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HIV/AIDS and Oral Health in Socially Disadvantaged Communities

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1. Introduction

The chapter begins with a brief overview of HIV/AIDS. Different oral manifestations of HIV/AIDS are reported with the fact that the oral lesions parallel the decline in the number of CD4 cells and an increase in viral load. The chapter also presents a trend of occurrence of oral manifestations before ARV and during ARV era. Moreover, the impact of HIV/AIDS on oral health of the people living with HIV/AIDS (PLWHA) in socially disadvantaged communities particularly in those living in Sub Saharan Africa where majority of HIV positive individuals reside is discussed. In addition, a need for a balanced diet by PLWHA is specified and a narration of functional impairment due to HIV/AIDS related oral conditions which often render these people unable to eat properly is presented. Knowledge of Oral manifestations of HIV/AIDS among dental practitioners, medical practitioners and people living with HIV/AIDS as well as the influence of this knowledge to the care for PLWHA is explored. A brief description of the care expectations of PLWHA from the medical and dental personnel is sighted. Eventually, recommendations for possible interventions are provided.

2. Overview of HIV/AIDS

Human immunodeficiency virus (HIV) is a lentivirus, a member of the retrovirus family that causes Acquired Immunodeficiency Syndrome or AIDS (Douek et al., 2009), an infectious disease in humans, in which progressive failure of the immune system allows life-threatening opportunistic infections and various cancers to thrive. HIV infection in humans is considered pandemic by the World Health Organization (WHO). HIV has been shown to have infected about 0.6% of the world's population and since its discovery in 1981 to the year 2006 AIDS has killed more than 25 million people. In 2009, AIDS claimed an estimated 1.8 million lives, down from a global peak of 2.1 million in 2004. However, a peak of an estimated 2.6 million people were newly infected in 2009 (UNAIDS report 2010). A disproportionate number of AIDS deaths occur in Sub-Saharan Africa, retarding economic growth and exacerbating the burden of poverty (Greener, 2002). UNAIDS report that Sub-Saharan Africa remains by far the worst-affected region, with an estimated 22.5 million people currently living with HIV/AIDS (67% of the global total), 1.3 million deaths (72% of the global total) and 1.8 million new infections (69% of the global total). However, the

number of new infections declined by 19% across the region between 2001 and 2009, and by more than 25% in 22 sub-Saharan African countries during this period (UNAIDS report 2010).

2.1 Types of HIV, virulence and mode of attack

Two types of HIV have been characterized: HIV-1 and HIV-2. HIV-1 is the virus that was initially discovered and termed both LAV and HTLV-III. It is more virulent, more infective and is the cause of the majority of HIV infections globally (Centers for Disease Control and Prevention 2001, Gilbert, et al., 2003). The lower infectivity of HIV-2 compared to HIV-1 implies that fewer of those exposed to HIV-2 will be infected per exposure. Because of its relatively poor capacity for transmission, HIV-2 is largely confined to West Africa (Reeves and Doms, 2002). The HIV is a frequently mutating retrovirus.

HIV infection has 3 stages; acute infection or primary infection stage, latency stage and AIDS. The acute infection lasts for several weeks and may include symptoms such as fever, lymphadenopathy that is swollen lymph nodes, pharyngitis presenting as sore throat, rash, muscle pain (myalgia), malaise and mouth and esophageal sore. During this stage most oral manifestations occur and these have been shown to be indicators for counseling and testing (Fabian et al., 2009). The latency stage is the second stage and it involves few or no symptoms and can last anywhere from two weeks to twenty years or more depending on the individual. AIDS, is the final stage of HIV infection, and is defined by low CD4+ T cell counts (fewer than 200 per microliter), presence of various opportunistic infections such as various parasitic, viral and microbial infections, cancers and other conditions. A small percentage of HIV-1 infected individuals retain high levels of CD4+ T-cells without being on antiretroviral therapy. However, most have detectable viral load and will eventually progress to AIDS without treatment, albeit more slowly than others. These individuals are classified as HIV controllers or long-term non-progressors (LTNP). People who maintain CD4+ T cell counts and also have low or clinically undetectable viral load without antiretroviral treatment have also been given the name of elite controllers or elite suppressors (ES) (Blankson, 2010; Grabar et al., 2009).

2.2 Testing for HIV

The first and most common blood test for patients who are suspected of having HIV infection, is usually the enzyme-linked immunosorbent assay (ELISA) test for the presence of HIV antibody in their blood. HIV-1 testing consists of initial screening with the ELISA to detect antibodies to HIV-1. Specimens with a nonreactive result from the initial ELISA are considered HIV-negative. Specimens with a reactive ELISA result are retested in duplicate (Piatak, et al., 1993). If the result of either duplicate test is reactive, the specimen is reported as repeatedly reactive and undergoes confirmatory testing with a more specific supplemental test such as the Western blot or, less commonly, an immunofluorescence assay (IFA). Only specimens that are repeatedly reactive by ELISA and positive by IFA or reactive by Western blot are considered HIV-positive and indicative of HIV infection. Specimens that are repeatedly ELISA-reactive occasionally provide an indeterminate Western blot result, which may be either an incomplete antibody response to HIV in an infected person or nonspecific reactions in an uninfected person. The combination of the ELISA and Western blot tests is more than 99.9% accurate in detecting HIV infection within four to eight weeks following exposure. The polymerase chain reaction (PCR) test can be used to detect the presence of viral nucleic acids in the very small number of HIV patients who have false-negative results on the ELISA and Western blot tests. These tests are also used to detect

viruses and bacteria other than HIV and AIDS. In socially disadvantaged communities however, these procedures of testing may not be feasible due to social constraints specifically poor social economic environments. This is where the oral manifestations become important indicators and most probably testing may depend only on ELISA test and CD₄ level counts.

3. Oral manifestations of HIV infection

Over 30 different oral manifestations of HIV disease have been reported since the beginning of the AIDS epidemic (Schjødt & Pindborg, 1987). Several groups of these oral manifestations are known. They may be; infections, neoplasms or other manifestations. Infections include fungal, viral or bacterial. Whereas, the most common neoplasms are Kaposi's Sarcoma and Non-Hodgkin's Lymphoma. The others category include non-specific or Aphthous-like ulcers, idiopathic thrombocytopenic purpura, mucosal melanin pigmentation and salivary gland diseases.

3.1 Fungal infections

Fungal infection or Oral Candidiasis (broadly known as thrush) is a relatively frequent problem for people who are HIV positive. People with candidiasis often notice changes in taste perception, which may make food undesirable. Oral candidiasis has been described to occur during the acute stage of HIV infection, (Dull et al., 1991) but it occurs most commonly with falling CD4⁺ T-cell count in the middle and late stages of HIV disease. Several reports indicate that most persons with HIV infection carry a single strain of *Candida* during clinically apparent candidiasis and when candidiasis is quiescent (Miyasaki et al., 1992). Oral Candidiasis may present in either of the following forms; pseudomembranous candidiasis, erythematous candidiasis, hyperplastic candidiasis, or angular cheilitis.

