

The State of Oral Health on the African Continent

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### Abstract

The African continent has continuously suffered from poverty, poor sanitation, and malnutrition, leaving it an open feeding ground for infectious disease and premature death. Along with poor oral hygiene and an unavailability of dental clinics, oral disease is allowed to thrive and cause great harm. In the last two decades, the World Health Organization and others have tried to implement better systems of oral health care for the African people and have advocated for more well-trained dentists, dental clinics, equipment, and affordable dental care. Progress has been made in some African countries, but the continent is still in serious need of an oral health care system that will deliver quality, affordable dental care, with equal access for all people.

### The State of Oral Health on the African Continent

The field of dentistry has seen great advancements in recent years. From invisible braces to teeth whitening, new types of fluoride treatments to electronic toothbrushes, dentistry in America is quickly advancing and offering novel and exciting treatments and products for the middle class consumer. However, as the U.S. and other developed countries explore technological advances in dentistry, much of the world still lacks sufficient oral health care and dental services. Developing countries in Africa, South America, and Asia are plagued by a poor state of general health, and consequently, oral health maladies in these locations are a critical concern. Whereas the main oral health problems in developed countries are dental caries and periodontitis, oral disease in developing countries is manifested quite differently. Due to deplorable living conditions, malnutrition, lack of available oral health care, and poor oral hygiene, people in developing countries are susceptible to oral diseases that are not even heard of in America, such as noma. This thesis focuses on the oral diseases that devastate the people in many developing countries in Africa and the concern for the current state of oral health in Africa. It concludes with suggestions of measures that can be taken to reduce the risk of these oral diseases, in an effort to better the oral health of Africans and improve their quality of life.

The World Health Organization (WHO) is currently the main organization that is intervening in Africa to promote oral health, and the WHO African Region includes 47 out of the 54 countries on the African continent (WHO Regional Office for Africa, 2014). The countries not included in this Region are Egypt, Sudan, Somalia, Libya, Morocco,

Tunisia, and Djibouti. Because of this inconsistency, statistics in this paper and generalizations about Africa may not specifically apply to these seven states.

### **Risk Factors for Oral Disease in Africa**

#### **Poverty**

Oral health is poor among the African population at large for many reasons. The biggest contributing factor of poor oral health is the state of poverty; the majority of the people on the African continent are desperately poor and live in destitute environments (WHO Regional Office for Africa, 2000). Living in poverty allows preventable oral diseases to be commonplace, unnecessarily cause great harm, and create burdens for individuals and societies. Society suffers from economic hardships and is robbed of productive potential when its people are overwhelmed by disease and poor health.

#### **Malnutrition**

Unfortunately, malnutrition has a close relationship with the state of poverty and greatly impacts the African continent. In fact, the malnourishment that exists in 20 countries in Africa combined makes up 90% of the global burden of malnutrition (WHO Regional Office for Africa, 2014). Much of the malnutrition is due to what public health officials call food insecurity: not having a reliable source of or access to food. Obtaining food in Africa is greatly dependent on the agriculture of the region, so drought, floods, and fighting can cause a great disturbance and lead to food insecurity (WHO Regional Office for Africa, 2014). In 2013, about 10.3 million African people were food insecure, and more than 1.4 million children were in danger of severe malnourishment (WHO Regional Office for Africa, 2014). Surveys conducted by the WHO show that most African countries suffer from a low intake of fruits and vegetables (WHO Regional

Office for Africa, 2014). As of last year, the WHO reported that the prevalence of malnutrition in Africa is very high and continues to increase (WHO Regional Office for Africa, 2014).

Malnourishment causes people to have weakened immune systems that are unable to fight off otherwise-preventable diseases. Not having a nutritious intake of food with the proper vitamins and minerals causes the breakdown of epithelial tissue in the oral mucosa, allowing pathogens to invade (Auluck & Pai, 2005). Many times malnutrition begins *in utero*, as the malady is passed down from mother to baby.

To maintain healthy oral tissues and bone in the oral cavity, it is necessary to have adequate amounts of vitamin A, vitamin D, vitamin K, vitamin C, the B complex vitamins, calcium, phosphorus, and magnesium (Sroda, 2010). It is critical for an embryo to receive these specific nutrients and others while developing, as primary teeth begin to mineralize during the third or fourth month of pregnancy, also known as the pre-eruptive stage in regards to the dentition (Sroda, 2010). Pre-eruptively, vitamin A aids in the formation of enamel and dentin and the creation of mucous-secreting cells in the salivary glands (Sroda, 2010). After tooth eruption, vitamin A helps to maintain tissues and functioning of the salivary glands (Sroda, 2010). Pre-eruptively, vitamin D has a role in the calcification of tissues like bone, enamel, dentin, and cementum, and post-eruptively, this vitamin aids in the repair of diseased bone (Sroda, 2010). Vitamin D also allows minerals like calcium and magnesium to be absorbed by the body (Sroda, 2010). Additionally, Vitamin K is important, as it is vital to the blood-clotting cascade. Pre-eruptively, vitamin C aids in bone and teeth formation and all connective tissue formation

(Sroda, 2010). Post-eruptively, vitamin C has a role in collagen formation, wound healing, connective tissue formation, and aids in phagocytosis (Sroda, 2010).

