Human Immunodeficiency Virus/Autoimmune Deficiency Syndrome:

A Pathophysiology and Cultural Perspective of Treatment in Sub-Saharan Africa

Kari Stanley

A Senior Thesis submitted in partial fulfillment
of the requirements for graduation
in the Honors Program
Liberty University
Spring 2015

Acceptance of Senior Honors Thesis

This Senior Honors Thesis is accepted in partial
fulfillment of the requirements for graduation from the
Honors Program of Liberty University.

_____
Cynthia Goodrich, Ed.D., M.S.N., RN, CNE
Thesis Chair

_____
Linda Gregory, M.S.N., RN
Committee Member

_____
Ben Kalu, M.D.
Committee Member

_____
Marilyn Gadomski, Ph.D.
Assistant Honors Director

_____
Date

Abstract

The human immunodeficiency virus (HIV) is a retrovirus that attacks the body's immune system increasing risk for development of opportunistic infections and ultimately acquired immunodeficiency syndrome (AIDS). Without treatment HIV can run its course within 10 years; however, several categories of antiretroviral therapy now exist that have various mechanisms of action designed to stop a patient's viral load from increasing so rapidly. The prevalence and risk for transmission is highest in Sub-Saharan Africa where resources and access to treatment is limited and underutilized. In order for health care providers to begin changing the statistics, cultural competence must be the foundation for all health care provided. Treatment, as recommended by the World Health Organization, can include either a one or three medication ART regimen. Education about the disease must be incorporated, as well as information regarding prescribed medications, forms of contraception, and multiple partner education. By mobilizing resources and reaching out into various communities, trust can be gained allowing the opportunity to receive care and have improved quality of life to more individuals who are infected or who are at risk of contracting HIV.

Human Immunodeficiency Virus/ Acquired Immunodeficiency Syndrome: A Pathophysiology and Cultural Perspective in Sub-Saharan Africa

The Human Immunodeficiency Virus (HIV)/Acquired Immunodeficiency Syndrome (AIDS) is a global disease that attacks the immune system weakening the body's defenses. It is a sexually transmitted infection that occurs most frequently in Sub-Saharan Africa. While about 36 million people are suffering from the disease, only 9.7 million are actually receiving treatment (Faulhaber & Aberg, 2009). This vast difference is a result of deficient knowledge regarding HIV, as well as a lack of available resources. In order to understand how HIV/AIDS is such a widespread and continually growing issue, the causes and transmission of the disease must be considered. The human immunodeficiency virus spreads via exchange of bodily fluids including blood, breast milk, and reproductive secretions. Signs and symptoms progress through four stages. Recognizing how these stages manifest and treating the symptoms such as weakened immune system, weight loss, or fever is most advantageous. Currently, no cure for HIV/AIDS is available, so the ultimate goal for each individual is to maintain healthy diagnostic levels of cluster of differentiation (CD4) counts and viral load studies (Faulhaber & Aberg, 2009). Because treatment is more difficult to obtain in third world countries, it is important to prevent this disease from spreading. In Sub-Saharan Africa, there are several villages more difficult to access creating a huge need for immediate short term treatment of infected individuals. More importantly, effectiveness will accompany only if a lasting system of health care is built to offer diagnostic and treatment options, to educate the communities, and to medically train natives who will be able to go fatherer into villages. Long term goals will be successful only if health care

providers are culturally competent and maintain a balance between bringing new information and skill sets while working with the beliefs and practices already established. Lastly, outcomes such as a decrease in HIV transmission, an increase in medical availability and treatment, and an overall healthier, better educated population must be strived for, established, and maintained.

Pathophysiology of HIV/AIDS

The human immunodeficiency virus (HIV) is a retrovirus that attacks the immune system by invading specific white blood cells called CD4 T-Lymphocytes. More specifically, it is a ribonucleic acid (RNA) virus, also known as a retrovirus. The term retrovirus is designated because of the manner in which the genetic material of the virus is replicated backwards (Kwong & Bradley-Springer, 2011) and then translated into a double helix deoxyribonucleic acid (DNA) strand. The process of HIV RNA replication is broken down into eight steps. Infection of an individual with HIV begins with the virus attaching to the cell membrane of the CD4 cell. It does so by binding to both a CD4 receptor and to other chemokine co-receptors. This creates a solid attachment; however, if either of the sites is not bound, then infection is rendered ineffective. The second step is characterized by an uncoating of the virus which allows for internalization by the CD4 cell. After the virus and CD4 cells are attached, the viral envelope fuses with the cell membrane and the viral contents are inserted into the CD4 cell. Third, a DNA strand is formed from the viral RNA. Reverse transcriptase is the agent responsible for copying viral RNA and duplicating the copy to make DNA. Next, the new viral DNA is integrated into the genetic material of the CD4 cell with the expertise of an integrase enzyme. The fifth step, involves reading the viral DNA, encoding a messenger RNA with instructions

of how to reproduce the virus, and stimulating the T cell to prepare for replication. Translation is the sixth step in which the instructions encoded on the messenger RNA lead to the creation of a protein chain. Seventh, a protease enzyme separates the protein chain into smaller segments. This is known as cleavage. The smaller protein chains will comprise new viruses. The eighth step is the final assembly of replicated RNA protein chains into daughter viruses. It is at this time that the CD4 cell releases daughter viruses into the blood stream to infect other CD4 cells (Faulhaber & Aberg, 2009). Retroviruses are defenseless without a host cell; however, HIV is very effective once it is allowed to attach and replicate. The process creates an exponentially self-destructive pattern in which CD4 cells are attacked in larger numbers every time viral replication occurs. As more lymphocytes are attacked and rendered ineffective, the body's immune system is weakened and less able to fight off infections (Kwong & Bradley-Springer, 2011).