3.1.1 Pseudomembranous candidiasis

Pseudomembranous candidiasis is by far the most common form of oral candidiasis. Pseudomembranous candidiasis appears as a white "curd-like" material (Fig. 1) that when wiped off reveals an underlying erythematous mucosa (Shiboski et al., 2009). Removable plaques on the oral mucosa are caused by overgrowth of fungal hyphae mixed with desquamated epithelium and inflammatory cells. This type of candidiasis may involve any part of the mouth or pharynx. Generally, the clinical diagnosis is made on the basis of appearance.



Fig. 1. Pseudomembranous candidiasis on the palate (a courtesy of F. Kahabuka)

3.1.2 Erythematous candidiasis

Erythematous candidiasis appears as flat, red patches of varying size (Fig. 2). It commonly occurs on the palate and the dorsal surface of the tongue (Shiboski et al., 2009). Erythematous candidiasis is frequently subtle in appearance and clinicians may easily overlook the lesions, which may persist for several weeks if untreated. Identification of fungal hyphae in the lesion is necessary to make a definitive diagnosis. Both Erythematous candidiasis and Pseudomembranous candidiasis can cause changes in taste perception and/or pain and a burning sensation.



Fig. 2. Erythematous candidiasis on the palate (a courtesy of F. Kahabuka)

3.1.3 Hyperplastic candidiasis

This type of candidiasis is unusual in persons with HIV infection. The lesions appear white and hyperplastic. The white areas are due to hyperkeratosis and, unlike the plaques of pseudomembranous candidiasis, hyperplastic candidiasis cannot be removed by scraping. The lesions may be confused with hairy leukoplakia. Diagnosis of hyperplastic candidiasis is made from the histologic appearance of hyperkeratosis and the presence of hyphae in the lesion.

3.1.4 Angular cheilitis

Angular cheilitis appears as an erythema and/or fissuring either unilaterally or bilaterally at the corners of the mouth (Shiboski et al., 2009). It can appear alone or in conjunction with another form of intraoral candidiasis. This condition is easily mistaken for chapped lips.

3.2 Viral infections

Members of the human herpesvirus (HHV) and human papillomavirus (HPV) families are the most common causes of primary viral infections of the oral cavity. Nonetheless, many other viral infections can affect the oral cavity in humans, either as localized or systemic infections.

3.2.1 Herpes simplex

Oral herpes simplex is a viral condition associated with herpes simplex virus type 1 (HSV-1). It is characterized by the eruption of serum-filled vesicles, or blisters (sometimes referred to as "cold sores" or "fever blisters") on the face, lips, or mouth. Herpes simplex lesions may be large, painful, and more prone to secondary infection in HIV-positive individuals. These lesions can cause pain and decrease the ability to eat comfortably.

3.2.2 Herpes zoster

Oral herpes zoster generally causes skin lesions. Following a prodrome of pain, multiple vesicles appear on the facial skin, lips, and oral mucosa. Skin and oral lesions are frequently unilateral and follow the distribution of the maxillary and/or mandibular branches of the trigeminal nerve. The skin lesions form crusts and the oral lesions coalesce to form large ulcers. The ulcers frequently affect the gingiva, so tooth pain may be an early complaint. The reactivation of varicella zoster virus (VZV) causes herpes zoster (shingles). The disease occurs in the elderly and the immunosuppressed.

3.2.3 Human Papillomavirus (HPV) lesions

HPV-associated lesions frequently occur in the oral cavity, including the lip and sides of the tongue. HPV lesions in the oral cavity may appear as solitary exophytic, papillary or multiple nodules. They may be sessile or pedunculated and appear as multiple, smooth-surfaced raised masses resembling focal epithelial hyperplasia or as multiple, small papilliferous or cauliflower-like projections. Lesions caused by HPV are common on the skin and mucous membranes of persons with HIV disease. HPV lesions tend to be more serious and more difficult to treat in HIV-positive people. A few reports also suggest that these oral lesions may be more prevalent, or the number of lesions may be greater in people with HIV.

3.2.4 Cytomegalovirus

Oral ulcers caused by cytomegalovirus (CMV) have been reported (Jones et al., 1993). These ulcers can appear on any mucosal surface and may be confused with aphthous ulcers (Heinic et al., 1993), necrotizing ulcerative periodontitis (NUP), (Dodd et al., 1993), and lymphoma. Unlike aphthous ulcers, however, which usually have an erythematous margin, CMV ulcers appear necrotic with a white halo, (Langford et al., 1990). Diagnosis of CMV ulcers is made from a biopsy but immunohistochemistry may be helpful.

3.2.5 Hairy Leukoplakia and Epstein-Barr virus

Oral hairy leukoplakia (HL), which presents as a nonmovable, corrugated or "hairy" white lesion on the lateral margins of the tongue, occurs in all risk groups for HIV infections, although less commonly in children than in adults, (Nadal et al., 1992). HL occurs in about 20% of persons with asymptomatic HIV infection and becomes more common as the CD4+ T-cell count falls, (Feigal et al 1991). HL lesions vary in size and appearance and may be unilateral or bilateral. The surface is irregular and may have prominent folds or projections, sometimes markedly resembling hairs. Occasionally, however, some areas may be smooth and flat. Lesions occur most commonly on the lateral margins of the tongue and may spread to cover the entire dorsal surface. While this condition may resemble thrush, hairy leukoplakia lesions cannot be wiped off, unlike the lesions of thrush. Hairy leukoplakia is thought to be caused by the Epstein-Barr virus (Frezzini et al., 2006). It is also associated with infectious mononucleosis. Since this condition is rarely seen unless the CD4 cell count is low, it is less common in areas where combination anti-HIV therapy is readily available. A definitive diagnosis requires identification of Epstein-Barr virus infected epithelial cells.

3.3 Bacterial infections

The most common oral lesions associated with bacterial infection are periodontal diseases.

3.3.1 Periodontal disease

Periodontal disease is a fairly common problem in both asymptomatic and symptomatic HIV-infected patients, (Masouredis et al., 1992, Winkler et al., 1992). It can take two forms: the rapid and severe condition called necrotizing ulcerative periodontitis (NUP), (Glick et al., 1994) and its associated and possibly precursor condition called linear gingival erythema (LGE), (Grbic et al., 1995). The presenting clinical features of these diseases often differ from those in non-HIV-infected persons in that unlike for non-HIV-related periodontal disease LGE and NUP often occur in clean mouths where there is very little plaque or calculus to account for the gingivitis.

3.3.2 Linear Gingival Erythema

The gingival (gum) condition originally known as HIV-gingivitis, and now called linear gingival erythema (LGE), appear as a distinct band of erythema of the gingival margin that does not respond to removal of local factors. LGE may be painful may bleed and may progress to periodontal disease. Sometimes LGE may be mistaken for ordinary gingivitis which usually is not painful and does not lead to periodontal disease.

3.3.3 Necrotizing Ulcerative Periodontal disease

Necrotizing ulcerative periodontitis (NUP), which previously was called HIV-periodontitis, is a condition associated with rapid soft tissue and bone loss, including exposure of the bone; rapid deterioration of tooth attachment; and the premature loss of teeth. Periodontal disease may go unnoticed until the tissues supporting the teeth are so damaged as to cause the loss of a tooth.