The B complex vitamins include thiamin, riboflavin, niacin, pyroxidine, cobalamin, folic acid, biotin, and pantothenic acid, and these are necessary for functioning of the immune system and helping new tissue cells form, allowing for tissue repair (Sroda, 2010). Deficiencies in the B complex vitamins can cause an increase in tissue sensitivity in the oral cavity, inflammation, and burning of the tongue (Sroda, 2010). Calcium, phosphorus, and magnesium have a role pre-eruptively in the mineralization of bone, enamel, and cementum (Sroda, 2010). After tooth eruption, these minerals assist in the remineralization of the hard tissues and maintenance of bone integrity (Sroda, 2010). Overall, calcium and magnesium are a requirement for strong bones and teeth. Alveolar bone surrounds the roots of teeth and supports the teeth and the periodontal ligaments that attach to them (Sroda, 2010). When this alveolar bone weakens, teeth can become loose and infection is likely. For repair of oral wounds to occur, protein, vitamin C, iron, zinc, copper, and selenium are required by the body (Sroda, 2010). Obtaining a proper amount of the vitamins and minerals discussed is essential for initiating oral health *in utero*, which will have a lasting and permanent impact on the child.

Frequently, a state of malnourishment includes a severe lack of protein intake. Protein is vital to almost every cellular process in the human body, and malnourishment with low protein intake specifically affects the immune system, as protein is needed for antibody production. In regards to the oral cavity, protein helps with the formation and

repair of all types of tissue. Pre-eruptively, protein aids in the construction of the mandible, maxilla, periodontal tissues, and the enamel matrix (Sroda, 2010).

### **Sanitation**

Unsanitary living conditions are another factor closely linked with poverty and play a role in Africa's poor state of oral health. Only 26% of the rural population in Africa has access to *improved sanitation*, which the WHO describes as having toilets (WHO Regional Office for Africa, 2014). Urban areas have a greater amount of improved sanitation, with 47% of the urban population using this luxury (WHO Regional Office for Africa, 2014). In 2011, only four countries in the African Region had met proper sanitation standards (WHO Regional Office for Africa, 2014). In sub-Saharan Africa, open defecation is an unsightly problem creating unsanitary environmental conditions, but unfortunately people do not have an alternative. In 2011, 200 million people contributed to the unsanitary environment by using open defecation (WHO Regional Office for Africa, 2014). Another issue in regards to sanitation is that one-third of Africa still does not have access to clean drinking water (WHO Regional Office for Africa, 2014). An unsanitary living environment and infected water supply allow dangerous microbes to easily spread and cause disease, weakening immune systems, and thus promoting the incidence of opportunistic oral diseases.

### **Inadequate Oral Health Care System**

The oral health care system in Africa is far from ideal and a large reason why oral disease is plaguing the continent. Firstly, there is a low availability of dental services, with the average dentist-to-population ratio being 1:150,000 (FDI World Dental Federation, 2014). This availability of dentists is in comparison to an average ratio of one



dentist for every 2,000 people in many industrialized countries (World Health Organization [WHO], 2015). The ratio varies among the countries of Africa, depending on an individual country's population and standard of living. For example, Ethiopia ranks below the continent's average and is greatly underserved, as there is one dentist for every one million people (FDI World Dental Federation, 2014). However, even in African countries with a greater number of dentists for the given population, there is unequal access to the dental care. Dentists often accumulate in the urban cities, aiming for higher salaries and avoiding the poor rural working conditions elsewhere.

Treatment for oral disease is very expensive in general, as it is the fourth most expensive disease to treat in industrialized countries (Petersen, 2004). Because of the urban location of the dental services and high costs, treatment offered only benefits the wealthy regions of the countries (FDI World Dental Federation, 2014). Some countries have high out-of-pocket payments that must be received before treatment can be administered. Unless they are of the wealthy minority, many times families have to borrow the money from someone and this pushes them deeper into poverty (WHO Regional Office for Africa, 2014). Because of the long history of poverty in rural areas of Africa, subsequent lack of finances, and geographic limitations, dental clinics have become very sparse in rural settings, leaving these large areas of Africa without dental care (WHO Regional Office for Africa, 2000). This is a troublesome issue, as much of the African population lives in these rural environments. In 2012, only 39% of the inhabitants in the WHO African Region lived in urban areas (WHO Regional Office for Africa, 2014). Currently, one of the biggest issues with oral health care in Africa is this wide gap between the availability of services offered for the wealthy and the lack of

services for the poor, largely living in rural areas (WHO Regional Office for Africa, 2014). In a study in 2004, 93% of 12 year olds in Burkina Faso had never been to a dentist, and this was also the case with 61% of 35-44 year olds living there (Petersen, 2004). In Madagascar, 83% of 12 year olds had never received dental care (Petersen, 2004).