Transmission Methods

HIV is transmitted through bodily fluids including blood, breast milk, semen, and vaginal secretions. An individual is not at risk by coming into contact with the saliva or sweat of an individual who is infected. The primary method of transmission is through unprotected sexual contact that involves semen, vaginal secretions, or blood. This is applicable to both heterosexual and homosexual relations. Furthermore, if genital lesions from another sexually transmitted infection (STI) appear at the time of intercourse, the risk of HIV transmission is significantly increased. Another way in which HIV is transmitted is through contact with blood. Before 1985, blood transfusions were not tested for HIV. In fact, 70-80% of people who received a clotting factor transfusion for hemophilia before 1985 became infected. Another method by which an individual could

come into contact with infected blood is through sharing of drug equipment. It is very unlikely (only about 0.3-0.4% chance) that a health care worker who comes into contact with an individual's blood, particularly through a needle stick, will be infected. This rate varies dependent upon the depth of penetration, needle gauge, patient's viral load, and amount of blood. Lastly, transmission can occur during the perinatal time of an individual's life. This is the most common method that children are infected. A fetus can be infected if there is a placenta abnormality and if the two blood supplies are allowed to mix. The risk further increases if the time after membrane rupture is prolonged. An infant can receive the virus during the birthing experience through contact of mucus membranes with vaginal secretions or maternal blood. Mothers can also transmit the virus through breast milk (Kwong & Bradley-Springer, 2011).

Diagnostic Testing

Diagnosis and surveillance of an HIV infection involves various tests that monitor the presence of antibodies, viral load, and CD4 count. If the body is introduced to the human immunodeficiency virus, it creates specific antibodies to fight off the infection. To test for their presence, the antibodies are captured, joined with an enzyme, stained, and examined under a microscope. This test is known as an enzyme-linked immunosorbent assay (ELISA). If the test returns with a positive result, then the ELISA is performed again, followed also by a Western Blot test. These precautions are taken to correctly diagnose a patient given the frequency of false positive test results. One specific example in which an individual might present with antibodies but not actually be infected would be in the case of an infant who received his infected mother's HIV antibodies while in-utero (Faulhaber & Aberg, 2009). Other causes of false positive results from the ELISA

test include but are not limited to autoimmune disorders, immunizations, and chronic renal failure. The ELISA test may also return with a false negative result if an individual is immunosuppressed or if they are within the *window period*. The window period is the timeframe during which an individual has been infected but has not created antibodies against the virus (Kwong & Bradley-Springer, 2011). Home testing kits are also available and differ in the biologic sample that is tested. The OraSure tests the saliva for antibodies while the OraQuick tests a drop of blood from a finger stick. These home tests are not diagnostic by themselves, but simply alert an individual that he or she needs to receive further testing to confirm or deny a diagnosis of HIV (Faulhaber & Aberg, 2009).

Disease Surveillance

In order to maintain surveillance of the disease progression and the effectiveness of treatment, both a CD4 count and a viral load is measured. Generally, a healthy individual will have a CD4 count of 800-1200 cells per microliter. With an HIV infection, the cell count is divided into three categories: >500cells/uL, 200-500 cells/uL, and <200cells/uL. These categories represent various stages of the disease with >500cells per uL being ideal maintenance of the disease and <200cells/uL being criteria for HIV which progressed into acquired immunodeficiency syndrome (AIDS). Furthermore, the viral load is also measured. If pharmacologic therapy is effective, then CD4 cell counts will remain high, and viral loads low (Faulhaber & Aberg, 2009). Special tests are also available to determine viral drug resistance. The genotype assay looks directly at genetic coding of the virus to detect the presence of any mutations that would create resistance to a particular antiretroviral (ART) drug. Another option is a phenotype assay which looks at the growth of HIV in numerous different ARTs. These are helpful in creating a drug

regimen that will be effective and keep both the viral load low and the CD4 count within a normal range (Kwong & Bradley-Spencer, 2011).