3.4 Neoplasms

Several opportunistic tumors (cancers or neoplasms) are associated with HIV infection. Two of them namely; Kaposi's sarcoma (KS) and non-Hodgkin's Lymphoma (NHL) occur most frequently and may manifest in the oral cavity. Both of these conditions are seen when immune suppression is severe and an individual has an AIDS diagnosis (a CD4 cell count below 200 cells/mm³).

3.4.1 Kaposi's Sarcoma

Kaposi's sarcoma (KS) is the most common neoplasm in people with HIV. KS may occur intraorally, either alone or in association with skin and disseminated lesions, (Ficarra et al 1988). Intraoral lesions have been reported at other sites and may be the first manifestation of late-stage HIV disease (AIDS).

KS can appear as a red, blue, or purplish lesion that do not blanch (whiten) with pressure. It may be flat or raised, solitary or multiple. Lesions' size ranges from small to extensive, often they enlarge rapidly and may become exophytic (grow outward). The most common oral site is the hard palate (Shiboski et al., 2009), but lesions may occur on any part of the oral mucosa, including the gingiva, soft palate, buccal mucosa and in the oropharynx, (Fig 3). Occasionally, yellowish mucosa surrounds the KS lesion. Oral KS lesions may enlarge, ulcerate, and become infected. Good oral hygiene is essential to minimize these complications. Biopsy and histologic examination are important in order to make a definitive diagnosis.



Fig. 3. Kaposi's sarcoma on the palate and skin (a courtesy of O. Hamza)

3.4.2 Non-Hodgkin's lymphoma

Diffuse, undifferentiated non-Hodgkin's lymphoma (NHL) is a frequent HIV-associated malignancy. NHL is the second most common tumor associated with HIV/AIDS (Frezzini et al., 2006), it can occur anywhere in the oral cavity. Most often NHL occurs as a soft, tumor-like mass (with or without involvement of underlying bone) that may enlarge rapidly. The lesion may present as firm, painless swelling that may be ulcerated but may also appear as necrotic or nonulcerated masses. Oral NHL may be confused with major aphthous ulcers and rarely as a pericoronitis associated with an erupting third molar. Histologic examination of biopsy specimens is required in order to make a definite diagnosis of NHL.

4. Other oral lesions associated with HIV disease

4.1 Oral ulceration

Oral ulcers resembling recurrent aphthous ulcers (RAUs) in HIV-infected persons are reported with increasing frequency. The cause of these ulcers is unknown. Proposed causes include stress and unidentified infectious agents. In HIV-infected patients, the ulcers are well circumscribed with erythematous margins. The ulcers of the minor RAU type may appear as solitary lesions of about 0.5 to 1.0 cm. The herpetiform type appears as clusters of small ulcers (1 to 2 mm), usually on the soft palate and oropharynx. The major RAU type appears as extremely large (2 to 4 cm) necrotic ulcers. The major RAUs are very painful and may persist for several weeks. The ulcers usually occur on nonkeratinized mucosa; this characteristic differentiates them from those caused by herpes simplex.

4.2 Aphthous stomatitis

Aphthous stomatitis (canker sores) is a common condition regardless of HIV status. In HIV-positive individuals the ulcers or sores may be slow to heal, and aphthous ulcers minor are more likely to become aphthous ulcers major.

4.3 Idiopathic Thrombocytopenic Purpura

Idiopathic thrombocytopenic purpura (ITP) has been reported to occur in HIV-infected patients. Oral lesions may be the first manifestation of this condition. They may present as petechiae, ecchymoses and hematoma anywhere on the oral mucosa. Spontaneous bleeding

from the gingiva can occur, and patients may report finding blood in their mouths on waking up.

4.4 Salivary Gland Disease and Xerostomia

Bilateral parotid gland enlargement occurs in HIV infected individuals. Salivary gland disease associated with HIV infection (HIV-SGD) can present as xerostomia with or without salivary gland enlargement. Salivary gland enlargement in children and adults with HIV infection usually involves the parotid gland (Fig 4). The enlarged salivary glands are soft but not fluctuant. The enlarged parotid glands can be a source of annoyance and discomfort. HIV-infected patients may also experience dry mouth in association with taking certain medications (such as ddI, antidepressants, antihistamines, and antianxiety drugs) that can hinder salivary secretion.



Fig. 4. Unilateral Parotid gland enlargement (a courtesy of F. Kahabuka)

4.5 Mucosal melanin pigmentation

Single and multiple oral mucosal melanotic macules have been reported to occur in HIV infected individuals. Some have been associated with zidovudine therapy. Their significance is not known and thus no treatment is indicated.

5. The relationship of HIV and oral health

Essentially, oral manifestations of HIV/AIDS are opportunistic diseases or manifestations of immune deficiency or derangement. They are not caused directly by HIV and in fact the same lesions occur in association with other immune deficiency disorders. Most oral health problems can be found in people who are either HIV positive or negative. But there are some differences worthy noting. Some conditions are found more often in PLWHA than the normal population. These include Oral candidiasis, Aphthous stomatitis (canker sores) and herpes simplex. Few oral health conditions are seen almost exclusively in people living with HIV/AIDS which include Oral Hairy Leukoplakia and opportunistic tumors, while some that are found in both populations are more problematic for people with HIV, especially those with advanced disease. Regarding dental caries, it is known that some medications used by people living with HIV/AIDS and even HIV itself may cause decreased salivary

flow, or dry mouth, which is known to contribute to rampant caries. This type of caries frequently develops at the cervical region of the tooth, and the cervical area is more likely to decay at a faster rate. While periodontal diseases can occur in anyone regardless of his/her HIV status, one particularly severe form (necrotizing ulcerative periodontitis) and a related condition (linear gingival erythema) appear to be unique to those with compromised immune systems. Many of the earliest manifestations of the immune suppression associated with HIV infection occur in the mouth – particularly oral candidiasis, but also viral and sometimes severe bacterial infections, including tuberculosis. The presence of these lesions may be an early diagnostic indicator of immunodeficiency and HIV infection, may change the classification of the stage of HIV infection, and is a predictor of the progression of HIV disease (Lifson et al., 1994). The dental and oral health professions therefore have a key role in early diagnosis, and in the management of these distressing infections.

6. Trend of occurrence of oral manifestations before ARV and during ARV era

Oral manifestations of HIV infection are a fundamental component of disease progression with up to 90% of HIV-seropositive patients developing oral lesions through the course of their HIV-infection (Arendorf et al., 1998, Dios et al., 2000, Patton et al., 2000, Samaranayake et al., 2002). Occurrence of the oral lesions parallels the decline in the number of CD4 cells counts less than 200 cells/mm³, and an increase in viral load greater than 3000 copies/mL, xerostomia, poor oral hygiene and smoking, (Aquirre et al., 1999, Tappuni & Fleming, 2001). Oral lesions are thus independent indicators of the HIV disease progression.

Following the introduction of highly active antiretroviral therapy (HAART), the oral manifestations of human immunodeficiency virus infection has changed drastically, (Aquirre et al., 1999, Domaneschi et al., 2011, Johnson 1999, Patton et al., 2000). HAART is effective in suppressing plasma-HIV viral load below a detectable level and elevating CD4 cell counts. One study noted a reduction of oral lesions from 47.6% pre-HAART to 37.5% during the HAART era (Patton et al., 2000). The study further reported a significant reduction in oral hairy leukoplakia and necrotizing ulcerative periodontitis, but on the other hand found no significant change in the incidence of oral candidiasis, oral ulcers and Kaposi's sarcoma. However, an increase was observed to occur in the HAART era of the salivary gland disease (Patton et al., 2000), and of oral warts (Greenspan et al., 2001, King et al., 2002).