In addition to the shortage of dental clinics throughout Africa, there is an absence of needed equipment, supplies, essential medicines, and human workers (Thorpe, 2006). Because of economic crises and war in many parts of Africa, the number of health care staff and buildings have dwindled and technology and supplies have disappeared (WHO Regional Office for Africa, 2014). In addition, health care personnel are frequently inappropriately trained and do not know how to best serve the African people. Very few countries can afford to purchase and maintain medical technology equipment, and when these are purchased, it is likely that the technology will be used incorrectly (WHO Regional Office for Africa, 2014).

### **Fluoride**

Fluoride use impacts the integrity of teeth and consequently, whether teeth will be prone to oral disease in the future. Fluoride is required at an optimal level for proper oral health; having either too little or too much fluoride during early development are both problematic (Sroda, 2010). Too little fluoride can increase the risk of dental caries and too much of it can lead to dental fluorosis (Sroda, 2010). There are a number of factors that contribute to fluoride intake including the local water supply, the amount of fluoride in food and drink, and the use of fluoridated toothpaste (Sroda, 2010). Fluoride is not widely used or available in many regions of Africa; in Burkina Faso, it was reported that

75% of 12 year olds living in rural areas did not use fluoridated toothpastes (Petersen, 2004).

Pre-eruptively, fluoride integrates into the tooth structure that is forming and adds strength to mineralizing tissue, and after the teeth have erupted, fluoride gives protection against the development of dental caries (Sroda, 2010). If a fetus is deficient in fluoride intake *in utero*, teeth become porous and weak against attack by acid, greatly increasing susceptibility to cavities in the future (Sroda, 2010). If too much fluoride is ingested at a young age, dental fluorosis results, ranging from mild white spots to dark brown staining on the permanent teeth (Sroda, 2010).

### **Tobacco**

A final factor influencing the frequency of oral disease in Africa is the increased use of tobacco that has resulted from increases in urbanization (Thorpe, 2006). In sub-Saharan Africa, there is greater availability of tobacco products due to increased marketing and fast population growth (WHO Regional Office for Africa, 2014). The use of tobacco products is generally more common among men, but the prevalence of smoking varies among the African countries. In Nigeria, 15% of adults reported smoking tobacco, whereas 67% of Kenyan adults reported this (Petersen, 2004). Tobacco use weakens the immune system, makes it harder to fight off oral infections, slows healing time, and weakens the integrity of oral wound healing (Petersen, 2004). Smoking tobacco while pregnant can cause birth defects that affect the oral cavity of the fetus, like cleft lip and cleft palate (Petersen, 2004). The health risks associated with tobacco use are increased when used in conjunction with alcohol. As alcohol consumption is also increasing among Africans during this period of industrialization, there is concern for the

effects this combination of substances will have on the body (Petersen, 2004). Most notably, tobacco use is causing a higher number of cases of oral cancer in Africa, just like it does in the U.S. Some of the oral effects of smoking include squamous cell carcinoma, leukoplakia, nicotine stomatitis, and smoker's melanosis (Little, 2013).

### **Oral Diseases Affecting Africans**

In an environment with poverty, malnutrition, lack of proper oral hygiene, and inaccessibility to dentists and basic oral health care, oral disease is bound to run rampant in the mouths of Africans. Oral diseases differ among regions of Africa in their severity and prevalence. The following oral diseases need to be addressed either due to their high occurrence and/or the severe harm that can result from them (WHO Regional Office for Africa, 2000).

#### **Noma**

According to the WHO, the most severe oral disease plaguing the continent of Africa is noma (WHO Regional Office for Africa, 2000). Noma has also been documented in Asia, Europe, and South America, but most cases are found in the "noma belt" of Africa, which lies below the Sahara and stretches from Senegal to Ethiopia (Marck, 2013). Noma occurs in 39 countries in the African Region and has an annual incidence of 20 cases per 100,000 people in the sub-Saharan part of the continent, though it is believed that the disease is under-reported (Thorpe, 2006; Varenne, 2015). Burkina Faso, Ethiopia, Mali, Niger, Nigeria, and Senegal report the highest number of cases of noma, with 100,000-140,000 cases reported each year (WHO Regional Office for Africa, 2014). Noma is most commonly found in extremely poor regions of developing countries, as risk factors for the disease include chronic malnutrition, viral infections, poor oral

hygiene, and inadequate sanitation (Petersen, 2009). Noma has been designated the *face of poverty* due to its high incidence in poverty-stricken areas and the disfiguring effects it has on the face (Marck, 2013).

Noma is also known as cancrum oris and comes from the Greek word *nomein* which means “to devour” (Auluck & Pai, 2005, p. 757). It is believed to be an anaerobic bacterial infection that causes necrosis of the oro-facial tissue and eats away at facial tissue and bone. It comes about as an opportunistic infection, in which the body’s ability to fight disease is already suppressed prior to the development of noma (Tonna, 2010). Though the disease can also affect adults with HIV, noma mostly affects children ages 2-6 years who have recently had one of the following infectious diseases: malaria, measles, chicken pox, necrotizing ulcerative gingivitis, or tuberculosis (Auluck & Pai, 2005). The effects of noma are truly devastating, as 70-90% of children who go without treatment for noma will die, and those that do survive are stricken with severe facial disfigurement (Thorpe, 2006).

