoid wastage of resources when the sample is too large, or inaccurate results when the sample is too small[99]. Sample size calculations are usually influenced by the study design, purpose of the study, degree of variability, level of confidence and level of precision[100].

Hussey et al. (1997) [101] defined study design as the "science and art of planning procedures for conducting studies so as to get the most valid findings". A study design is used to give a detailed plan used to guide and focus the research exercise. The main objective of the current study was to determine the impact of oral health education on knowledge, oral hygiene practices, oral hygiene status, oral health status and subsequently OHRQoL. This was done by evaluating an intervention and non-intervention group for oral health knowledge, oral health seeking behaviour, sugary intake, oral hygiene practices, oral health status and OHRQoL at baseline. This was followed by oral health education for the intervention group on one on one basis and re-

evaluation of the participants at intervals of three and six months for all the baseline variables. This is in line with the National Institute for Clinical Excellence guidelines for dental recall where they recommend a recall at three and six months[102]. The non-intervention group received no education but was similarly evaluated at three and six months. Both the intervention and non-intervention group were sampled from two different centres. The recruitment was conducted during the same period. This explained the larger sample for the KNH participants. Collecting data in both sites over the same period protected against the effect of disease maturation.

To answer the research questions, a quasi-experimental study design was considered suitable because it takes care of the threats associated with non-experimental designs such as validity[103]. This study design has been found appropriate for use when there is concern that having both intervention and non-intervention groups in the same facility would result in contamination. Given the environment for the current study, the approach adapted was to use one facility (KNH) as the intervention group and the other (MDH) as a non-intervention group. The design involved a pre-test, followed by the intervention and then a post-test for the intervention group. For the non-intervention group, the same pre-test and post-test were given but there was no intervention.

In the current study, a non-equivalent non-intervention group was used. This is recommended where study areas are not chosen randomly[104]. The non-equivalent non-intervention group design is good when a program is introduced in one area and its effects compared against a similar area in the neighborhood but not necessarily equivalent. The non-equivalent group protects against history, maturation, testing and instrumentation as sources of invalidity[104]. However, because the study areas are not

randomly selected with respect to intervention and non-intervention groups, selection bias cannot be ruled out completely. By comparing the pre-test and post-test measures on selected effects or major differences between the intervention and non-intervention groups might explain differences or lack of differences in the experimental and control group after the intervention[104]. In the current study, it was possible to demonstrate change in various variables between baseline and follow-up period for the intervention group while controlling for the effect of maturation, testing and instrumentation using the non-intervention group.

6.1.2 Sampling method

In order to obtain a representative sample, systematic random sampling method was used. This method was adapted because of good spread across the population and its simplicity. Systematic random sampling method is useful when units in sampling frame are not numbered serially and when a sampling frame consists of a very long list[104]. In both centres (KNH and MDH) the participants reported consecutively everyday. There was no pre-determined order on how they reported, hence systematic random sampling method was used.

6.1.3 Ethical considerations

The basic requirement of clinical trials is comparison between the intervention and non-intervention groups. In their most exacting form, they call for concurrent 'non-intervention', which is group with corresponding characteristics to the intervention group

but not given the "special treatment". The ethical question at hand is whether it is proper to withhold from the controls a treatment that might perhaps give them benefit. On the other hand there must be some basis for withholding treatment for the non-intervention group. It is the responsibility of the researcher to the participants and requirements of the trial to clearly and very considerably define what is at stake. It might be impossible to withhold, even temporarily, any treatment for a disease in which life or death or serious after-effect are at stake[104].

However, in the present study, which broadly sought to find out the influence of oral health education on specific oral diseases, and, consequently its impact on the OHRQoL of PLWHA, the ethics of using a rigid controlled group did not put the participants at risk since the non-intervention group were not in a different situation from all such patients suffering from oral diseases. The participants in the non-intervention group were thus not specifically disadvantaged. Furthermore, by being selected in the study, the participants in the non-intervention group requiring urgent dental attention were referred for treatment immediately. They therefore benefitted more than if they had not been participants in this study. The use of any other form of trial would probably have been less informative and thus would not have achieved the objectives of this study. The participants in the non-intervention group received health education after it was found that oral health education led to improved oral health status and Oral Health Related Quality of Life.

6.1.4 Data analysis

It is crucial that randomized clinical trials are not only well designed but also well conducted and analyzed if the possibility of systematic errors is to be avoided. An

important first stage in the analysis is to work out the flow of the number of participants at enrolment, follow-up and analysis. This helps in understanding the external validity of the study since the dropout rate may lead to a sample that is no longer representative of those eligible for the intervention.

Baseline information collected at enrolment is used to describe the characteristics of the participants, demonstrate that randomization has led successfully to comparability of the treatment and controls, adjust treatment effects for variables strongly related to the outcome and carry out subgroup analysis. Thus the characteristics of the participant should not vary significantly between the baseline and follow-up. Significant tests for baseline differences between the study groups are inappropriate, since non-significant imbalances of a strong predictor will have more effect on the results than significant imbalances on factors unrelated to the outcome[104]. This should be so because demographic variables could act as confounders thus affecting the relationship between independent and dependent variables. In this study, there were no statistically significant differences between demographic characteristics at baseline and at the follow-up period. The criteria that the characteristics of participants should not vary significantly during the study were therefore met.

In the current study "complete cases analysis" method was used where only participants who completed the study were included in the analysis[105]. This method is used when data are missing data at random (MCAR). In the current study, the demographic variable at baseline and review 2 did not vary significantly (Table 5.1).

6.1.5 Research instruments and indices

Questionnaire:-

The questionnaire was in two parts: Part 1 evaluated the oral health knowledge, oral hygiene practices, sugary intake and oral health seeking behaviour. Part 2 evaluated the oral health-related quality of life (OHRQoL) using OHIP-14 (Oral Health Impact Profile-14)

Part 1: Assessment of oral health knowledge, oral hygiene practices, sugary intake and oral health seeking behaviour

Assessment of the change in knowledge, oral hygiene practices, oral health seeking behaviour and sugary intake was done using an interviewer-administered standardized semi-structured WHO questionnaire[96]. It is well known that the information gained through such means is valid to a large extent but that validity of the questionnaire may be influenced by the wording. In the current study, the questionnaire was pre-tested and a debriefing done to ensure that the respondents understood the questions correctly. During the debriefing, the respondents were asked by the interviewer about their understanding of questions that were likely to be misunderstood or appeared to cause difficulties during the interview and a clarification was given. In this way, therefore, it was possible to get reliable answers for all the questions during actual data collection.