Reports from few countries in the Sub Saharan Africa present a closely similar picture. In Tanzania Hamza et al., (2006) observed oral lesions in 39.5% of the patients whereas Fabian et al., (2009) reported at least one oral lesion in 45% of the PLWHA they examined while Mwangosi & Majenge, (2011) reported a prevalence of oral manifestations to be 23.5%. In Kenya Butt et al., (2001) reported over 80% prevalence of candidiasis of the hyperplastic, erythematous and pseudomembraneous types, 27.9% prevalence of lymphadenopathy and angular cheilitis, while oral Kaposi's sarcoma was seen in 13% of the patients. Six years later, Butt et al., (2007) encountered oral manifestations with highest prevalence in the oral cavity to include: angular cheilitis 32.4%, hyperplastic candidosis (labial mucosa) 15%, erythematous candidosis (gingival) 5%, Kaposi's sarcoma (hard/soft palate) 2.9% and Parotid enlargement 2%. Shiboski (2002) in South Africa reported that oral candidiasis (OC) was the most common oral lesion among HIV-infected women, and that the preliminary findings suggest that HAART is associated with a decreasing OC incidence. A study by Rwenyonyi et al., (2011) among Ugandan children living with HIV/AIDS recorded one or more oral lesions in 73% of the children examined. Furthermore, they found cervical

lymphadenopathy (60.8%), oral candidiasis (28.3%) and gingivitis (19.0%) to be the most common soft tissue oral lesions. They reported that the overall frequency distribution of soft tissue oral lesions was significantly lower in children on highly active antiretroviral therapy (HAART) as compared to their counterparts not on HAART.

7. Knowledge of oral manifestations of HIV/AIDS, infection control and dental care services to people living with HIV and AIDS

7.1 Knowledge of oral manifestations

Dental practitioners have satisfactory knowledge about HIV and AIDS as well as oral manifestations of HIV/AIDS. Dental students alike, especially in the last years of training have sufficient knowledge on HIV and AIDS. The attitude of dental practitioners and dental students towards HIV positive patients is good. Majority are willing to give dental treatment to HIV positive patients (Arjuna et al., 2011, Park et al., 2011, Turhan et al., 2010), though a few never treat HIV positive patients (McQuistan et al., 2010). In relation to HIV transmission, some dental students and even some dental personnel believe that HIV can be easily transmitted during clinical procedures. Some dentists, dental students and some dental school deans prefer that HIV/AIDS patients should be referred to specialized clinics (Ryalat et al., 2011, Vázquez-Mayoral et al., 2009). On the other hand, medical practitioners' knowledge of oral manifestations of HIV/AIDS is insufficient. Likewise people living with HIV/AIDS have limited awareness of oral manifestations of HIV/AIDS (Kahabuka et al., 2007). The limited knowledge and awareness may negatively impact oral health care delivery to the PLWA but may also limit utilization of dental care services even when they are available (Pereyra et al., 2011).

7.2 Knowledge on infection control measures

During provision of oral health care services, it is imperative to adhere to infection control to prevent transmission of diseases from patient to healthcare worker, healthcare worker to patient and patient to patient. Indeed, to be able to control cross infection of any blood borne diseases, the highest standards of infection control must be maintained in all clinical situations. This is essential in as far as controlling HIV spread is concern. Despite the importance of infection control in dental practice, a study by Uti et al., (2009) showed that while the level of knowledge of the dentists was generally acceptable, there was still partial compliance with recommended infection control procedures among Nigerian dentists as a result of inadequate supplies. Therefore, dental students and dental personnel must be provided with proper and current education on infection control as well as sufficient supplies in order to enhance positive attitude towards HIV positive patients. In the event a dental personnel or dental student finds himself/herself HIV positive appropriate action should be taken to protect patients and staff.

7.3 Dental care services to PLWHA

In socially disadvantaged communities, it is common to find people living with unmet dental care needs (Kikwilu et al., 2008). For people living with HIV/AIDS oral manifestations add to an already existing problem of unmet dental care needs. A number of factors contribute to this situation. Some of them are; high cost, unavailability of the services, lack of insurance and education, a shortage of dentists trained or willing to treat persons living with HIV/AIDS, patient fear and discomfort with dentists, stigma within

health care systems, lack of awareness of the importance of regular dental care, and other competing priorities, (Mofidi & Gambrell, 2009, McQuistan et al., 2010). Like any health condition faced by HIV-positive people, early identification and treatment should be emphasized. In many cases, when PLWHA are attended by medical professionals for other ailments referral to a dentist should be made as soon as possible for management of oral lesions. The dental profession therefore, has an obligation to provide the required dental services to PLWHA.

8. Need for a balanced diet by people living with HIV/AIDS (PLWHA)

Food is the foundation of nutritional health. Nothing can replace food. It can be supplemented, adjusted, increased or decreased, but not entirely replaced. Food provides the building blocks of carbohydrates, proteins and fats (the macronutrients), as well as vitamins and minerals, (the micronutrients). The best way to make sure an individual gets all of these nutrients is by eating a wide variety of healthy foods every day (Centre for Disease Control 1987). Unfortunately during the acute stage, PLWHA develop oral manifestations most of which are painful conditions that may impair eating. Disturbances in eating hinders accomplishment of the PLWHA's need for a nutritionally balanced diet required much more than uninfected individuals because they need to naturally boost their immune system but also they need to deal with the weight loss. Moreover, AIDS is well known for causing severe weight loss known as wasting (WHO 2005). Whereas starving people tend to lose fat first, the weight lost during HIV infection tends to be in the form of lean tissue, such as muscle (WHO 2005). This type of wasting led to the term "slim" in some African countries during the early years of AIDS pandemic because AIDS sufferers lost a lot of lean tissue. In children, HIV is frequently linked to growth failure. One large European study found that children with HIV were on average around 7 kg (15 lbs) lighter and 7.5 cm (3 inches) shorter than uninfected children at ten years old (Kotler et al., 1989a). The double factors, that is inability to eat properly and the wasting caused by HIV infection make the PLWHA more vulnerable to nutritional insufficiency.

8.1 Weight loss and mortality

In a study done in Tanzania among people living with HIV/ AIDS (Fabian et al., 2009) it was shown that the mean BMI in males was 21.01 ± 3.89 (SD) and in females the figure was 22.81 ± 3.85 (SD). In all, low BMI was significantly correlated with presence of oral candidiasis, angular cheilitis, lymph node enlargement, and oral ulcers. Moreover, candidiasis was associated with angular cheilitis and oral hairy leukoplakia, and dry mouth was related to lymph node enlargement and oral hairy leukoplakia. It is therefore assumed that people living with HIV/AIDS cannot eat well once they have oral lesions. The U.S. Centers for Disease Control and Prevention (CDC) recognized wasting as an AIDS-defining condition in 1987. The "wasting syndrome" is defined as a weight loss of at least 10% in the presence of diarrhea or chronic weakness and documented fever for at least 30 days that is not attributable to a concurrent condition other than HIV infection itself (Centre for Disease Control 1987). In practice, any involuntary weight loss of that magnitude is typically considered wasting.