Noma is specifically considered a polybacterial infection, as a variety of bacteria in cooperation with one another cause harm, disrupting vasculature and degrading extracellular proteins in facial tissue (Masipa et al., 2013). The following microbes have been identified in noma lesions: *Treponema vicentii*, *Staphylococcus aureus*, *a-hemolytic Streptococcus*, *Borrelia vincentii*, *Fusobacterium necrophorum*, *Prevotella intermedia*, and other spirochetes (Auluck & Pai, 2005; Tonna, 2010). *Fusobacterium necrophorum* is thought to be a key player in the progression of noma (Auluck & Pai, 2005). This bacterium produces dermatotoxins and can be transmitted through unsanitary water (Auluck & Pai, 2005). *Prevotella intermedia* breaks down lipids, leading to tissue

destruction, and it also releases proteases that break down immunoglobulin G, weakening the immune response (Auluck & Pai, 2005). The polybacterial infection of the various microbes alone is not enough to initiate noma (Tonna, 2010). A state of malnourishment and a suppressed immune system from a previous infectious disease are required for noma to flourish in an individual (Feller et al., 2014). The children in Africa are noma's main target, as they are regularly subjected to protein-deficient diets, poor nutrition, poor oral hygiene, and weakened immune systems (Auluck & Pai, 2005).

The WHO classifies noma into four stages (WHO Regional Office for Africa, 2000). The initial progression and signs of the disease are somewhat unknown, as victims do not report for treatment until noma has reached the advanced stages (Auluck & Pai, 2005). The disease resembles an oro-facial gangrene and is believed to begin as a mucosal ulceration with edema that eventually develops a black, necrotic center (Tonna, 2010). The infection is rapidly progressive and spreads among tissue types in the face, destroys facial tissue, and the mandibular and maxillary bones are exposed and reabsorbed, frequently causing facial deformities (Tonna, 2010). Individuals with this disease also present with a bluish-black discoloration of facial skin, severe dehydration, excessive salivation, anemia, and bad breath that is a result of the bacteria involved (Masipa et al., 2013; Tonna, 2010). Noma is a deadly, disfiguring disease (FDI World Dental Federation, 2014). Even when treated, the effects of noma can include early loss of deciduous teeth, damage to tooth buds of permanent teeth, dislodging of the jaw bone, and severe disfigurement of the face (Auluck & Pai, 2005).

Fortunately, if noma is caught in its early stages and antibiotic treatment is administered, the disease can be cured 90% of the time (Tonna, 2010). The first line of

treatment for noma includes broad spectrum antibiotics, a disinfectant mouth rinse, IV fluids, and vitamin supplements (Tonna, 2010). Penicillin and metronidazole are commonly used antibiotics, however some cases have shown that *Fusobacterium necrophorum* and *Prevotella intermedia* are resistant to penicillin, so culture and sensitivity tests should be conducted to determine the proper antibiotics to be administered (Auluck & Pai, 2005). A high-protein diet is beneficial to reverse the body's state of malnourishment. In addition, saline irrigation of facial lesions and removal of dead facial tissue can help prevent osteonecrosis, myonecrosis, and breaking of the skin (Masipa et al., 2013). Children who survive noma ideally need surgical reconstruction after the disease has taken its devastating toll. They may have abundant facial scar tissue and possible fibrosis of facial muscles, and reconstructive surgery is necessary to allow proper functioning of the mouth and oral cavity (Masipa et al., 2013). However, many families cannot afford surgery and/or would have to travel a long distance to receive the reconstructive treatment. Without surgical intervention, children are often left with extremely disfigured faces and are not able to properly talk, eat, or breathe normally for the rest of their lives (Masipa et al., 2013). They are further discriminated against and rejected by their families and society.

With or without treatment, death can result from noma due to a systemic inflammatory response, malnutrition, septicemia, dehydration, or aspiration pneumonia (Tonna, 2010). Many children are not fortunate enough to receive the antibiotic treatment for a variety of reasons, the main reason being that these antibiotics are not commonly available in the third world. Secondly, some parents do not know what to look for in the beginning stages of the disease, and noma can rapidly progress to advanced stages in a

matter of days, at which point death is imminent. Conversely, some families do recognize noma in their children but believe that it is a curse that was cast on the family (Thorpe, 2006). Because of this, the child may be ignored, hidden, or sent to live in isolation rather than be taken in for treatment (Thorpe, 2006).