Furthermore, the questions were asked in English, a language the participants understood well.

Part 2: Assessment of the oral health-related quality of life.

The Oral Health-related Quality of Life (OHRQoL) was assessed using the Oral Health Impact Profile-14 (OHIP-14). This instrument is a shortened version of OHIP-49 developed by Slade and Spencer in 1994 [97]. The OHIP-14 is directly based on a conceptual model developed by Locker in 1988[106] and has demonstrated high stability, internal consistency, good construct and discriminant validity[107,108]. It is also sensitive to detection of short-term change in quality of life after clinical intervention[109]. The OHIP-14 has been shown to have a significant association with self-rated oral health status and satisfactory psychological well-being[110].

Cross-cultural adaptation procedures are critical components of the validation of a research instrument developed in a different target population. The first priority when developing a questionnaire is to assess the extent to which the concepts and dimensions hypothesized are universal. A minimum requirement for international validity and reliability is a clear factor structure replicated across countries with the same items and comparable variance[110]. The question in the OHIP-14 is phrased as follows "Because of the state of your teeth, have you experienced any of the following problems during the past year?" The wording "state of teeth" may give the impression that the oral health quality of life was assessed from the status of the teeth only. However, in posing the question to the participants in this study, it was made clear that their own

assessment of the status of their oral health should also involve the soft tissues (gums, palate, tongue) as well.

Clinical examination:-

Assessment of oral hygiene and oral health status: Scoring for plaque, gingival inflammation, calculus and caries were done using the basic methods described in the WHO oral health survey (1997)[96]. These are methods that have been used and validated by WHO universally. Diagnosis of dental caries was done using the DMF(T) index. DMF(T) is a general indicator of dental health in a population. However, incipient dental caries not visible to the naked eyes, secondary caries below fillings and interproximal caries may have been missed since no x-rays were taken. It is widely acknowledged that technical and logistical reasons preclude taking X-rays in epidemiological studies of this nature.

Gingivitis manifests clinically as swelling, redness and often bleeding of the gingival margin. It is diagnosed clinically by visual inspection and tactile examination. The presence and degree of inflammation are assessed based on a combination of redness, swelling and presence or absence of bleeding on gentle probing of the gingival sulcus. Various indices can be used to give numerical value to the degree of inflammation in the clinical situation. A simple bleeding index by Loe and Silness (1963) [111] was used in the current study. It has been shown to be most useful in determining the degree of gingival inflammation in research and is the most commonly used method in assessing and quantifying gingivitis[111]. The participants from KNH (intervention group) with the dental problems were advised to visit a dental clinic for treatment as soon as possible.

6.2 Discussion of the study findings.

Socio-demographic characteristics

In the current study, there were more females (66.2%) than males (33.8%). This is a reflection of the prevalence of HIV infection which has been reported to have a higher female to male ratio of 1.9:1[28]. Most of the participants were in the 31-40 year-age group. This probably reflects the current HIV infection epidemiology in Kenya and elsewhere in Africa where the peak prevalence of the disease is 35-39 years[28,61,112].

Most (65.3%) of the participants were married. Studies have identified marriage as a risk factor in HIV transmission in populations where the prevalence of the disease is high. Within-marriage transmission is thought to be due to extra-marital incidences[113]. It could also be an indicator of the population structure where most of the persons in the general population are married[23]. Almost all the participants (97.6%) had been to school. This correlates closely with data from the Kenya National Literacy Survey which shows literacy levels to be 94% and 91% for males and females respectively[114]. Majority (63.9%) of the participants were in the informal sector as compared to 26.2% in formal employment. In Kenya, the informal sector has been reported to contribute 63% of all employment[114].

CD4 cell count and ARV therapy

All participants in this study were confirmed to be HIV positive through serology (ELISA test and Western blot) before enrolment. This information was readily available from their clinical records. The literature shows that CD4 cell counts have a relationship with gingival inflammation. It has been shown that a decrease in CD4 cell count is

associated with an increase in gingival bleeding. The patients with a CD4 cell count < 200 cells/mm^3 have a higher prevalence of gingival inflammation than those with a CD4 cell count of >200 cells/mm^3 [53]. In the present study, CD4 cell count was identified as a confounder for gingival inflammation.

The participants were grouped into two categories: those with a CD4 cell count of less than 200 cells/mm^3 and those with a CD4 cell count of 200 cells/mm^3 and above. This categorization was based on the Centres for Disease Control (CDC) clinical guidelines. It is the cut-off point for entry into ARV therapy in asymptomatic patients[8].

Over 60% of the participants at KNH and MDH had a CD4 cell count of less than 200 cells/mm^3 at enrolment. This observation was similar to that by Koech et al. 2008[61], who found that 64% of participants at KNH had a CD4 cell count of less than 200 cells/mm^3. The high proportion of participants with a CD4 cell count of less than 200 cells/mm^3 may indicate that most of the PLWHAs sought treatment when the disease progression was already fairly advanced.

The use of HAART has been found to reduce the prevalence of HHV-8, KS and OHL[36, 38, 67]. In the current study, 49.7% of the participants were on ARV therapy. This is in agreement with a Kenyan study by Koech et al. 2008[61] which showed that 57% of the participants were on ARV therapy, and with a WHO report which showed that 60% of patients in South Africa were on ARV therapy [115]. One of the guidelines for starting ARV treatment is a CD4 cell count of less than 200 cells/mm^3. Most of the participants were on first line regimens. This could be due to the fact that currently, the first line regimen is

the standard antiretroviral therapy. The drugs are available free of charge and are accessible to majority of the patients.

Though CD4 count had identified as a confounder during literature review [37,38]. In the current study there was no statistically significant association between CD4 cell count and gingival inflammation (Table 5.15). Therefore it was not controlled for during regression analysis (Table 5.17).

Effect of oral health education on oral health knowledge.