A significant relationship between weight loss and mortality, disease progression, or both has been demonstrated in numerous prospective and retrospective studies both before the advent of effective antiretroviral therapy (ART) (Guenter, P. et al., 1993, Newell et al., 2003,

Wheeler et al., 1998 WHO 2005) and in the current era of treatment, in regions where such therapy is available, (Schwenk et al., 2000, Thiebaut et al., 2000). In addition to weight loss, depleted levels of body cell mass, which contains the metabolically active tissue, have been associated with increased risk of mortality in patients with HIV infection, (Guenter, P. et al., 1993). In socially disadvantaged communities, nutrition may become a major concern and probably the high mortality rate in Sub Saharan Africa may be contributed to, by poor nutrition.

Increased resting energy expenditure (REE) is a common finding in patients with HIV infection particularly in those with systemic secondary infections, (Heijligenberg et al., 1997, Shevitz et al., 1999). In addition, decreased energy intake has been found to be the primary contributor to wasting, particularly during periods of rapid weight loss rather than REE. Elevated REE may serve as a cofactor in accelerating weight loss and provides evidence of a failure to compensate for decreased energy intake. Studies using stable isotope techniques have demonstrated that total energy expenditure (TEE) is not significantly elevated in weight-stable patients with HIV infection, when compared with estimates of TEE in other studies of healthy adults (Heijligenberg et al., 1997). Patients losing weight have been found to have decreased levels of TEE, despite elevated rates of REE, reflecting a decrease in physical activity levels.

8.2 Treatment to reduce wasting

Intervention for wasting is important in the management of people living with HIV/AIDS. Treatment of secondary infections and other complications of HIV infection is an important factor in the management of wasting, as first evidenced by an increase in weight and body cell mass in patients with disseminated CMV infection treated with ganciclovir, (Kotler et al., 1989b). Opportunistic infections that interfere with swallowing such as candidiasis, herpes, or CMV esophagitis make the patients particularly susceptible to wasting. In addition to secondary infections, aphthous ulcers, chronic diarrhea, or malabsorption of any etiology; depression; and other contributors to anorexia should be treated.

8.3 Nutritional intervention to reduce wasting

Nutritional strategies to forestall or reverse wasting must work to maintain or increase energy intake. Patients with HIV infection can increase protein synthesis rates during periods of increased dietary intake, (Selberg et al 1995). However, nutritional supplementation alone is unlikely to fully restore weight or lean tissue in PLWHA. Dietary counseling is another important factor and when counseling is done by dietitians it can help individuals to identify target energy intake and food choices to suit individual tastes, practices, and tolerances. Issues such as the importance of maintaining energy intake should be emphasized, even during periods when eating is not pleasurable; and can give patients techniques for managing HIV- or medication-related symptoms such as anorexia, early satiety, nausea, vomiting, diarrhea, food intolerances, and oral or esophageal ulcers. Natural foods including homemade juices, fruits and naturally grown foods may be the most suitable types of foods during the periods when the HIV/AIDS complications are further complicated by oral and esophageal conditions.

Increases in net daily energy intake can be achieved with the use of oral supplements, despite some compensatory decrease in self-selected food consumption. Such supplements can be very useful in individuals for whom an inability or unwillingness to prepare or consume meals becomes an impediment to oral intake. A variety of liquid and solid oral

supplements are available, including conventional preparations and specialized formulas for patients with specific intolerances such as fat malabsorption or lactose intolerance. Elemental formulas provide another option for individuals with malabsorptive disorders. Some studies suggest an increased benefit from special oral preparations containing specific amino acids and proprietary agents for PLWHA, (Clark et al., 2000, Pichard et al., 1998, Shabert et al., 1999). Until further data become available, the primary criteria for selection of a specific supplement should be tolerability and cost. However, use of food supplements in socially disadvantaged communities may not be practical because of unavailability.

As stated by the WHO (Petersen 2006) oral health professionals have a most important role to play in early detection of HIV/AIDS as part of their daily practice. It is needed to ensure that professionals do have the necessary skills but such skills may be obtained through systematic continuous education. In developing countries at some areas where oral health professionals are not available, specially trained primary health care workers may be instrumental in prevention of HIV/AIDS if they undertake examinations for detectable oral lesions.

9. Medical and dental service expectations of PLWHA

PLWHA have various expectations both from medical and dental personnel. For instance, Guenter, D. et al., (2010) reported that there are 3 forms of professional expert that PLWHA expect from their physicians, these included Medical/Clinical, Legal/Statutory and Moral/Ethical. With regard to the medical/ clinical expectations the PLWHA required HIV/AIDS specific knowledge and that the knowledge should be in a context of continuity over time and willingness to negotiate. The legal/statutory expectations included advocating on behalf of patients to gain access to the broader determinants of health determinants such as disability, housing, food and dietary supplements that PLWHA identified as necessary in effectively managing their illness. The PLWHA indicated that it was difficult to negotiate for moral authority of physicians. There is concern by the PLWHA that they are negatively judged, especially with regard to mode of transmission, drug use, sexuality and sexual practices. The PLWHA reported that they are open to constructive ethical and moral guidance regarding their health if they are treated in a nonjudgmental way by their physicians. Regarding expectations from dental personnel, a study done in Tanzania reported that PLWHA indicated a social need rather than a professional need (Shubi et al., 2006). The majority (95%) reported that they needed the Oral Health Professionals to have empathy, others (85%) indicated that they need the Oral Professionals to observe sterility and avoid discrimination while fewer (60%) indicated that they needed the professionals to set a separate special clinic for PLWHA or incorporate Oral Health services in the already existing special clinics for PLWHA.

10. Recommendations

Access to ARV remains low in socially disadvantaged communities. Oral manifestations affect quality of life through difficulties in food testing, chewing and swallowing. There is therefore need for immediate oral health care and referral, prevention and treatment of oral diseases. Oral health promotion is needed particularly among the socially disadvantaged communities especially in the developing countries. This can be accomplished through encouraging oral health professionals and public health professionals to work together to

make oral health an integral component of optimum care management and introduction of surveillance of oral diseases associated with HIV/AIDS.