### **Acute Necrotizing Ulcerative Gingivitis**

The next most severe oral disease plaguing the lives of Africans is acute necrotizing ulcerative gingivitis (ANUG). This disease is an anaerobic bacterial infection that causes gingival tissue necrosis (Masipa et al., 2013). Many of the risk factors for this oral disease coincide with living in Africa, including poor diet, vitamin deficiencies, lack of oral hygiene, and weakened immune systems (Atout, 2013). Gingival tissues become swollen, red, very painful, and bleed frequently, and individuals present with elevated temperatures and lethargy (Sroda, 2010). Individuals may have extremely bad breath and a loss of gum tissue or large ulcers between teeth (Atout, 2013). ANUG can precede the onset of noma, and treatment for this oral disease is important in order to prevent the progression to the more serious condition (Masipa et al., 2013). Dental treatment for ANUG is commonly invasive debridement, which involves the removal of dead and infected tissue (Sroda, 2010). Antibiotics, recurrent mouth washing, and deep tooth cleaning are also essential to eradicate this disease state (Masipa et al., 2013).

### **Oral Cancer**

Oral cancer in Africa has increased in the last decade due to increased use of chewing tobacco, smoking tobacco, alcohol, and betel nut, which has similar effects as tobacco on the oral cavity (Thorpe, 2006). Even though many Africans live in poverty, with little money and lack of essential resources, addictions to tobacco and alcohol still



exist (Auluck, 2005). More than 300 carcinogens are found in tobacco smoke, and when combined with carcinogens in some alcoholic beverages, the harmful effects are greatly increased (Johnson, 2001). The carcinogens act locally, especially on keratinocyte stem cells, and produce chemical analogs that interfere with DNA replication (Johnson, 2001). In addition, when mucosal cells are chronically exposed to carcinogens, oncogenes are activated and gene deletions occur (Little, 2013). The most common gene deletion found in tobacco-related oral cancer occurs on chromosome 9 (Little, 2013). Over 90% of oral cancer classifies as squamous cell carcinoma and is asymptomatic early on (Little, 2013). Oral cancer usually begins on the lips and tongue, however it can also be located under the tongue, on the soft palate, and on the gingival (Dickson, 2011). Frequently, people in Africa only seek medical help once the cancer reaches an advanced stage and becomes painful, and treatment at this point may not be available (Auluck, 2005). Oral cancer can become deadly when it obstructs the airway, enters major vessels of the head and neck, or metastasizes to other organs and areas of the body (Little, 2013).

### **Oral Manifestations of HIV and AIDS**

Human Immunodeficiency Virus (HIV) afflicts much of the African continent; of the 2.7 million new cases of HIV reported globally in 2010, 70% of these cases were from sub-Saharan Africa (WHO Regional Office for Africa, 2014). Public health officials claim that the HIV epidemic is slowing down, as more efficient treatment methods are being discovered (WHO Regional Office for Africa, 2014). However, the disease is still spreading, as there were 1.6 million new cases in Africa in 2012 (WHO Regional Office for Africa, 2014). When a disease or condition weakens the immune system, many times there will be oral manifestations. As HIV progresses past the asymptomatic stage, oral

manifestations will likely appear (Lamont, Hajishengallis, & Jenkinson, 2014). In fact, 40-50% of HIV-positive individuals will have a fungal, bacterial, or viral infection present in their mouth, especially during the beginning stages of HIV infection (Petersen, 2004). Oral manifestations of HIV include necrotizing gingivitis, necrotizing periodontitis, Kaposi's sarcoma, recurrent aphthous ulcers, hairy oral leukoplakia, oral warts, and candidiasis (Sroda, 2010; Thorpe, 2006). All of these oral diseases can make chewing and swallowing very uncomfortable, and if they are not treated, they can limit food intake, become very painful, and lead to other health problems (Dickson, 2011; Sroda, 2010).

The most common oral disease in people with HIV is oral candidiasis, also known as "thrush," which is caused by the fungus *Candida albicans* (Lamont et al., 2014, p. 351). *C. albicans* is a normal fungus that lives in the gastrointestinal tract (Lamont et al., 2014). However, when a person is immunocompromised from HIV, the fungus can grow out of control in the oral cavity. Candidiasis presents as creamy white lesions on the oral mucosa, commonly on the soft palate, tongue, gingiva, buccal mucosa, and oropharynx, and a burning and swelling sensation may be felt in the mouth (Dickson, 2011; Lamont et al., 2014). Mouth rinses are a common treatment for this fungal infection, and if the infection is severe, the anti-fungal drug fluconazole can be used and has led to beneficial results for people with HIV (Dickson, 2011). However, oral candidiasis in HIV positive individuals is a strong indicator that the HIV disease state will likely progress to AIDS (Little, 2013).

### **Dental Caries**

The prevalence of dental caries in Africa is rather low compared to its existence in developed countries. However, an increase in urbanization in African cities and a global increase in sugar consumption has caused sugar-rich diets to be more common, and there is a fear that the frequency of dental caries is likely to rise, especially among children (WHO Regional Office for Africa, 2000). Six major factors determine the likelihood of developing dental caries, otherwise known as a “cavity” (Sroda, 2010, p. 168). These include the specific bacteria housed in the mouth, the structure of the tooth, amount and frequency of carbohydrates ingested, fluoride use, amount of saliva produced, and quality of oral hygiene (Sroda, 2010).