Dental education is an important strategy in controlling periodontal diseases provided it is implemented in a relatively simple. The aimed should be to modify or at best chang the participants daily oral health habits. However, there are inadequate research findings to support such efforts. This is due to failure to include evaluation of these activities; enthusiasm often taking precedence over scientific assessment[77]. Nevertheless, awareness on the prevention of oral diseases is important and can influence dental behaviour[72].

At baseline, the participants had poor oral health knowledge on the causes and prevention of dental caries and periodontal diseases. Previous studies have reported poor knowledge on oral health among the general population in Kenya[20, 116]. The poor knowledge could possibly be due to lack of oral health education programs in the country. In this study, health education resulted in significant improvement of the participants knowledge on definition, causes and prevention/control of periodontal diseases and dental caries (Tables 5.5, 5.6), this is in line with other studies which have

demonstrated improvement in oral health-related knowledge following oral health education[78,117] These findings demonstrate that simple intervention can result in significant change in oral health knowledge. However, proper oral health knowledge was not achieved by all the KNH participants after the intervention and there was need to reinforce oral health education at the subsequent visit to achieve optimal levels of knowledge.

Effect of oral health education on oral hygiene practices.

A large number of surveys in different parts of the world have found brushing to be one of the best ways to maintain good oral health[118,119,120]. In the current study 96.9% of the participants said they brushed their teeth at enrolment. This finding is similar to other studies where over 90% of the participants reported that they brushed their teeth [121,122]. Although it is universally accepted that tooth brushing is the primary means of maintaining good oral health, most people brush their teeth for social reasons[120]. Studies have recommended that adults should brush their teeth at least twice a day [118,119,120]. In the current study the number of participants who brushed their teeth at least twice a day increased significantly for the KNH participants from 50% to 86.3% between baseline and review 2 (Table 5.7). The change for MDH participants was not significant. Oral health education on one-on-one basis was therefore considered to be a viable strategy in improving brushing habits among PLWHA. The hypothesis that oral health education does not lead to improved oral health knowledge which in turn does not lead to improved oral hygiene practices was rejected.

At enrolment, majority of the participants (84%) said they had brushed their teeth on the morning of the clinical examination, 38.9% had brushed the previous evening and

10.8% had brushed the previous afternoon. This brushing pattern could be attributed to the fact that most people brush their teeth in the morning for social status and on the basis of what other people will think about them instead of brushing to prevent occurrence of oral diseases and conditions[120]. Moreover most people do not have access to their brushing aids at lunch time since they are away from home.

After intervention, the proportion of participants brushing in the morning and evening increased significantly for KNH participants (Table 5.7). This was in line with the emphasis placed on brushing at least twice a day (in the morning and before going to bed) during the health education sessions. This improvement in the pattern of brushing translated to better oral hygiene among the intervention group (fig 5.6). The hypothesis that improved oral hygiene practices does not lead to improved oral hygiene status among PLWHA was rejected.

Effect of oral health education on the intake of sugary diet.

Sugar is one of the risk factors for development of dental caries and periodontal disease. PLWHA have an increased demand for energy and may have been encouraged to consume sugary foods to meet these demands. Over half of the participants said they consumed sugary foods at baseline. The results showed that the participants from MDH were more likely to take sugary food as compared to KNH participants at baseline. The reasons for this observation was not clear.

There was a reduction in the proportion of participants who consumed sugary food at both KNH and MDH between baseline and review 2, although there was no intervention at MDH. A study by Petersen et al.[123], also found a reduction in sugary intake among

the intervention and non-intervention groups. The slight decline in sugary intake among the non-intervention group could have been due to halo effect of the study on the group. In the current study only the KNH participants demonstrated a significant reduction in sugary intake (Table 5.12). This was attributed to health education. This would translate to reduction in caries experience though it was not possible to demonstrate it in the current study due to time factor.

Effect of oral health education on oral health seeking behavior

Access to regular dental care is essential in the management of HIV infection-related oral diseases [79]. It is generally recommended that everybody should visit a dental clinic at least every six months. In the current study, 67.5% of the participants said they had ever visited a dental clinic but only 5.8% visiting regularly. Dental visits are usually made for symptomatic rather than preventive reasons. Most people in developing countries visit a dental clinic only when they have symptoms (especially pain) rather than for routine dental check up[80, 81, 117, 124].

In this study, oral health education was aimed at changing oral health seeking behavior of the participants. All participants from KNH were informed of their dental needs and advised to seek treatment as soon as possible. A positive improvement would have been shown by an increase in the new visits made by the participants in the six months of intervention period. However, only two participants from KNH who had never visited a dental clinic did so during the six months of intervention. All the other participants did not visit a dental clinic even after being advised to do so. This finding, therefore demonstrated a negligible impact of oral health education on the oral health seeking behaviour of the participants in the span of six months. The reasons for not seeking

treatment could be related to issues such as HIV/AIDS stigma, cost of treatment and the short span of intervention period. It is also likely that the participants concerned with their HIV status were overriding those related to their oral health.

Overall, the level of satisfaction with dental treatment was 43.5% among those who had visited a dental clinic at enrolment. In a study conducted in USA, 86% of the HIV positive persons were satisfied with dental treatment[125]. The low levels of satisfaction in the current study could be due to poor oral health knowledge and inadequate dental services in Kenya as compared to the USA. In the current study the main reason for satisfaction visits to the dental clinic was pain relief. Studies have reported that most dental visits are due to pain[126]. Thus once the pain is relieved, the patients feel their needs have been met. For the patients who were not satisfied with treatment, the main reasons was fear of injection of local anaesthesia and long waiting time in the dental office. A study by Calnan et al.[127] indicated the main reason for not being satisfied was the poor quality of treatment and attitudes of staff. This could reflect different attitudes of patients towards oral health care providers in the different regions[128]. For the participants who had not visited a dental clinic at enrolment, the main reason for not visiting was because of their HIV status. This did not change at review 1 and review 2 for both KNH and MDH since only two participants visited the dental clinic during the period. Studies have reported that people with HIV infection may have limited access to dental services due to discrimination[129]. HIV is known to be a stigmatized disease. Stigma by self, public and clinician needs to be addressed so that PLWHA can go about their daily lives including visits for dental care, with confidence.

Effect of oral health education on oral hygiene status and gingival inflammation.