Typical Progression

From the time an individual is initially infected to the development of AIDS, there are four phases through which the human immunodeficiency disease progresses. About two to four weeks after infection, an individual is in the first phase known as acute retroviral syndrome. It is during this time that viral load is very high, and there are a few symptoms such are fever, malaise, swollen lymph nodes, headache, muscle and joint pain, and rash. Many times, people may mistakenly attribute these symptoms to influenza. The first three weeks after initial infection and up to three months after, an individual is within the *window period* during which the ELISA test might return a false negative result. The second phase of HIV disease, known as the Early Chronic Infection phase, begins once the antibody test becomes positive. Untreated, the length of this period lasts around eight to 10 years and is categorized as asymptomatic. The term asymptomatic is a slight misnomer, because patients can still have symptoms such as fever, headache, night sweats, and lymphadenopathy. Blood studies during this time period will result with a CD4 count above 500cells/uL (Kwong & Bradley-Spencer, 2011). Because symptoms are mild or non-existent, the individual might not know that they are infected and continue to put others at risk. It is important to note that even without symptoms, an infected individual can still transmit the disease (Faulhaber & Aberg, 2009).

The next phase, which can persist for up to two years, is characterized by a CD4 count of 200-500 cells/uL and a significant increase in viral load. It is during this

Intermediate Chronic Infection that an individual will experience worsened symptoms that are relentless enough to interfere with activities of daily living (Kwong & Bradley-Spencer, 2011). Opportunistic infections may arise during this stage, the most common of which include shingles, oropharyngeal candidiasis, and oral hairy leukoplakia. Shingles is caused by the varicella zoster virus and causes eruptions of the nerve endings along a particular dermatome. Oropharyngeal candidiasis, or thrush, is a fungal infection that also has a proclivity for the genital region. Lastly is oral hairy leukoplakia which originates from the Epstein Barr virus. It is manifested in raised white lesions on the sides of an individual's tongue (Faulhaber & Aberg, 2009). Some Kaposi sarcoma spots may begin appearing during this stage; however, they are more pronounced during the final stage known as Late Chronic Infection, or Acquired Immunodeficiency Syndrome (AIDS) (Kwong & Bradley-Spencer, 2011). The Center for Disease Control (CDC) establishes the criteria by which AIDS can be diagnosed. Such criteria are defined as having a CD4 T-cell count lower than 200cells/uL in addition to one opportunistic infection and one opportunistic cancer. There are lists of each opportunistic disease category including infections such as candidiasis or pneumocystis jiroveci pneumonia and cancers such as Kaposi sarcoma or Burkitt's lymphoma (Faulhaber & Aberg, 2009).

To be diagnosed with AIDS, an individual must also present with wasting syndrome and AIDS dementia complex. Wasting syndrome is defined as losing at least 10% of the individual's ideal body mass (Faulhaber & Aberg, 2009). AIDS dementia complex or HIV associated dementia is described as having decreased cognitive function caused by HIV replication within the central nervous system (CNS). Soon after infection, HIV enters the brain and begins replicating. In the presence of HIV, the body releases

inflammatory neurotoxins which can cause injury and even death of neurons thereby leading to dysfunction of the CNS. Having a low CD4 count is the largest risk factor to developing AIDS dementia complex with a 60% correlation. Not only do the CNS effects include motor and behavioral disturbances but also a decrease in cognitive functioning. Of further importance is that patients who develop HIV associated dementia, have a poorer response to antiretroviral therapy. Therefore, early detection of this clinical manifestation is crucial so that effective therapy can be attained and health status maintained (Muniyandi, Venkatesan, Arutselvi, & Jayaseelan, 2012).

Opportunistic Diseases

The presence of opportunistic diseases is secondary to having an altered immune system. The immune system is typically led by lymphocytes that are differentiated into various forms and have differing tasks. Whenever a foreign substance is present within the body, an antigen presenting cell, such as a macrophage, attaches itself to the foreign substance delivering it to a CD4 T-Lymphocyte. All cells have proteins and epitopes on their cell surface which allow for recognition and memory of various substances. The body is therefore able to differentiate between self and non-self recognition proteins known as major histocompatibility complex (MHC) molecules. Self/non-self recognition is an important aspect not only with blood transfusions and transplants, but also on an everyday basis as the body fights off foreign substances, or antigens. Once CD4 T-helper lymphocytes are presented with an antigen, they give directions for the rest of the immune system to attack and store memory of the invading pathogen while creating antibodies if the pathogen were to ever reappear (Sommer, 2009). In a patient with HIV whose viral load increases, the number of properly functioning CD4 cells decreases. The

body is no longer able to fight off infections or even recognize the presence of a pathogen. Both abnormalities lead to the development of opportunistic infections and cancers (Faulhaber & Aberg, 2009).