Bacteria in the mouth feed on ingested carbohydrates and release acid, causing enamel to demineralize (Sroda, 2010). The intake of fluoride in water or through toothpaste use is important because it aids in the remineralization of the enamel (Sroda, 2010). Proper oral hygiene is essential to avoiding dental caries; the plaque left on teeth needs to be brushed away or else the bacteria can spread and produce more acid (Sroda, 2010). Children in Africa have an increased risk of dental caries because of poor oral hygiene, lack of fluoride use and intake, and an increasingly sugary diet. Similarly to the more severe oral diseases previously mentioned, the incidence of dental caries varies greatly in different parts of the continent. Overall, 90% of cases of dental caries go untreated among the African people (WHO Regional Office for Africa, 2000). If they ever receive treatment for this oral health issue, commonly the only option is to extract the tooth, as decay has severely taken its toll on the tooth (FDI World Dental Federation, 2014).

**Fluorosis**

Fluorosis is an oral condition that is especially common in the Rift Valley of East Africa (WHO Regional Office for Africa, 2000). Fluorosis is due to an excessive fluoride intake and causes staining and pitting of teeth and in severe cases may damage all of the enamel (WHO, 2001). Excessive fluoride intake is most commonly from drinking water containing high levels of fluoride. Fluoride belts exist in regions around the world that contain high levels of fluoride in the water supply, and one of these exists in Africa, containing Egypt, Libya, Sudan, Kenya, and Algeria (WHO, 2001). Removing high levels of fluoride from a water source is difficult, especially in poor African countries, so preventing fluorosis in Africa is unlikely. However, though this oral disease affects the color and structure of teeth, it is not known to have further complications and is not an oral disease of high severity.

**The Impact of Poor Oral Health**

Oral health does not just involve healthy teeth, as Americans tend to think of it. It also includes healthy gums, soft tissues, tongue, chewing muscles, lips, salivary glands, and palate (Petersen, 2009). Oral health is a state without disease that allows for proper functioning of the mouth and oral tissues (WHO Regional Office for Africa, 2000). Having proper oral functioning of the craniofacial complex allows one to speak, smile, chew, swallow, kiss, taste, and smell (Thorpe, 2006). Oral appearances affect self-esteem, and oral health allows people to interact with others without distress or humiliation (Petersen, 2009). A poor state of oral health is a serious issue, as it can be detrimental to the general health of the body. For example, decayed and painful teeth can interfere with eating and limit food intake and cause malnutrition, especially in children (Thorpe,

2006). Severe infections in the oral cavity can quickly spread to other parts of the body and lead to dangerous systemic infections.

Poor oral health and the oral diseases that contribute to it affect people all over the world, of all races. Though some forms of oral disease are not life-threatening, oral disease is an important issue to consider due to its high incidence and impact on individuals in terms of pain, discomfort, and lessening quality of life (WHO Regional Office for Africa, 2000). Oral disease can cause functional and social limitations for the individual, has a large financial impact on both the community and the individual, and is an economic burden to society (WHO Regional Office for Africa, 2000). In addition, proper oral health care and early detection of oral disease can reduce the likelihood of premature death. Oral examination can show nutritional deficiencies and microbial infections that may be manifested elsewhere in the body. In 2012, the average life expectancy for the WHO African Region was 58 years, whereas the global average at this time was 70 years (WHO Regional Office for Africa, 2014). Malnutrition, poor sanitation, and infectious disease in Africa are largely to blame for this low life expectancy; however, improving the state of oral health would greatly benefit the African people.

### **Intervention by the WHO**

Oral disease has a large impact on the African population and has been a target of concern for many years. In 2000, the WHO decided to survey the oral health situation in Africa to learn how to better help the African people and reduce the risk of oral disease (WHO Regional Office for Africa, 2000). It was discovered that only 14 out of the 46 countries surveyed in Africa had a national oral health plan (WHO Regional Office for

Africa, 2000). In addition, oral health care taught in Africa was mainly curative in essence and not preventive (WHO Regional Office for Africa, 2000). Workers in the field of oral health were not taught about noma, the oral manifestations of HIV, and other severe oral diseases but rather were taught about treating dental caries (WHO Regional Office for Africa, 2000). The oral health care systems in Africa had been modeled after those in the Western world, in which dentists were situated in urban areas in a private practice setting (WHO Regional Office for Africa, 2000). When dental services were available to those in the general public, they were focused on treatment of issues, like curing tooth pain, and health workers neglected to advise patients on preventative medicine (WHO Regional Office for Africa, 2000). Upon these findings, the WHO made a declaration that the African people needed universal access to quality, affordable oral health care, with an emphasis on prevention-oriented services (WHO Regional Office for Africa, 2000).