The mean plaque scores decreased significantly from 0.89 to 0.15 for the KNH participants (Table 5.14). This concurs with other studies where mean plaque scores decreased after oral health education[79,80]. Suggesting that improved oral hygiene practices after oral health education lead to improved oral hygiene status.

At baseline 46.4% of the participants at KNH and MDH had gingival inflammation. Studies by Butt et al.[5] among hospitalized HIV patients in Kenya and Goddard et al.[126] among HIV positive American Indians showed that 100% and 55% of the patients respectively had gingival inflammation. However, a Tanzanian study[45] showed that gingival inflammation was absent among HIV positive individuals. The difference could be due to variations in immunological status[39] of the study populations, oral hygiene practices or the studied sample's environment. For example in the Butt et al. study[5], the participants were admitted in hospital which could have negatively affected their oral hygiene practices or the extreme ill-health could have made it challenging to practice optimal oral hygiene measures.

Gingival bleeding is commonly used to partly evaluate oral health status. In the current study, gingival scores improved significantly among the intervention group after oral health education (Table 5.16). The greatest improvement was observed between baseline and review 1, suggesting that the major impact of oral health education on gingival inflammation occurred after the initial education rather than after subsequent visits. Other studies have reported a reduction in gingival scores after oral health education programs [78,80]. The present findings imply that oral health education can be used as a strategy for reduction of gingival inflammation in PLWHA at least in the short

term. However, longer follow-up periods would be necessary to see to what extent the gains in gingival scores would be maintained.

The mean gingival scores reduced from 0.66 to 0.11 for the KNH participants between baseline and review 2 (Table 5.16). Hofer et al.[68] observed a change from 1.6 to 1.4 after 4 months of intervention in a Brazilian sample of PLWHA. Although in both studies there was a reduction in the mean gingival scores, the changes in the current study were higher. The bigger changes observed in the current study could probably be explained by the fact that health education was done on a one-on-one basis whereas in the Brazilian study the education was give on a group basis.

Odhams regression demonstrated that change in mean gingival score was a significant predictor of gingival inflammation (Table 5.17). This demonstrated a strong association between plaque and gingival inflammation among PLWHA. The odds ratio for having gingival inflammation in the presence of plaque at baseline was 7.0 while at six months the odds ratio was 39.0 among the intervention group. Studies done among PLWHA have reported an odds ratio between plaque and gingival bleeding ranging from 0.24 to 66.6[130]. The change in the odds ratio could be because of the change in the brushing habits where there was an improvement in the proportion of participants who brushed their teeth in the evening. This could have led to a better correlation between presence of plaque and gingival inflammation unlike at baseline where they brushed their teeth in the morning.

Linear gingival erythema (LGE) was encountered among two (1.02%) participants at baseline, review 1 and review 2. The two had good oral hygiene. A study by Alejendro

at al. 2000[131] reported a prevalence of LGE of 0.65% among participants on HAART. LGE has been reported to show a strong association with a decrease in the CD4 cell count even with good oral hygiene. However due to limited numbers of participants with LGE, the current study could not assess the relationship between LGE and oral hygiene.

Effect of oral health education on oral mucosal lesions

There was a reduction in the proportion of PMC, EC and angular chelitis among the KNH participants after health education (Table 5.21). This is in agreement with a study by Hilton et al. 2004[132], in which the rate of *candidal* infection reduced following improved oral hygiene. The change in these lesions could be attributed to the fact that they are fungal infections and *candida* levels are known to reduce with proper oral hygiene[133].

The prevalence of Kaposi's Sarcoma (KS) did not change during the study period. This could be because of the nature of the lesions. They may fail to resolve even with specific treatment such as chemotherapy or surgery.

Effect of oral health education on dental caries, calculus and prosthetic status.

In the current study, the prevalence of dental caries was 55%. This was higher than the prevalence reported by Tukutuku et al. 1998 (32%)[7] among PLWHA in Zaire. Oral health education did not have a significant effect on caries experience during the six months intervention period. This in line with a report by Petersen et al. 2004[123], where no positive effect on dental caries experience was demonstrated by an oral health

education programme. Unless in its very early stages and with the presence of fluoride, dental caries is an irreversible disease. It may take a long time to develop depending on the carious challenge. Once the carious lesion develops, it will not resolve with education alone without some form of treatment. No form of invasive treatment was offered to the participants as part of the intervention strategy in the current study.

The major component of the DMF(T) was decay (Table 5.19), reflecting high unmet treatment needs among MDH participants. The decay and missing components were high for KNH participants. This is in line with studies done in many African countries, where access to oral health care is limited and carious teeth are left untreated or are extracted to alleviate pain and/or discomfort. Losing teeth is still seen as a natural consequence of ageing [80,81,82,134].

There was no change in the mean decay (D), missing (M) and filled (F) DMF(T) components. This could be explained by the fact that only two participants sought dental care after health education. If many had sought treatment for dental caries , then this may have led to a decrease in the decay (D) component and an increase in either one or both components of missing (M) and filled (F) teeth

The mean calculus score reduced significantly from 1.28 to 0.43 for the intervention group after health education (Table 5.18). This concurs with a study by Kowash et al. [133] where the mean calculus score reduced significantly after oral health education. The reason for this could be that after brushing parts of the soft calculus were dislodged from the tooth surface.

Tooth replacement is important to restore function and aesthetics. Although 41% of the participants had lost their teeth and needed replacement only 5% had dentures. A study done in Tanzania[135], found only 4.7% of the adults wore partial dentures out of 39% who needed tooth replacement. A study done in Singapore[136] among dentate patients found that 78% of the patients requiring dental prosthesis did not have any. In the current investigation, none of the participants had a denture inserted during the study period. This could be attributed to the relatively high cost of dental prostheses or attitudes toward replacement of teeth. Most of the participants were probably not embarrassed or self-conscious due to their missing their teeth (Tables 5.22, 5.23) this could be due to the fact that majority had lost posterior teeth. This means that they lacked a psychological need (aesthetic need) for the tooth replacement. It was also noted that majority had lost only a few teeth and hence their masticatory function was not severely compromised.

Impact of oral health education on Oral Health-related Quality of Life (OHRQoL) of PLWHA.