Treatment

Because HIV is incurable, pharmacologic treatment is administered with the goal of maintaining desirable CD4 cell counts and viral loads. According to Kwong and Bradley-Springer (2011), successful treatment can allow a patient with HIV to live longer within the Early Chronic Infection stage and manage far fewer symptoms during that time. Antiretroviral Therapy (ART) drugs are divided into six different categories based on mechanism of action (see Table 1). With these various mechanisms of action, it is important to recognize that viruses, just like bacteria, can become resistant to specific treatments. An individual may be tested to see if the HIV virus that they carry is already resistant and how it can best be treated. However, more important to maintain efficacy, is that the patient be diligent in taking their ART medication as prescribed. Failure to do so can result in virus mutation and can render that particular category of ARTs ineffective for the individual (Kwong & Bradley- Springer, 2011). When taken as prescribed, ARTs "can reduce viral loads by 90% to 99%, which makes adherence to treatment regimens extremely important" (Kwong & Bradley- Springer, 2011, p. 247)

Table 1

Antiretroviral Therapy Drugs

Drug Category	Mechanism of Action
Entry Inhibitors	Prevent HIV from binding to CD4 cells
Nucleoside Reverse Transcriptase Inhibitors (NRTI)	Inhibit the virus' ability to develop DNA by inserting an extra nucleoside along the RNA strand
Non-Nucleoside Reverse Transcriptase Inhibitors (NNRTI)	Hinder reverse transcriptase from duplicating the RNA into DNA
Nucleotide Reverse Transcriptase Inhibitors (NtRTI)	Attach to reverse transcriptase blocking its effects
Integrase Inhibitors	Stop HIV RNA from being inserted into the CD4 cell
Protease Inhibitors	Prevent replicated stands of HIV from being cut into proper lengths

Note. Adapted from "Infection and human immunodeficiency virus infection" by J. Kwong and L. Bradley-Springer, 2011, *Medical-surgical nursing: Assessment and management of clinical problems* (8th ed., pp. 235-255).

Prevention and Early Diagnosis

Prevention and early diagnosis is the next step in getting HIV/AIDS under control. Individuals who are at risk of developing HIV and other sexually transmitted diseases demonstrate high risk behaviors such as participating in unprotected sex, having multiple sexual partners, being a young age at first sexual encounter, experiencing sexual abuse, and abusing drugs and other substances. Assessing for these risk factors and encouraging HIV testing for an individual who meets such criteria, are crucial aspects to maintaining optimal health throughout disease progression. It is also hopeful that an

individual who is diagnosed with and educated about the facts of transmission will begin practicing safer behaviors (Faulhaber & Aberg, 2009). In first world countries, both knowledge and resources abound. Efforts are already in place and being evaluated for efficacy in the prevention of HIV transmission. Not only are public schools incorporating some form of sex education into their curriculum, but several college campuses are offering condoms, and clinics are being created where drug equipment- particularly needles- can be traded in for new, sterile equipment. Controversy is rampant in regards to the implementation and motivation of these efforts. Opponents believe that offering such equipment and education will only further encourage and promote these behaviors are acceptable. Proponents, however, argue that people are going to choose for themselves how they behave. It is better to respond by offering methods that decrease detrimental effects to both the individuals and also to society as a whole (Benagiano, Carrara, Filippi, & Brosens, 2011; Barreras &Torruella, 2013). Furthermore, as people begin to utilize the resources and services offered, they can receive more education about and encouragement for HIV testing.

Application to Sub-Saharan Africa

Considering that nearly 69% of HIV/AIDS cases are located in Sub-Saharan Africa, there is a very high need to bring knowledge, treatment, and prevention to that area. It is estimated that while about 36 million people are suffering from the disease, only 9.7 million are actually receiving treatment. To promote a more effective outreach in cities and villages throughout Sub-Saharan Africa, a basic understanding of the culture would be advantageous. Culture is defined as “a fuzzy set of basic assumptions and values, orientations to life, beliefs, policies, procedures and behavioral conventions that

are shared by a group of people, and that influence (but do not determine) each member's behavior and his/her interpretations of the meaning of other people's behavior" (Spencer-Oatey, 2012, p. 3). Essentially, culture is the influencing background shared by a group of people through which an individual learns to perceive his/her surrounding environment, relationships, and circumstances. Culture can be determined by aspects of an individual's life such as location, ethnicity, vocation, or hobbies. It is seen in the work created by the people within a culture, appreciated by the values which they hold, and often better understood when basic assumptions of the culture are revealed (Spencer-Oatey, 2012).

Importance of Being Culturally Intelligent

In a cross-cultural experience, it is important to have what David Livermore (2013) described as cultural intelligence. Cultural Intelligence, or CQ, is a measurement of a person's thoughts and behaviors within different cultures. It is divided up into four different categories including CQ Drive (amount of motivation to do well within a culture), CQ Knowledge (how much is known about the specific culture in which they are interacting), CQ Strategy (plans made in light of their cultural knowledge and evaluation of the effectiveness of the plan), and CQ Action (understanding cultural encounters and responding appropriately). Livermore (2013) broke down each of the categories and provided ways in which a person can improve his or her cultural intelligence. In a health care setting, the Purnell Model provided 12 domains of culture by which a health care provider can assess an individual or group of people. Some of those domains include communication, roles of the individual, high-risk behaviors, nutrition, childbearing practices, and health care practices (Purnell, 2005). Each of the domains

listed help guide the manner in which education, prevention, and treatment can be delivered in Sub-Saharan Africa.