During this time, in an effort to improve the state of oral health in Africa and sustain it, the WHO Regional Committee for Africa drafted a ten-year strategy that would address the oral health care system issues that were recently observed (WHO Regional Committee for Africa, 2008). It created an expectation that by 2008, all African countries would have created a national oral health care strategy and plans to execute it (WHO Regional Office for Africa, 2000). This strategy would include improved dental facilities with proper equipment, technologies, and staff, proper training of oral health personnel, and the creation of oral health management systems (WHO Regional Office for Africa, 2000). Research would be conducted in order to prioritize the severity of the oral diseases in each African region and regulate optimal levels of fluoride, and families and

communities would be educated on proper oral hygiene and healthy lifestyles (WHO Regional Office for Africa, 2000). This strategy by the WHO placed an emphasis on severe oral diseases like noma, the oral manifestations of HIV, and oral cancers (WHO Regional Office for Africa, 2000).

In 2008, the oral health situation in Africa was reassessed to determine progress made and redefine challenges. After ten years of implementing their strategy, it was determined that progress had been made on the African continent, but there were still large issues and challenges to conquer (WHO Regional Committee for Africa, 2008). By this time, 22 countries had produced national oral health policies and programs and started putting them into practice (WHO Regional Committee for Africa, 2008). Nine countries had programs designed to control noma, and 25 countries developed oral health initiatives in regards to HIV/AIDS control, mother-baby health, and oral health education in schools (WHO Regional Committee for Africa, 2008). However, most oral health care centers were located in urban areas and hospitals, and dental services were designed for emergency treatments, not preventative dental care (WHO Regional Committee for Africa, 2008). The oral health care centers and dental equipment were inadequate, a result of limited funding (WHO Regional Committee for Africa, 2008).

In addition, researchers discovered that oral disease prevention techniques were known but not put into practice. The WHO claims that prevention was not a priority in these health care strategies drafted by the African countries (WHO Regional Committee for Africa, 2008). For example, monitoring fluoride levels in drinking water was not given much attention (WHO Regional Committee for Africa, 2008). However, it was observed that the average dentist-to-population ratio had slightly improved. In 17

countries, a total of 1,000 dental nurses had been trained and in 30 countries, a total of 7,717 dental hygienists were trained (WHO Regional Committee for Africa, 2008). The WHO recommends a dentist-to-population ratio of 1:10,000 and unfortunately, many regions of Africa fall short of this (WHO Regional Committee for Africa, 2008). In its assessment, the WHO also found that the training of dentists was not suited to the needs of the region and not much research had been done to track the spread and severity of oral disease (WHO Regional Committee for Africa, 2008). The lack of research on the scope of oral disease in various regions left health care program developers at a disadvantage when it came to knowing how to best help the people (WHO Regional Committee for Africa, 2008). Overall, the communities as a whole were not involved with promoting better oral health care (WHO Regional Committee for Africa, 2008).

In light of these challenges, the WHO Regional Office for Africa developed a plan to move forward. This intervention included increasing the commitment of political governments and appointing oral health officers to lead the newly-formed oral health programs (WHO Regional Committee for Africa, 2008). Additionally, the strategy called for prioritizing actions regarding better sanitation and educating the public on oral health, including bringing this education into the primary schools (WHO Regional Committee for Africa, 2008). The WHO called for an increase in national funding for the oral health programs and for the investment of quality and suitable equipment for oral health centers (WHO Regional Committee for Africa, 2008). It also advocated for an increase in the number of skilled dental professionals and that research be done to evaluate the effectiveness of these reforms (WHO Regional Committee for Africa, 2008).



## **A Current Look at the Oral Health Situation**

**Improving the health care system.** In the past 15 years, a combined effort from African governments, international partners, and other community health agencies has sought to strengthen oral health care systems in order to improve the oral health of the African people, which will subsequently improve general health and promote longevity (WHO Regional Office for Africa, 2014). As a result of these efforts over recent years, some African countries have seen improvement in their oral health care systems.

However, the biggest obstacle in the way of bettering oral health in Africa is the gap between the services enjoyed by the wealthy and the lack of services for the poor (WHO Regional Office for Africa, 2014). The WHO states that quality dental care must be available for everyone in Africa. Dental care cannot just serve the wealthy and those who live in cities, but it needs to be accessible to everyone, carried out by well-trained health professionals, and affordable (WHO Regional Office for Africa, 2014).

To achieve dental care equality on the African continent, the WHO states that the following resources are essential: finances, available and equally distributed health workers, available medicine, and government cooperation (WHO Regional Office for Africa, 2014). Unfortunately, these are the same factors that have always been needed for equality in dental care in Africa, but due to the entrenched state of poverty and unstable governments, the continent is still struggling to acquire these. Much of the previous efforts to better oral health care in Africa have not lived up to their fullest potential because of a lack of funding. The WHO has declared that African governments must increase government spending on healthcare and devote more of their national budgets to this issue (WHO Regional Office for Africa, 2014). Among many things, finances are

needed for better and more dental equipment, stocking of essential medicines, and better salaries for health care workers (WHO Regional Office for Africa, 2014). The WHO believes that increased salaries for dental personnel, especially those who work in rural settings, will make them more committed and less likely to desert their station (WHO Regional Office for Africa, 2014). In addition, very little or no money is devoted to health research in Africa, despite urging by the WHO to African governments (WHO Regional Office for Africa, 2014). With increased finances, this research could be done and give more accurate results to the governments about the health of their people.