In the sub-Saharan Africa, the burden of oral diseases and illness is growing as a social and public health problem. Poor oral health-related to HIV seropositive persons represents a double burden particularly to people living in deprived communities[2]. Not only do oral diseases negatively impact on quality of life, causing pain and suffering but PLWHA often face social stigma because of their appearance and at times foul smell. In addition, this group of people is often under-served in oral health care facilities as they are often ignored or neglected by dentists[137].

Traditional methods of measuring oral health status focuses on the presence or absence of disease and not gathering information on the well being of the people (in terms of how they feel about their mouth). These measures are not suitable for advocacy at political level since they do not give the impact of the problem on individual's daily life. Oral Health Impact Profile (OHIP) is more appreciated by policy makers in terms of impaired quality of life than clinical indices.

The broad aim of this study was to investigate the effect of oral health education on oral health-related quality of life. The intervention carried out was not meant to determine directly the relationship between oral health education and OHRQoL. This could not be elucidated by the design of the present study. Rather, the intention was to assess whether or not there were changes in specific indicators of oral health that could accrue from oral health education and to what extent the changes influenced the OHRQoL of PLWHA. In this way, it was postulated that the hypotheses set forth in the study touching on the relationship between oral health education and OHRQoL could be investigated.

The current study (Table 5.5, 5.6,) it was observed that improved oral health knowledge after intervention led to an increase in the proportion of participants who brushed their teeth at least twice a day (Table 5.7, 5.8, 5.9), which supports the view that proper oral hygiene practices can be attributed to good knowledge of oral health.

The increased proportion of participants brushing at least twice a day was significantly associated with improved oral hygiene (Table 5.14, Fig 5.6). As shown in table 5.17,

the mean plaque scores translated to reduction in gingival scores. It was also demonstrated that plaque was the primary aetiological factor in gingival inflammation.

In the present study, slightly below half (48.2%) of the participants had an oral health-related attribute at baseline. A study done in Uganda among HIV positive individuals, found that 68.4% of the participants had an oral health attribute [137]. This high prevalence of PLWHA complaining of oral attributes could be a reflection of unmet treatment needs this group of people. The main oral attribute in the current study was pain (35.6%). In a study done by Guteta S et al 2008[138] the main attribute was difficulty eating (27.9%), followed by oral pain (27.3%). This could be due to difference dietary habits in the two study groups

After the intervention there was reduction in all the oral attributes among the KNH participants. There was a significant reduction in the proportion of participants who had sleep disruption and painful ache in the mouth between baseline and review 2 (Table 5.21). In the current study, the overall effect size was moderate (Table 5.24) for the KNH participants. There was no effect size for the MDH participants. This shows that although oral health education had positive effects on OHRQoL, education might not eliminate all oral attributes.

Following intervention, a large effect size was recorded among the KNH group (Table 5.24) for the physical pain sub-scale while the social and physical disability subscale had moderate effect size. The reduction in gingival inflammation (Table 5.14) able and oral mucosal lesions (Table 5.21) may explain the reduction in pain and physical disability sub scale. The improvement observed in the social sub-scale may be due to

improved confident in the oral health after brushing and observing this change since they were trained to check if their gingiva was inflamed or not.

In the current study, the mean plaque scores decreased significantly from 0.89 to 0.15 and gingival scores improved significantly from 0.66 to 0.11 among the intervention group after health education (Tables 5.14 and 5.16). These findings supported the hypothesis that oral health education led to improved Oral Health-Related Quality of Life of PLWHA.

Odhams correlation showed that changes in psychological discomfort, psychological disability, handicap and functional subscales were significantly correlated with change in gingival inflammation (Table 5.24). The association between reduction in gingival inflammation at psychological and functional may be explained by the fact that once the inflammation reduced, the discomfort when eating reduced and they were able to chew better than before the intervention.

The current study has contributed worthwhile information about the impact of oral health education on the OHRQoL of PLWHA. In this study, oral health education was given by a public health specialist, on one on one basis with participants. This can be duplicated in various dental clinics where PLWHA may seek dental treatment. Under these circumstances, the person giving the oral health education does not necessarily have to be a public health specialist. The information can be given by a dental nurse, oral hygienist or community oral health officer. Although oral health education given by persons who are not public health specialist, may seem to be a challenge from a public health point of view, there is need to be explored it since the aim is usually to reach a

wider audience with minimum cost and time and currently there are few public health specialists and it will also not be cost-effective to use this cadre to give oral health education to a large number of PLWHA. This may mean training of other cadres to give oral health education.

Limitations of the study

1. Being a quasi-experiment, representativeness of the population may have been weakened. At the same time it was not possible to fully control contamination since the participants were not confined. This may lead to an overestimation of the impact of the intervention.

2. Since no radiographs were taken during the study. Though acceptable in field research due to cost and unnecessary public exposure to X-rays since the rooms where data is collected is not protected, it might there may have been underreporting of dental caries.

CHAPTER 7

CONCLUSIONS AND RECOMMENDATIONS

7.1 Conclusions

The study analyzed the interplay between oral health education, oral health knowledge, oral hygiene practices, oral health status and oral health-related quality of life. Based on the findings of the study, it can be concluded that:-

1. Oral health education led to better oral health knowledge. This in turn led to improved oral hygiene practices, improved oral hygiene and reduction in the prevalence and severity of gingival inflammation. Therefore, oral health education is a viable strategy in reduction of gingival inflammation.

2. There was a strong positive correlation between plaque and gingival inflammation. Although 76% of the reduction in gingival bleeding could be explained by the reduction in plaque scores, the other 24% could not. This suggests that although plaque was a major factor in the aetiology of gingival inflammation, there were other factors that played a part in its occurrence.

3. Relatively simple oral health education resulted in a moderate effect size on Oral Health Impact Profile among the intervention group. This showed oral health education can improve Oral Health-related Quality of Life (OHRQoL) among PLWHA.

4. Correlation showed a significant association between the reduction in gingival bleeding and improvement in physical discomfort, psychological disability and functional disability sub-scales of the OHIP-14.

5. Oral health education is a viable strategy for improving OHRQoL of PLWHA.

7.2 Recommendations

Based on the findings of the current study, it can be recommended that,

1. Since a well structured oral health education programme can create improved oral health status and Oral Health-related Quality of Life (OHRQoL) among PLWHA, there is need to introduce and integrate oral health education intervention in the overall health plan for PLWHA.