11. References

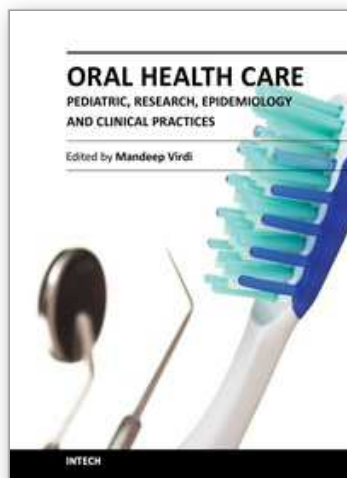
- Aquirre, J.M., Echebarria, M.A., Ocina, E., Ribacoba, L. & Montejo, M. (1999). Reduction of HIV-associated oral lesions after highly active antiretroviral therapy. *Oral Surg Oral Med Oral Pathol Oral Radiol Endod.* 88(2):114-115.
- Arendorf, T.M., Bredekamp, B., Cloete C.A., & Sauer, G. (1998). Oral Manifestations of HIV infection in 600 South African patients. *J Oral Pathol Med.* 27(4): 176-179.
- Arjuna, N.B., Ellepola, A.N., Sundaram, D.B., Jayathilake, S., Joseph, B.K. & Sharma, P.N. (2011). Knowledge and attitudes about HIV/AIDS of dental students from Kuwait and Sri Lanka. *J Dent Educ.* 75(4):574-581.
- Blankson, J.N. (2010). Control of HIV-1 replication in elite suppressors. *Discovery medicine* 9 (46): 261–266. PMID 20350494.
- Butt, F.M., Chindia, M.L., Vaghela, V.P., & Mandalia, K. (2001). Oral manifestations of HIV/AIDS in a Kenyan provincial hospital. *East Afr Med J.* 78(8):398-401.
- Butt, F.M., Vaghela, V.P., & Chindia, M.L. (2007). Correlation of CD4 counts and CD4/CD8 ratio with HIV-infection associated oral manifestations. *East Afr Med J.* 84(8):383-8.
- Centre for Disease Control. (1987). Revision of the CDC surveillance case definition for acquired immunodeficiency syndrome. Council of State and Territorial Epidemiologists; AIDS Program, *Center for Infectious Diseases*. MMWR Morb Mortal Wkly Rep. 36 Suppl 1:1S-15S.
- Centers for Disease Control and Prevention. (2001). *Revised guidelines for HIV counseling, testing, and referral*. MMWR Recomm Rep. 50 (RR-19): 1–57. PMID 11718472.
- Clark, R.H., Feleke, G., Din, M., Yasmin, T., Singh, G., Khan, F.A. & Rathmacher, J.A. (2000). Nutritional treatment for acquired immunodeficiency virus-associated wasting using beta-hydroxy beta-methylbutyrate, glutamine, and arginine: a randomized, double-blind, placebo-controlled study. *JPEN J Parenter Enteral Nutr.* 24(3):133-139.
- Dios, P.D., Ocampo, A. & Miralles, C. (2000). Changing prevalence of human immunodeficiency virus-associated oral lesions. *Oral Surg Oral Med Oral Pathol Oral Radiol Endod.* 90(4):403-404.
- Dodd, C.L., Winkler, J.R., Heinic, G.S., Daniels, T.E., Yee, K. & Greenspan, D. (1993). Cytomegalovirus infection presenting as acute periodontal infection in a patient infected with the human immunodeficiency virus. *J Clin Periodontol* 20:282-285.
- Domaneschi, C., Massarente, D.B., de Freitas, R.S., de Sousa Marques, H.H., Paula, C.R., Migliari, D.A. & Antunes, J.L. (2011). Oral colonization by *Candida* species in AIDS pediatric patients. *Oral Dis.* 17(4):393-398. doi: 10.1111/j.1601-0825.2010.01765.x. Epub 2010 Nov 29.
- Douek, D.C., Roederer, M. & Koup, R.A. (2009). Emerging concepts in the immunopathogenesis of AIDS. *Annu. Rev. Med.* 60: 471–84. doi:10.1146/annurev.med.60.041807.123549. PMC 2716400. PMID 18947296.
- Dull, J.S., Sen, P., Raffanti, S., Middleton, J.R. (1991). Oral candidiasis as a marker of acute retroviral illness. *South Med J* 84:733-735, 739.
- Fabian, F.M., Kahabuka, F.K., Petersen, P.E., Shubi, F.M. & Jürgensen, N. (2009). Oral manifestations among people living with HIV/AIDS in Tanzania. *Inter Dent J.* 59:187-191.

- Feigal, D.W., Katz, M.H., Greenspan, D., Westenhhouse, J., Winkelstein, W., Lang, W., Samuel, M., Buchbinder, S.P., Hessol, N.A., Lifson, A.R., Rutherford, G.W., Moss, A., Osmond, D., Shiboski, S., Greenspan, J.S. (1991). The prevalence of oral lesions in HTV-infected homosexual and bisexual men: Three San Francisco Epidemiologic Cohorts. *AIDS*. 5:519-525.
- Ficarra, G., Berson, A.M., Silverman, S. Jr., Quivey, J.M., Lozada-Nur, F., Sooy, D.D., Migliorati, C.A. (1988). Kaposi's sarcoma of the oral cavity: a study of 134 patients with a review of the pathogenesis, epidemiology, clinical aspects, and treatment. *Oral Surg Oral Med Oral Pathol*. 66:543-550.
- Frezzini, C., Leao, J.C., Cedro, M. & Porter, S. (2006). Aspects of HIV disease relevant to dentistry in the 21st century. *Dent Update*. 33(5):276-8, 281-2, 285-6.
- Gilbert, P.B., McKeague, I.W., Eisen, G., Mullins, C., Guéye-Ndiaye, A., Mboup, S. & Kanki, P.J. (2003). Comparison of HIV-1 and HIV-2 infectivity from a prospective cohort study in Senegal. *Statistics in Medicine* 22 (4): 573-593. doi:10.1002/sim.1342. PMID 12590415
- Glick, M., Muzyka, B.C., Salkin, L.M., Lurie, D. (1994). Necrotizing ulcerative periodontitis: a marker for immune deterioration and a predictor for the diagnosis of AIDS. *J Periodontol*. 65:393-397.
- Grabar, S., Selinger-Leneman, H., Abgrall, S., Pialoux, G., Weiss, L. & Costagliola, D. (2009). Prevalence and comparative characteristics of long-term nonprogressors and HIV controller patients in the French Hospital Database on HIV. *AIDS*. 23 (9): 1163-1169. doi:10.1097/QAD.0b013e32832b44c8. PMID 19444075.
- Grbic, J.T., Mitchell-Lewis, D.A., Fine, J.B., Phelan, J.A., Bucklan, R.S., Zambon, J.J., Lamster, I.B. (1995). The relationship of candidiasis to linear gingival erythema in HIV-injected homosexual men and parenteral drug users. *J Periodontol*. 66:30-37.
- Greener, R. (2002). AIDS and macroeconomic impact. In *State of The Art: AIDS and Economics*. Forsythe, S.S. pp. 49-55 IAEN. ISBN 0960519610, 9780960519613
- Greenspan, D., Canchola, A.J., MacPhail, L.A., Cheikh, B. & Greenspan, J.S. (2001). Effect of highly active antiretroviral therapy on frequency of oral warts. *Lancet*. 5;357(9266):1411-1412.
- Guenther, P., Muurahainen, N., Simons, G., Kosok, A., Cohan, G.R., Rudenstein, R. & Turner, J.L. (1993). Relationships among nutritional status, disease progression, and survival in HIV infection. *J Acquir Immune Defic Syndr*. 6(10):1130-1138.
- Guenther, D., Gillett, J., Cain, R. & Pawluch, D., Travers, R. (2010). What Do People Living With HIV/AIDS Expect From Their Physicians? Professional Expertise and the Doctor-Patient Relationship. *Journal of the International Association of Physicians in AIDS Care*. 9(6) 341-345.
- Hamza, O.J.M., Matee, M.I.N., Simon, E.N.M., Kikwilu, E., Moshi, M.J., Mugusi, F., Mikx, F.H.M., Verweij, P.E. & van der Ven A.J.A.M. (2006). Oral manifestations of HIV infection in children and adults receiving highly active anti-retroviral therapy [HAART] in Dar es Salaam, Tanzania. *BMC Oral Health*. 18;6:12
- Heijligenberg, R., Romijn, J.A., Westerterp, K.R., Jonkers, C.F., Prins, J.M. & Sauerwein, H.P. (1997). Total energy expenditure in human immunodeficiency virus-infected men and healthy controls. *Metabolism*. 46(11):1324-1326.
- Heinic, G.S., Greenspan, D. & Greenspan, J.S. (1993). Oral CMV lesions and the HIV infected: early recognition can help prevent morbidity. *J Am Dent Assoc*. 124:99-105.