The Culture of Sub-Saharan Africa

Sub-Saharan Africa is topographically defined as being inclusive of those countries which are below the Sahara Desert. The general description is further sub-categorized into smaller regions such as West Africa, East Africa, the Horn of Africa, Central Africa, and Southern Africa (Berglee, 2012). Culture varies among these regions, countries, and tribes; however, some aspects remain generally constant. For example, Sub-Saharan African culture places greater value on collectivism than on individualism which are differentiated by where a person or group of people receive an identity. Collectivist cultures tend to view actions in light of the effects those actions will have on the entire group. Collectivism also tends to place greater value on the betterment and well-being of the group than on the needs of an individual (Livermore, 2013). Another characteristic of Sub-Saharan African culture is their view of time. Specifically, individuals within this culture generally view time as being fluid focusing on the social/relational aspect of time as opposed to the exact "time" as noted on a clock. Starting and ending times for events are more of a suggestion rather than a mandatory expectation (The Global Road Warrior, 2014). Another influencing factor of culture is the view of gender roles. Oftentimes in Sub-Saharan Africa, societies are patriarchal where men are the head of households and communities. This is further seen in the practice of polygamy which varies from country to country, but is overall very common among Sub-Saharan Africans. "The percentage of married women (ages 15-49) with co-wives ranged from 3% in Madagascar, where [polygamy] is prohibited by law, to 53% in Guinea. The

median value is about 23%" (Reniers & Tfaily, 2012, pp. 1076-1077). These are just a few factors of the culture in Sub Saharan Africa that influences the approach and effectiveness of providing health care.

Treating Patients

Establishing a presence within each community varies depending on the status of hospitals and clinics in that particular area. Most likely, a health care provider or team will begin work by making connections and gaining the trust of the people. In regards to specifically fighting the HIV/AIDS disease, efforts will probably best be geared towards treatment with antiretroviral therapy. Treatment with ARTs is very effective in maintaining a low viral load. It is suggested that to prevent mutation of the virus and delay progression of disease, a combination therapy of at least three antiretroviral drugs would be more effective (Kwong & Bradley-Springer, 2011). Possible issues arise when looking to prescribe such a heavy treatment regimen. First, how likely are the patients to accurately and consistently take the medication? Second, how does a patient who lives far away from medical care, refill the prescription order?

Patient education about prescriptions. Education is essential in achieving a solution to some of the major issues faced in the battle against HIV/AIDS. In fact, several countries are already delivering HIV/AIDS health education. The HIV/AIDS peer education system in Tanzania was studied, and four categories of educators were assessed for effectiveness of teaching. The four categories based on the D4 Diagnostic Quadrant include the discerning, dissolute, decorous, and disempowered educators (see Table 2). The study found that decorous and discerning educators are most effective at influencing their peers. Because of this, it was suggested to invest more resources into these

educators who would be more readily capable of sharing viable HIV/AIDS prevention measures (Renzaho & Clarke, 2013).

Table 2

D4 Diagnostic Quadrant: Types of Educators

D4 Diagnostic Quadrant: Types of Educators		**Sexual Practices**	
		Healthy	*Unhealthy/Risky*
HIV/AIDS Knowledge	*High*	Discerning	Dissolute
	Low	Decorous	Disempowered

Note. Adapted from "Introducing the D4 diagnostic quadrant as a targeting tool: Developing a framework for the effectiveness of HIV/AIDS interventions in Tanzania and beyond" by A.M.N. Renzaho and M. Clark, 2013, *Australian Journal of Primary Health, 19*(3), p. 219-227.

The goal is not to remove responsibility from the health care provider in offering patient education. Rather, more individuals should be trained and included in the task force of educating to multiply positive effects. Livermore (2013) explained that one aspect of the culture in Sub-Saharan Africa is the tendency to have a high power distance. This translates into a highly respected and unquestioning view of those in authority. While not always advantageous, having power distance between the patients and the health care providers can provide the education and motivation for patients to take their medication as prescribed.

Mobilize and simplify the resources. In an area where people have low financial resources, limited access to transportation, and several obligations to uphold for family survival, a high concern persists that HIV patients will not be able to attend follow up exams or refill prescriptions. To address this need, Bing & Epstein (2013) described

an innovative health care system called Pharmacy on a Bicycle where trained individuals carry a backpack full of medicine, ride a bicycle to distant villages, and provide prescription refills for patients. This effort has been implemented in parts of Africa, Asia, and South America with relatively successful outcomes. If something similar were implemented in more areas throughout Sub-Saharan Africa with the goal of educating, treating, and assessing, then the effects of one central health care facility could be multiplied in its effort to reach more remote locations than originally deemed possible. Mobilization of medical resources is a great idea for areas in which the local people would not be able to go themselves to receive treatment and where professionally trained health care providers are limited.

Another concern that Bing and Epstein (2013) addressed is the complexity of prescription therapy. They bring to the light the idea of simplifying prescriptions into fewer pills that are more user-friendly. The supposition is that greater compliance may be achieved if individuals only needed to take one pill on a consistent basis as opposed to the current three pill regiment for HIV- ART. Other methods of simplification could be evaluated with the goal that more people will utilize the treatment offered and respond with more accurate and consistent outcomes. The goal is not to take away patient autonomy, but to empower individuals to receive care that can improve both the quantity and quality of their lives.