2. In areas where there is scarcity of resources, intervention using oral health education on one on one basis alone can be a worthwhile measure that can be implemented to enhance Oral Health-related Quality of Life (OHRQoL) among PLWHA.

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Appendices

Appendix 1: Questionnaire

The questionnaire is in two parts: **Part 1 evaluates the oral health knowledge, oral health seeking behaviour sugary intake and oral hygiene practices while part 2 evaluates the Oral Health-Related Quality of Life (OHRQoL) using OHIP-14**

PART 1:

ORAL HEALTH KNOWLEDGE, ORAL HEALTH SEEKING BEHAVIOUR SUGARY INTAKE AND ORAL HYGIENE PRACTICES

Identification number_____Sex_____Geographic Location _____

Age in years as at last birthday.....Level of Education.....

Marital status.....Occupation .....

CD 4 cell count_____

Are you on ARV treatment yes_____ no _____

Type of ARV drugs _____

---

1. Are your teeth important to you? ☐
   i. No
   ii. Yes
2. False teeth are
   i. Better than natural teeth
   ii. Stronger than natural teeth ☐
   iii. Less functional than natural teeth
   iv. Do not know

The following questions seek to find out how much you know about oral health.

3. Plaque is
   i. The name of a tooth
   ii. A common name for dirt on tooth surfaces
   iii. A name of a disease
   iv. Bacterial/germ deposits on tooth surfaces
   v. Do not know

4. Dental caries/tooth decay is
   i. The name for the disease which causes holes in the tooth surface
   ii. The name of an instrument used in the dental clinic
   iii. All the above
   iv. Do not know

5. Bleeding of gums is usually caused by
   i. Eating hard food
   ii. Plaque present near the gums
   iii. All the above
   iv. Do not know

6. Calculus/tartar is
   i. A part of the jaw bone
   ii. Hard deposits on the tooth surface
   iii. All of the above
   iv. Others, specify

v. Do not know

7. Plaque can best be removed by

i. Going to the dentist or dental therapist regularly

ii. Cleaning one's teeth daily

iii. Rinsing the mouth with water

iv. Rinsing with a mouth wash

v. Do not know

8. You should change your toothbrush

i. After 3-4 months

ii. After one year

iii. When the bristles start to bend

iv. When the bristles are getting discoloured

v. Do not know

vi. Others specify_____

9. Tooth decay is caused by

i. Germs destroying the tooth surface

ii. Eating too much spicy food

iii. Fermentation of sugars at the tooth surface

iv. Do not know

10. Does eating sweets frequently during the day harm the teeth

i. No

ii. Yes

iii. Do not know

11. Tooth decay can be prevented by

i. Limiting the amount of sugar consumption

ii. Use of fluoride toothpaste

iii. Carrying out a proper oral hygiene

iv. All the above

v. Do not know

12. Healthy gums appear

i. Red and shiny

ii. Pink and firm

iii. Do not know

13. Calculus/tartar can be removed by

i. A dentist or a trained dental personnel

ii. Thorough teeth cleaning

iii. Do not know

14. If your gums bleed you should stop cleaning the teeth

i. Disagree

ii. Agree

iii. Do not know

The following questions are related to cleaning one's teeth.

15. Do you clean your teeth? ☐

    i. No (go to question 25)

    ii. Yes (Continue with question 18)

16. How often do you clean your teeth?

    i. Don't know

    ii. Sometimes ☐

    iii. Once a day

    iv. Twice a day

    v. More than 2 times a day

17. With what do you clean your teeth?

    i. With a toothbrush ☐

    ii. With a chewing stick

    iii. Others specify.....

18. What do you put on your cleaning device?

    i. Nothing

    ii. Toothpaste ☐

    iii. Others.....

19. Did you clean your teeth yesterday afternoon?

    i. No ☐

    ii. Don't know or remember

iii. Yes

20. Did you clean your teeth yesterday evening?

i. No

ii. Yes

iii. Don't know or remember

21. Did you clean your teeth yesterday morning?

i. No

ii. Yes

iii. Don't know or remember

22. Did you clean your teeth this morning?

i. No

ii. Yes

iii. Don't know or remember

23. I find having to brush my teeth everyday

i. Necessary

ii. Unnecessary

iii. Don't know

The following questions are related to some things you may or may not eat.

24. Do you eat foods which contain sugars such as buns, scones, toffees, chocolate, biscuits, sweets, ice cream, candies, cakes, honey, jam.... etc?

i. No (go to question 30)

ii. Yes (continue with question 27) ☐

25. How often do you eat these sweet types of foods?

i. Some times but not everyday (go to question 30)

ii. Once a day ☐

iii. 2 to 3 times a day

iv. 4 to 6 times a day

v. More than 6 times a day

26. Do you find it necessary to consume these sweet types of food daily?

i. No ☐

ii. Yes

27. Would you stop consuming these sweet types of food if that would be better for your teeth?

☐

i. No

ii. Yes

The following questions are related to things you may or may not drink.

28. Do you drink drinks which contain sugars such as coca cola, fanta, schweppes orange, sprite, Pepsi cola, tea with lots of sugar, juices .....etc?

i. No (go to question 34) ☐

ii. Yes (continue with question 31)

29. How often do you drink these sugary drinks?

i. Sometimes but not everyday
ii. Once a day
iii. 2 to 3 times a day
iv. 4 to 6 times a day
v. More than 6 times a day

30. Do you find it necessary to consume these sugary drinks daily?

i. No
ii. Yes

31. Would you stop consuming these sugary drinks if that would be better for your teeth?

i. No
ii. Yes

The following questions are related to seeking dental care

32. Have you ever visited a dental clinic to seek dental care?

i. No (go to question 39)
ii. Yes (continue with question 35)

33. Are you visiting the dentist or trained dental personnel on a regular basis, for example, twice a year?

i. No (go to question 40)

ii. Yes (continue with question 36)

34. You are a regular visitor to the dentist or trained dental personnel. The following question is related to how satisfied you are about your experiences in the clinic.