- Jones, A.C., Freedman, P.D., Phelan, J.A., Baughman, R.A. & Kerpel, S.M. (1993). Cytomegalovirus infections of the oral cavity: a report of six cases and review of the literature. *Oral Surg Oral Med Oral Pathol.* 75:76-85.
- Kahabuka, F., Fabian, F., Petersen, P.E. & Nguvumali, H. (2007). Awareness of HIV/AIDS and its oral manifestations among people living with HIV in Dar es Salaam, Tanzania. *Afri J of Aids Research.* 6: 91-95
- Kikwilu, E.N., Masalu, J.R., Kahabuka, F.K., & Senkoro, A.R. (2008). Prevalence of oral pain and barriers to use of emergency oral care facilities among adult Tanzanians *BMC Oral Health.* 8: 28. Published online 2008 29. doi: 10.1186/1472-6831-8-28.
- King, M.D., Reznik, D.A., O'Daniels, C.M., Larsen, N.M., Osterholt, D.M. & Blumberg, H.M. (2002). Human Papillomavirus-Associated Oral Warts among HIV-Seropositive Patients in the Era of Highly Active Antiretroviral Therapy: An Emerging Infection. *Clin Infect Dis.* 34:641-648.
- Kotler, D.P., Tierney, A.R., Wang, J. & Pierson, R.N. Jr. (1989a). Magnitude of body-cell-mass depletion and the timing of death from wasting in AIDS. *Am J Clin Nutr.* 50(3):444-7
- Kotler, D.P., Tierney, A.R., Altilio, D., Wang, J. & Pierson, R.N. (1989b). Body mass repletion during ganciclovir treatment of cytomegalovirus infections in patients with acquired immunodeficiency syndrome. *Arch Intern Med.* 149(4):901-5
- Langford, A., Kunze, R., Timm, H., Ruf, B. & Reichet, P. (1990). Cytomegalovirus associated oral ulcerations in HIV-infected patients. *J Oral Pathol Med.* 19:71-76.
- Lifson, A.R., Hilton, J.F., Westenhouse, J.L., Canchola, A.J., Samuel, M.C., Katz, M.H., Buchbinder, S.P., Hessol, N.A., Osmond, D.H., & Shiboski, S. (1994). Time from HIV seroconversion to oral candidiasis or hairy leukoplakia. among homosexual and bisexual men enrolled in three prospective cohorts. *AIDS.* 8:73-79.
- Masouredis, C.M., Katz, M.H., Greenspan, D., Herrera, C., Hollander, H., Greenspan, J.S. & Winkler, J.R. (1992). Prevalence of HIV-associated periodontitis and gingivitis in HIV-infected patients attending an AIDS clinic. *J Acquir Immune Defic Syndr.* 5:479-483.
- McQuistan, M.R., Kuthy, R.A., Qian, F., Riniker-Pins, K.J., & Heller KE. (2010). Dentists'treatment of underserved populations following participation in community-based clinical rotations as dental students. *Journal of Public Health Dentistry.* 70:276-284.
- Miyasaki, S.H., Hicks, J.B., Greenspan, D., Polacheck, I., MacPhail, L.A., White, T.C., Agabian, N. & Greenspan, J.S., (1992). The identification and tracking of *Candida albicans* isolates from oral lesions in HIV-seropositive individuals. *J Acquir Immune Defic Syndr.* 5:1039-1046.
- Mofidi, M. & Gambrell, A.M. (2009). Community-Based Dental Partnerships: Improving Access to Dental Care for Persons Living with HIV/AIDS. *Journal of Dental Education.* 73(11):1247-1259.
- Mwangosi, I.E.A.T. & Majenge, J.M. (2011). Prevalence and awareness of oral manifestations among people living with HIV/AIDS attending counselling and treatment centres in Iringa Municipality, Tanzania. *Tanzania Journal of Health Research.* 13: 205-213.
- Nadal, D., de Roche, B., Buisson, M. & Seger RA (1992). Oral hairy leukoplakia in vertically and horizontally acquired HIV infection. *Arch Dis Child.* 67:1296-1297.
- Newell, M.L., Borja, M.C. & Peckham, C. (2003). Height, Weight, and Growth in Children Born to Mothers With HIV-1 Infection in Europe. *Pediatrics* 111(1) e52-60.

- Park, J.C., Choi, S.H., Kim, Y.T., Kim, S.J., Kang, H.J., Lee, J.H., Shin, S.C. & Cha, Y.J. (2011). Knowledge and attitudes of Korean dentists towards human immunodeficiency virus/acquired immune deficiency syndrome. *J Periodontal Implant Sci.* 41(1):3-9. Epub 2011 Feb 28.
- Patton, L.L., McKaig, R., Strauss, R., Rogers, D. & Eron, J.J. Jr. (2000). Changing prevalence of oral manifestations of human immunodeficiency virus in the era of protease inhibitor therapy. *Oral Surg Oral Med Oral Pathol Oral Radiol Endod.* 89(3):299-304.
- Pereyra, M., Metsch, L.R., Tomar, S., Valverde, E., Jeanty, Y., Messinger, S & Boza, H. (2011). Utilization of dental care services among low-income HIV-positive persons receiving primary care in South Florida. *AIDS Care.* 23(1):98-106.
- Petersen, P.E. (2006). Policy for prevention of oral manifestations in HIV/AIDS - The approach of the WHO Global Oral Health Programme. *Adv Dent Res.* 19: 17-20
- Piatlak, M., Jr., Saag, M. S., Yang, L. C., Clark, S. J., Kappes, J. C., Luk, K. C., Hahn, B. H., Shaw, G. M. & Lifson, J.D. (1993). High levels of HIV-1 in plasma during all stages of infection determined by competitive PCR. *Science* 259 (5102): 1749-1754. doi:10.1126/science.8096089. PMID8096089.
- Pichard, C., Sudre, P., Karsegard, V., Yerly, S., Slosman, D.O., Delley, V., Perrin, L. & Hirschel, B. (1998). A randomized double-blind controlled study of 6 months of oral nutritional supplementation with arginine and omega-3 fatty acids in HIV-infected patients. Swiss HIV Cohort Study. *AIDS.* 12(1):53-63.
- Reeves, J.D. & Doms, R.W. (2002). Human Immunodeficiency Virus Type 2. *J. Gen. Virol.* 83 (Pt 6): 1253-1265. doi:10.1099/vir.0.18253-0. PMID12029140.
- Rwenyonyi, C.M., Kutesa, A., Muwazi, L., Okullo, I., Kasangaki, A. & Kekitinwa A. (2011). Oral Manifestations in HIV/AIDS Infected Children. *European Journal of Dentistry* 5:291-298.
- Ryalat, S.T., Sawair, F.A., Al Shayyab, M.H. & Amin, W.M. (2011). The knowledge and attitude about HIV/AIDS among Jordanian dental students: (Clinical versus pre clinical students) at the University of Jordan. *BMC Res Notes.* 15;4(1):191. [Epub ahead of print]
- Samaranayake, L.P., Fidel, P.L., Naglik, J.R., Sweet, S.P., Teanpaisan, R., Coogan, M.M., Blignaut, E. & Wanzala, P. (2002). Fungal infections associated with HIV infection. *Oral Dis.* 8: 151-160.
- Schiødt, M. & Pindborg, J.J. (1987). AIDS and the oral cavity. Epidemiology and clinical oral manifestations of human immune deficiency virus infection: a review. *Int J Oral Maxillofac Surg.* 16(1):1-14.
- Schwenk, A., Beisenherz, A., Romer, K., Kremer, G., Salzberger, B. & Elia, M. (2000). Phase angle from bioelectrical impedance analysis remains an independent predictive marker in HIV-infected patients in the era of highly active antiretroviral treatment. *Am J Clin Nutr.* 72(2): 496 - 501
- Selberg, O., Suttman, U., Melzer, A., Deicher, H., Muller, M.J., Henkel, E. & McMillan, D.C. (1995). Effect of increased protein intake and nutritional status on whole-body protein metabolism of AIDS patients with weight loss. *Metabolism.* 44(9):1159-1165.
- Shabert, J.K., Winslow, C., Lacey, J.M. & Wilmore, D.W. (1999). Glutamine-antioxidant supplementation increases body cell mass in AIDS patients with weight loss: a randomized, double-blind controlled trial. *Nutrition.* 15(11-12):860-864.