For those individuals who find it difficult to travel to a health care setting, other ideas should be considered to make the testing and diagnosis more available. One idea would be to mobilize the tests, much like the pharmacy on a bicycle (Bing & Epstein, 2013). As previously mentioned, there are tests such as the OraSure and OraQuick that

can be ordered for home testing. One option would be to further condense testing supplies into something that could be carried in a backpack or satchel. While not capable of diagnosing, such tests in combination with a patient assessment can help guide individuals to receive more specific testing. This would probably also be cheaper and more convenient than to give an ELISA test to everyone in each village. Furthermore, it is likely that there would be local hang outs such as churches or schools since Sub-Saharan Africans are generally characterized by community. By utilizing a communal attitude and making health care more available, people would be more likely to receive the care offered. While being tested for HIV, patients can concurrently receive education about the disease. These efforts implement the saying retold by Francis Bacon, "If the mountain won't come to Mohammed, then Mohammed will go to the mountain," (Martin, n.d.). Many individuals living in the wilderness and far out villages can benefit greatly from the efforts of health care providers who are willing to bring their resources to the people rather than simply waiting for the people to seek out resources.

Complications of Diagnosis. In order to treat an individual for HIV/AIDS, a diagnosis must be made using an ELISA and western blot testing series (Faulhaber & Aberg, 2009). In several places, having a HIV/AIDS diagnosis is taboo and shameful to the culture. Much of the stigma comes from ignorance about the disease, but also because the desire results from very private, personal interactions between individuals (Sipsma, et al., 2011). Fear of the discrimination that accompanies a diagnosis of HIV/AIDS may lead individuals to refuse testing. For patients considering or in need of HIV/AIDS testing, it may seem that suffering an unknown disease attributed to some evil spirits would be better than to face the stigma and discrimination brought about by a positive

HIV test. The dominant religion among Sub-Saharan Africans is identified by the International Mission Board (n.d.) as the African Traditional Religion. Those adhering to this religion believe that everything is rooted in the Spiritual World. As efforts to educate the populace about HIV and AIDS increases, it is hopeful that people will abandon the fear and judgment caused by misunderstood symptoms and outcomes. Knowledge gained can encourage the people that something more can be done rather than being fearful of the rampant, uncontrollable death seen throughout Sub-Saharan Africa. Instead of believing that evil spirits are cursing an individual for bad deeds, knowledge can be gained regarding germs, HIV prevention, and health maintenance.

Prevention Measures

Prevalence and correlation of polygamy. Implementing prevention measures in Sub-Saharan Africa requires assessment of the practices of the people and the effectiveness of current attempts. To gain a better understanding of the culture and people groups that are being targeted for improved HIV/AIDS prevention, several aspects must be considered. For example, one occurrence that varies in prevalence throughout the area of Sub-Saharan Africa is that of polygamy. Throughout the past 20 years varied results were evidenced by several studies regarding the prevalence of HIV transmission in polygamous marriages (Saddiq, Tolhurst, Lalloo, & Theobald (2010). Through their qualitative study, Saddiq, et al. (2010) purposed to address some of these variations by inviting individuals of different genders, beliefs, and backgrounds from Maiduguri, Nigeria to answer questions about the vulnerability of HIV in polygamous marriages. Questions were posed regarding promiscuity in relationship to polygamy, the influence

religion has on perceptions, and the weight gender roles carry within marriage. Several thoughts were divulged offering helpful insight and clarity. Whether supportive of polygamy or not, individuals from both Christian and Muslim beliefs addressed their concern of promiscuity being problematic in both polygamous and monogamous relationships. The difference between the two marriage relationships is that monogamous marriages only have two people possibly partaking in extra-marital sexual encounters and only one other person within the marriage that would be at risk of contracting the disease. Within a polygamous relationship, there are more individuals who might possibly be unfaithful and more who are at risk for transmission (Saddiq, et al., 2010).

Male circumcision and condom use. In looking at the effectiveness of physical modifications to prevent the transmission of HIV, both male circumcision and condom use are aspects to be considered. A study of the cost efficiency of circumcision and antiretroviral therapy in reducing the incidence and mortality of HIV was performed by Barnighausen, Bloom, & Humair (2012). This study found that ART prescription in combination with male circumcision decreases the total cost of treatment and provides effective benefits for both males and females (Barnighausen, et al., 2012). The decreased risk for males is thought to be attributed to the high number of CD4lymphocytes that reside under the foreskin. The foreskin creates a warm, damp environment suitable to the harboring and growth of microbes. Therefore, male circumcision decreases the risk for males to acquire HIV by establishing an unfavorable environment for growth of HIV (Puri, Kumar, & Ramesh, 2010). Women will indirectly have a decreased risk of contracting HIV by decreasing the number of infected males harboring the virus ((Barnighausen, et al., 2012).