Do you usually leave the dental clinic in a satisfied manner?

i. No (go to question 38)

ii. Yes (continue with question 37))

35. What makes your visit to the dental clinic satisfying?

There is more than one answer possible. We ask you to prioritize the answers by beginning with the strongest reason in the top box

i. No bleeding gums anymore

ii. Treatment done without injection

iii. No dental problems discovered at all

iv. Only advice was needed

v. Fillings done instead of extraction

vi. Get relief from pain get painless treatment

vii. Treatment is quickly done

viii. Explanation of what is going to happen

ix. Other, specify .....

x. Don't know

36. What kind of things don't you like about receiving dental care?

There is more than one answer possible. We ask you to prioritize the answers by beginning with the strongest reason in the top box

.

i. The local anaesthesia/injection ☐
ii. The noise of the equipment ☐
iii. The unfriendly treatment of the staff
iv. The long time smell in the surgery ☐
v. Time spent in the waiting room
vi. Don't like people working in my mouth
vii. Other, specify.....
viii. Don't know ☐

37. Are there things which make you hesitate to seek dental care?

i. No (end of questionnaire) ☐
ii. Yes (continue with question 39)

38. Since you have not visited the dental clinic and are hesitant to do so in the future, would you tell us reasons why you are hesitant in seeking dental care?

There is more than one answer possible. We ask you to prioritize the answers by beginning in the strongest reason in the top b ☐

i. Distance to dental clinic is too long ☐
ii. Presence of unfriendly dental workers
iii. Long waiting time at the dental clinic ☐

iv. No time to go to the dental clinic

v. Treatment is too costly

vi. Getting painful treatment ☐

vii. HIV status

viii. Don't know what kind of treatment to expect ☐

ix. Level of hygiene at dental clinic is poor ☐

x. For fear of losing a tooth

xi. Heard stories about bad things happening to patients in the

xii. Dental clinic

xiii. Other, specify ..... ☐

xiv. Don't know

39. Are there things which make you hesitate to seek dental care on a regular basis?

i. No ☐

ii. Yes (go to question 41)

40. Since you have visited the dental clinic but are not going on a regular basis and you are

hesitant in seeking further dental care, would you tell us the reasons why you are hesitant?

There is more than one answer possible. We ask you to prioritize by beginning with the strongest reason in the top box

i. Distance to dental clinic is too long ☐

ii. Presence of unfriendly dental workers ☐

iii. Long waiting time at the dental clinic

iv. No time to go to the dental clinic

v. Treatment is too costly ☐

vi. Getting painful treatment

vii. Don't know what kind of treatment to expect

viii. Fear of stigmatization

ix. Level of hygiene at dental clinic is poor ☐

x. For fear of losing a tooth

xi. Heard stories about bad things happening to patients in the dental clinic ☐

xii. Other, specify .....

xiii. Don't know ☐

Part 2 : OHIP-14 item/WHO 2005

The following question assesses the oral health quality of life

41. Because of the state of your teeth, have you experienced any of the following problems during the past year?

Functional limitations	*Yes*	*No*	*Don't know*
Difficulty with speech/Trouble pronouncing words			
Sense of taste worse			
Pain and discomfort			
Painful aching in the mouth			
Sleep interrruption			
Uncomfortable to eat foods			

Psychological impacts			
Been self-conscious			
Felt tense because of problem with teeth			
Difficulty to relax			
Been embarrassed about appearance of teeth			
Felt life less satisfactory			
Avoid smiling because of teeth			
Behavioral impacts			
Diet been unsatisfactory			
Had to interrupt meals			
Been irritable with others			
Difficulty doing usual jobs			
Reduced participation in social activities			
Days taken off work			
Totally unable to function			

End of questionnaire

Thank you for filling in the questionnaire.

Appendix 2: Clinical examination form (WHO[98])

Ramfjords periodontal disease index plaque component-1961 (modified by Shick R.A and Ash MM)

0= absent of dental plaque

1= dental plaques in the interproximal areas or the gingival margin covering less than a third of the gingival half of the facial or lingual surface of the tooth

2= dental plaque covering more than a 1/3rd but less than 2/3rd of the gingival half of the facial or lingual surface of the tooth.

3= dental plaque covering 2/3rd or more of the gingival half of the facial or lingual of the tooth.

Tooth	16		21		24		36		41		44	
Surface	F	L	F	L	F	L	F	L	F	L	F	L
Score												

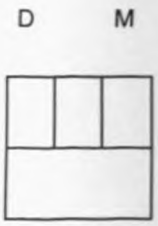
Green and Vermillion calculus index

Scores	Criteria
0	No calculus present
1	Supragingival calculus covering not more than a third of the exposed tooth surface
3	Supragingival calculus covering more than 1/3rd but not more than 2/3rd of the exposed tooth surface and/or the presence of individual flecks of subgingival calculus around the cervical portion of the tooth or both
4	Supragingival calculus covering more than 2/3rd of the exposed tooth surface and/or continuous heavy band of subgingival calculus around the cervical portion of the tooth or both

	Right		Anterior		Left		Total	
	Buccal	Labial	Buccal	Lingual	Buccal	Labial	Buccal/labial	Lingual
Upper								
Lower								
Total								

Loe and Silness gingival index- 1963

Score	**Criteria**
0	Absence of inflammation/normal gingiva
1	Mild inflammation, slight change in colour, redness, oedema, hypertrophy, no bleeding on probing
2	Moderate inflammation; moderate glazing, redness, oedema, hypertrophy, bleeding on probing
3	Severe inflammation; marked redness ,hypertrophy, ulceration tendency to spontaneous bleeding.



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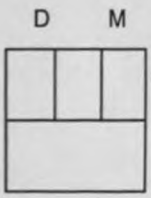

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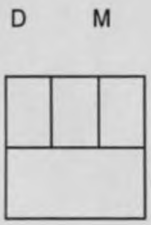

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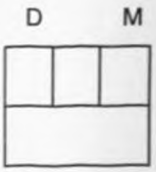

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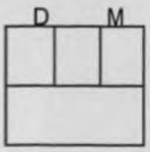

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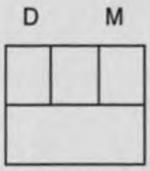


36

Score:

DENTITION STATUS

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

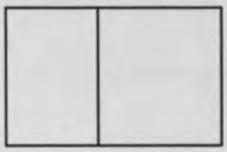
48 47 46 45 44 43 42 41 31 32 33 34 35 36 37 38

Crown	*Crown/Root*		*Status*
A	0	0	Sound
B	1	1	Decayed
C	2	2	Filled, with decay
D	3	3	Filled, no decay
E	4	–	Missing, as a result of caries
–	5	–	Missing, any other reason
F	6	–	Fissure sealant
G	7	7	Bridge abutment, special crown or vaneer/implant
–	8	8	Unerupted tooth, (crown)/unexposed root

T T –.....