The disadvantaged oral health care system in Africa must be addressed, and the government leaders in African countries should become actively engaged to promote and see better oral health among their people (WHO Regional Office for Africa, 2014). The continued intervention by outside organizations like the WHO and FDI World Dental Federation is of dire need, not only because of the severity and harmful implications of oral disease but also because of Africa's rapidly growing population. Africa is currently the second most populated continent, with over one billion people calling it home (WHO Regional Office for Africa, 2014). Africa has a young population, and it is projected that the population will double in the next 40 years (WHO Regional Office for Africa, 2014). Researchers believe that by the end of this century, Africa may house over one-third of the world's population (WHO Regional Office for Africa, 2014). If the oral health care system remains the way it is in Africa, there could be devastating results for the people in years to come.

**Positive results.** In regards to improving the general and oral health among Africans, some regions of the continent have made notable progress. Some countries are

currently drafting and implementing national medicine policies in order to expand the accessibility of essential medicines (WHO Regional Office for Africa, 2014). A few African countries have also created national nutrition programs in recent years. For example, Ethiopia initiated a national nutrition program, and 71% of children aged 6-59 months were given vitamin A supplements as a result of this program (WHO Regional Office for Africa, 2014). In addition, the child mortality rate in Ethiopia due to malnutrition has decreased in the last decade (WHO Regional Office for Africa, 2014). In the past five years, countries have tried to create policies to better protect the security of food and improve agricultural efforts in their region. For example, in 2011, Kenya created the Kenya Food and Nutrition Policy in which the Kenyan government made efforts to increase the production of quality food (WHO Regional Office for Africa, 2014). However, a lot of work still needs to be done to reverse the pattern of malnutrition that devastates the African continent. The WHO says that nutrition needs to be added to national budgets in order to see a real and lasting change. Presently, most of the money for bettering nutrition in Africa comes from international partners (WHO Regional Office for Africa, 2014).

In regards to tobacco, African countries are beginning to draft up and exercise tobacco control policies in an effort to decrease the harmful health effects seen in their populations from tobacco use (WHO Regional Office for Africa, 2014). Most countries have put bans on tobacco advertising, and 33 countries require that tobacco products have health warnings on their packaging (WHO Regional Office for Africa, 2014). A majority of African countries have increased excise taxes on tobacco products in recent years, hoping to discourage the consumption of tobacco, and this method has been effective in

reducing tobacco use (WHO Regional Office for Africa, 2014). The WHO is also quickly trying to put the WHO Framework Convention on Tobacco Control into operation in its intervening regions of Africa (WHO Regional Office for Africa, 2014).

In recent years, some countries have trained health care personnel how to better identify noma. It is equally vital to train mothers to recognize noma in their children, how it can be treated, and especially how it can be prevented. The WHO suggests that for early detection of noma, children should have their mouths examined for ulcerations (WHO Regional Office for Africa, 2014). It is also very important that dental and health centers are stocked with the drugs and antiseptics used to treat noma and have available nutritional supplements (WHO Regional Office for Africa, 2014). In the fight against noma, prevention of the disease is the highest priority. Overall, providing children with a better, nutritious diet and advocating oral hygiene including brushing teeth can greatly reduce the risk of noma.

**Moving forward.** Oral disease shares many of the same risk factors as diseases affecting general health, and targeting these will better both oral health and general health in a population. In its intervention efforts to promote oral health, the WHO has placed an emphasis on the importance of more funding for oral health care from African governments, increased dental workers and dental equipment, and greater accessibility to dental services, and these are all necessary for an oral health care system to function well. However, intervention should also include aims that will benefit overall health, such as providing clean drinking water, sanitation, and housing, controlling tobacco and alcohol use, teaching well-balanced nutrition, and increasing the availability of nutritious foods (WHO Regional Office for Africa, 2000). In the end, the state of poverty and destitution

that is widespread among the African continent will limit the effects that interventions can have. However, involvement in the oral health situation in Africa is not in vain, and efforts should be continued in hopes of seeing positive change and reducing the risk of oral disease in Africa. To seriously reduce the risk of and prevalence of oral disease in Africa, cooperation from African governments is essential. African leaders must desire better health for their people and make policies and decisions regarding funding and national budgets in light of this. One of the main reasons why the WHO's interventions were unsuccessful was due to a lack of funding from the African countries. Once national budgets towards oral and general health increase, these finances can be used to improve the water supply, sanitation, and combat malnutrition, the main factors impacting the initiation of oral disease in Africa. In addition, increased funding would allow for the creation of more dental clinics, especially in rural areas, and better trained dentists to serve the needs of the African people.

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