- Shevitz, A.H., Knox, T.A., Spiegelman, D., Roubenoff, R., Gorbach, S.L. & Skolnik, P.R. (1999). Elevated resting energy expenditure among HIV-seropositive persons receiving highly active antiretroviral therapy. *AIDS*. 13(11):1351-1357.
- Shiboski CH (2002). HIV-related oral disease epidemiology among women: year 2000 update. *Oral Dis*. 8 (Suppl) 2:44-48.
- Shiboski, C.H., Patton, L.L., Webster-Cyriaque, J.Y., Greenspan, D., Traboulsi, R.S., Ghannoum, M., Juvericc, R., Phelan, J.A., Reznik, D., Greenspan, J.S., The Oral HIV/AIDS Research Alliance, Subcommittee of the AIDS Clinical Trial Group. (2009). The Oral HIV/AIDS Research Alliance: updated case definitions of oral disease endpoints. *J Oral Pathol Med* 38:481-488
- Shubi, F., Kahabuka, F.K., Fabian, F. & Nguvumali, H. (2006). Caries status and opinions of people living with HIV/AIDS on oral health care providers' desired behaviour. *Tanz Dent J*. 13:56-63.
- Tappuni, A.R. & Flemming, G.J. (2001). The effect of antiretroviral therapy on the prevalence of oral manifestations in HIV-infected patients: a UK study. *Oral Surg Oral Med Oral Pathol Oral Radiol Endod*. 92(6):623-628.
- Thiebaut, R., Malvy, D., Marimoutou, C. & Davis, F. (2000). Anthropometric indices as predictors of survival in AIDS adults. Aquitaine Cohort, France, 1985-1997. Groupe d'Epidemiologie Clinique du Sida en Aquitaine (GECSA). *Eur J Epidemiol*.. 16(7):633-639.
- Turhan, O., Senol, Y., Baykul, T., Saba, R. & Yalçın, A.N. (2010). Knowledge, attitudes and behaviour of students from a medicine faculty, dentistry faculty, and medical technology Vocational Training School toward HIV/AIDS. *Int J Occup Med Environ Health*. 23(2):153-160.
- UNAIDS report on the global AIDS epidemic 2010. Available at http://www.unaids.org/globalreport/documents/20101123_GlobalReport_full_en.pdf (Accessed 2011-09-01).
- Uti, O.G., Agbelusi, G.A., Jeboda, S.O. & Ogunbodede, E. (2009). Infection control knowledge and practices related to HIV among Nigerian dentists. *J Infect Dev Ctries*. 3(8):604-610.
- Vázquez-Mayoral, E.E., Sánchez-Pérez, L., Olguín-Barreto, Y. & Acosta-Gío, A.E. (2009). Dental school deans' and dentists' perceptions of infection control and HIV/AIDS patient care: a challenge for dental education in Mexico. *AIDS Patient Care STDS*. 23(7):557-562.
- Wheeler, D.A., Gibert, C.L., Launer, C.A., Muurahainen, N., Elion, R.A., Abrams, D.I. & Bartsch, G.E. (1998). Weight loss as a predictor of survival and disease progression in HIV infection. Terry Bein Community Programs for Clinical Research on AIDS. *J Acquir Immune Defic Syndr Hum Retrovirol*. 18(1):80-85.
- Winkler, J.R., Herrera, C., Westenhuse, J., Robinson, P., Hessel, N., Buchbinder, S., Greenspan, J.S. & Katz, M.H. (1992). Periodontal disease in HIV-infected and uninfected homosexual and bisexual men. *AIDS* 6:1041-1043.
- World Health Organization (2005). Consultation on Nutrition and HIV/AIDS in Africa: Evidence, lessons and recommendations for action.



Oral Health Care - Pediatric, Research, Epidemiology and Clinical Practices

Edited by Prof. Mandeep Viridi

ISBN 978-953-51-0133-8

Hard cover, 302 pages

Publisher InTech

Published online 29, February, 2012

Published in print edition February, 2012

Oral health care in pediatric dentistry deals with complete oral health, including preventive aspects for children right from their conception to adolescence, encompassing all the spheres of dentistry including various specialties. It also includes planning a preventive program at individual and community levels. The current research interests in oral health care include studies regarding the role of stem cells, tissue culture, and other ground-breaking technologies available to the scientific community in addition to traditional fields such as anatomy, physiology, and pharmaceuticals etc of the oral cavity. Public health and epidemiology in oral health care is about the monitoring of the general oral health of a community, general afflictions they are suffering from, and an overall approach for care and correction of the same. The oral health care-giver undertakes evaluation of conditions affecting individuals for infections, developmental anomalies, habits, etc. and provides corrective action in clinical conditions. The present work is a compendium of articles by internationally renowned and reputed specialists about the current developments in various fields of oral health care.

How to reference

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Febronia Kokulengya Kahabuka and Flora Masumbuo Fabian (2012). HIV/AIDS and Oral Health in Socially Disadvantaged Communities, *Oral Health Care - Pediatric, Research, Epidemiology and Clinical Practices*, Prof. Mandeep Viridi (Ed.), ISBN: 978-953-51-0133-8, InTech, Available from:
<http://www.intechopen.com/books/oral-health-care-pediatric-research-epidemiology-and-clinical-practices/hiv-aids-and-oral-health-in-socially-disadvantaged-communities>

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