Prosthetic Status (0 = no prosthesis, 1= bridge, 2 = more than one bridge, 3 = partial denture, 4 = both bridge(s) and partial denture(s), 5 = full removable denture, 6 = implant, 9 = not recorded, X = not applicable, edentulous with no denture

Upper Lower



Modified WHO Adult Screening of Oral Mucosal Lesions Data Capture Sheet
Oral Mucosa

CODE	CONDITION	CODE	LOCATION
1	No abnormal condition	A	
2	Pseudomembranous Candidiasis	B	
3	Erythematous Candidiasis	C	
4	Hyperplastic Candidiasis	D	
5	Angular Cheilitis	E	
6	Herpetic Ulceration	F	
7	Aphthous Ulceration	G	
8	Infective (TB, STDs) Ulceration	H	
9	Atypical Oral Ulceration	I	
10	Erythema Multiforme	J	
11	Oral Hairy Leukoplakia	K	
12	Kaposi's Sarcoma	L	
13	Non-Hodgkin's lymphoma	M	
14	HPV-related lesions	N	
15	Melanotic hyperpigmentation	O	
16	White patches: Frictional keratosis	P	
17	White patches: Idiopathic leukoplakia – homogenous	Q	
18	White patches: Idiopathic leukoplakia – fissured	R	

19	White patches: Idiopathic leukoplakia – ulcerated	S	
20	Erythroplakia	T	
21	Mixed Leukoplakia/Erythroplakia		
22	Lichen Planus,Reticular		
23	Lichen Planus, Plaque		
24	Lichen Planus, Erosive		
25	Lichen Planus, Bullous		
26	Lichen Planus, Desquamative gingivitis		
27	Leukodema		
28	Stomatitis nicotina		
29	Atrophy		
30	Glossitis		

Other.....
.....
.....

Appendix 3: Consent form

The purpose of the study

I am a PhD student in the Department of Community health, University Nairobi. I am currently conducting a study whose aim is to determine the **"Impact of oral health education on oral health status and quality of life of PLWHA".** Studies have found that oral health education reduces the burden of oral diseases and conditions among the general population. However, the impact of oral health education on oral health of PLWHA is not well documented. There is scanty information on the impact of health education on oral health of PLWHA in Kenya. Your participation in this study will help us generate data, which will be useful in formulating intervention programs for PLWHA and develop oral health promotion programs. This will go along way in alleviating suffering among this group of people.

Voluntary participation

I understand that I have entered the study voluntarily and that no guarantee can be made on the ultimate outcome of the exercise. I also understand that I can terminate my participation in the study at will without any consequences. I understand that the participation in the study does not entail any financial benefit.

Anticipated risk

No risk is anticipated for participating in the study

Confidentiality

The information given to the researcher will be kept in strict confidence. No information by which your identity can be revealed will be released or published.

I, the undersigned _____ having been informed about the study/having had read all the above, had time to ask questions, received satisfactory answers concerning issues I did not understand, do wilfully give consent to participate in the study.

_____ _____

(Patient signature or print right thumb) (Date)

_____ _____

(Person who informed/discussed with the patient) (Date)

Appendix 4: Oral health education procedure and the aids used.

After the patient had settled in the room after which the purpose of the study explained. Following consent by the participant to take part in the study, the first question on the questionnaire was posed. The participant was given time to answer the question. If the participant gave the correct answer, then the next question was asked. If the participants did not give the correct answer(s), then the correct answer was given and the participant was asked to explain his/her understanding of the answer given. Only when the participant gave the correct answer was the next question asked.

A model and a toothbrush (photograph a) were used to demonstrate how they show brush their teeth, the participants were then requested to demonstrate how they will brush they teeth henceforth using the model and tooth brush. Photographs of a health gingival and health teeth (b), inflamed gingival (c), health tooth (b), a carious tooth (d) and calculus (e) were also shown to demonstrate the difference between health and disease. After which they were told to comment on whether their gum was healthy or not using a face mirror and give reason for their answer. If they could not give the correct status, the correct status was given to them and explained. Health education was only given at baseline.

Dental model and toothbrush (a)

Healthy gingiva (b)

Inflamed gingiva (c)

Dental Caries (d)

Dental calculus(e)

Appendix 5: Ethical Approval

KENYATTA NATIONAL HOSPITAL
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KNHplan@Ken.Healthnet.org

Ref: KNH-ERC/01/3574 **Date: 23rd June, 2006**

Dr Loice Gathece
Dept. of Periodontology, Community and Preventive Dentistry
UNIVERISTY OF NAIROBI

Dear Loice,

RESEARCH PROPOSAL: "IMPACT OF HEALTH EDUCATION ON ORAL HEALTH STATUS AND QUALITY OF LIFE OF PEOPLE LIVING WITH HIV/AIDS IN KENYA".(P52/3/2006)

This is to inform you that the Kenyatta National Hospital Ethics and Research Committee has reviewed and **approved** revised version of your above cited research proposal for the period 23rd June 2006 – 22nd June 2007.

You will be required to request for a renewal of the approval if you intend to continue with the study beyond the deadline given.

On behalf of the Committee, I wish you fruitful research and look forward to receiving a summary of the research findings upon completion of the study.

This information will form part of database that will be consulted in future when processing related research study so as to minimize chances of study duplication.

Yours sincerely

PROF A N GUANTAI
SECRETARY, KNH-ERC

c.c. Prof. K.M.Bhatt, Chairperson, KNH-ERC
The Deputy Director CS, KNH
The Dean, Faculty of Dental Sciences, UON
The Chairman, Department of Community Health UON
The HOD, Medical Records KNH.
Supervisor: Prof Joseph K. Wang'ombe, Prof Peter Ng'ng'a, Dr Peter N. Wanzala.

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