Another method to practice healthy sexual behaviors is the incorporation of condom use. Many individuals who have been diagnosed with HIV continue to have unprotected sex increasing the risk of transmission of HIV/AIDS and of contracting secondary sexually transmitted infections (STI) that potentiate the spread of human immunodeficiency virus (Gerbi, Habtemariam, Tameru, Nganwa, & Robnett, 2012). Oftentimes, in Sub-Saharan Africa, there are very negative views and assumptions about condom use. Some of the psychosocial barriers to condom use include the high value placed on having children and the negative connotation of promiscuity (Saddiq, et al., 2010). Such beliefs associated with condom use would deter individuals from engaging in protected sexual health behaviors. Changing the stigmas and promoting condom use could contribute to decreased HIV transmission in high-risk individuals (Gerbi, et al., 2012). When educating about the use of condoms information should be provided in regards to the material composition. Natural or lambskin condoms have larger pores thereby allowing semen or vaginal secretions to pass. Therefore, in contrast to latex condoms, natural or lambskin condoms do not provide adequate protection from HIV. (Faulhaber & Aberg, 2009).

Influence of gender roles. Oftentimes, male superiority within the culture of Sub-Saharan Africa influences several aspects of HIV /AIDS transmission. Gender roles have major implications in the practice of polygamy and in condom use. The connecting factors have to do with a poor view of women in comparison with the importance of keeping men satisfied, honored, and in control. For one thing, within the Islamic religion, women are thought to have decreased sexual drive and should therefore be able to provide for the male whose sexual needs are greater. This may demonstrate itself through

a man having multiple wives or refusing to use condoms. As previously mentioned, condom use may imply that one partner is engaging in extra-marital affairs, which would be dishonorable to the husband and the relationship in the eyes of society. Recognizing the role of men within the culture of Sub-Saharan Africa is very important to develop and implement educational strategies. Both males and females should be taught about the disease and prevention of HIV/AIDS (Saddiq, et al., 2010). Additional topics can be included in education such as empowerment and self-esteem of women, particularly for those who experience partner violence. Small, Nikolova, & Narendorf (2013) reported that men subjected to education topics including knowledge of HIV, use of condoms, and the role of stigma agreed to begin using condoms or at least discuss the idea with their partners. The researchers explained that "the most successful studies… employed trained female facilitators who acted as culturally experienced researchers" (Small, et al., 2013, 2841). These culturally intelligent, facilitated interventions were 50% effective at increasing knowledge of HIV and stimulating healthy attitudes regarding women (Small, et al., 2013).

From mother to baby. Transmission of HIV/AIDS from mother to baby through giving birth and breastfeeding is another major concern. In the developing countries of Sub-Saharan Africa, the average income per capita is a mere $1,657 in US dollars (The World Bank, n.d.). It would not be practical to consider making Cesarean deliveries common for the public. There would not be enough human resources to account for all of the surgeries. In addition, the surgeries would likely be accompanied by procedure related infections and concern for funding.

Another idea to prevent mother-to-baby transmission is by supplying infant formula in place of breast milk is debated. Doherty, Sanders, Goga, & Jackson (2011) detail several issues that have arisen in regards to formula feeding. The World Health Organization set guidelines for formula use to include patient education and free formula distribution to those who qualify. Not only have studies found that patient education is poorly regulated, but the availability of formula in clinics is often unreliable. Formula feeding also causes concern for the overall health of an infant aside from transmission of HIV. The composition of breast milk is variable according to what the infant needs, and it also provides passive immunity to the infant. When a baby is fed formula, his nutritional status is not as well regulated, and his immune system is not fortified by receiving antibodies form the mother. The article shared that one study by The Bellagio Child Survival Group found that "infants age 0-5 months who are not breastfed have seven-fold and five-fold increased risks of death from diarrhea and pneumonia respectively, compared with infants who are exclusively breastfed" (Doherty, et al., 2011, 63). Other nutritional and health concerns originate in improper formula handling. Cases were found where infants would receive diluted formula which led to malnutrition from the decreased amount of nutrients being received. Furthermore, several instances were noted where the formula was contaminated with fecal bacteria (Doherty, et al., 2011).

Several programs have already been established to help solve the problem of mother to baby transmission of HIV. Routine testing of pregnant women and infants in South Africa been made "virtually universal" (Barron, et al., 2013, p. 71). There are several other programs throughout Sub-Saharan Africa whose goal is "for the prevention of mother-to child transmission (PMTCT) of the human immune deficiency virus"

(Ghanotakis, Miller, & Spensley, 2012, p. 921). This increasing trend is evidenced by an improved percentage of HIV positive, pregnant women being treated with antiretroviral therapy from 15% in 2005 to 57% in 2011. The World Health Organization updated their recommendations in 2010 for ART prophylaxis of pregnant women in order to best address the problem of mother to child transmission in light of the ability for varying countries to respond. The revision proposed two different methods and gave each country the option to decide for themselves which method would be more feasible. One option centered on the prescription of just one ART prenatally and while breastfeeding. The other involved a similar structure but with a three drug combination. Both are effective to prevent transmission; however, the three drug regimen enabled countries to maintain rates that are comparable to those within developed countries (Ghanotakis, et al., 2012). To best address and allay several health concerns including HIV transmission, malnutrition, and death by diarrhea and pneumonia by focusing attention on antiretroviral therapy and exclusive breastfeeding rather than on formula feeding (Doherty, et al., 2011).

Conclusion

In conclusion, there are several methods and practices already in place that are proving to be successful in decreasing the prevalence and transmission of the human immunodeficiency virus. As more awareness is gained and research is performed, these statistics will continue to be improved. It will take time to gain knowledge regarding the culture of the various people groups throughout Sub-Saharan Africa, innovation to create ideas such as the pharmacy on a bicycle , and education across the board on various issues regarding HIV/AIDS. It will not be sufficient enough to bring only antiretroviral

therapy as a quick fix, but to also plan long term goals of maintaining lower prevalence. This can only be done through the education of both males and females with topics of transmission addressed including multiple sexual partners, breastfeeding, circumcision practices, and condom use. Furthermore, the idea to mobilize resources is brilliant. If applied to more than pharmacologic therapy, mobilization could revolutionize community health in Sub-Saharan Africa. Goals should be established to create a system of accountability for peer educators, provide assessment opportunities of patients who find it more difficult to travel to the health clinic, and offer resources such as condoms and treatment therapy on a more regular basis. Ultimately the sphere of influence would be widened to include remote villages and people groups. In gaining the trust of the people and the knowledge of their practices, health care providers will continue to make an impact on the health of individuals in Sub-Saharan Africa who are already infected and at risk for contracting the human immunodeficiency virus.

References

Barnighausen, T., Bloom, D. E., & Humair, S. (2012). Economics of antiretroviral treatment vs. circumcision for HIV prevention. *Proceedings of the National Academy of Sciences, 109*(52), 21271-21276.

Barreras, R. E. & Torruella, R. A. (2013). New York City's struggle over syringe exchange: A case study of the intersection of science, activism, and political change. *Journal of Social Issues, 69*(4), 694-712.

Barron, P., Pillay, Y., Doherty, T., Sherman, G., Jackson, D., Bhardwaj, S., Robinson, P., & Goga, A. (2013). Eliminating mother-to-child HIV transmission in South Africa. *Bulletin of the World Health Organization 91*, 70-74.

Benagiano, G., Carrara, S., Filippi, V., & Brosens, I. (2011). Condoms, HIV and the Roman Catholic Church. *Reproductive Biomedicine Online, 22*, 701-709.

Berglee, R. (2012). Subsaharan Africa: Identifying the boundaries. *Regional Geography of the World: Globalization, People, and Places.* 465- 613.

Bing, E. G. & Epstein, M. J. (2013). Pharmacy on a bicycle. *Stanford Social Innovation Review.* Retrieved from: http://www.ssireview.org/articles/entry/pharmacy_on_a_bicycle#.

Doherty, T., Sanders, D., Goga, A., & Jackson, D. (2011). Implications of the new WHO guidelines on HIV and infant feeding for child survival in South Africa. *Bulletin of the World Health Organization 89*, 62-67.

Faulhaber, J. & Aberg, J. A. (2009). Acquired immunodeficiency syndrome. In C. Porth, & G. Matfin (Eds.), *Pathophysiology: Concepts of altered health states*. (8th ed., p. 427-445). Philadelphia: Lippincott Williams & Wilkins.

Gerbi, G. B., Habtemariam, T., Tameru, B., Nganwa, D., & Robnett, V. (2012). A quantitative risk assessment of multiple factors influencing HIV/AIDS transmission through unprotected sex among HIV-seropositive men. *AIDS Care, 24*(3), 331-339.

Ghanotakis, E., Miller, L., & Spensley, A. (2012). Country adaptation of the 2010 World Health Organization recommendations for the prevention of mother-to-child transmission of HIV. *Bulletin of the World Health Organization 90*, 921-931.

Global Road Warrior. Togo: Country snapshot. Retrieved from: http://www.globalroadwarrior.com.ezproxy.liberty.edu:2048/contentinfo.asp?cid=175&nid=65&next_nid=66

International Mission Board. (n.d.). *African Traditional Religion/ Animism.* Retrieved from: http://subsaharanafricanpeoples.imb.org/explore/view/traditional-religion

Kwong, J. & Bradley-Springer, L. (2011). Infection and human immunodeficiency virus infection. In S. Lewis, S. Dirksen, M. Heitkemper, L. Bucher, & I. Camera (Eds.), *Medical-surgical nursing: Assessment and management of clinical problems* (8th ed., pp. 235-255). St Louis: Mosby Elsevier.

Livermore, D. A. (2013). *Serving with eyes wide open: Doing short-term missions with cultural intelligence.* Grand Rapids, MI: Baker Books.

Martin, G. (n.d.). The meaning and origin of the expression: If the mountain will not come to Muhammad. Retrieved from: www.phrases.org.uk/meanings/if-the-mountain-will-not-come-to-muhammad.html.

Muniyandi, K., Venketesan, J., Arutselvi, T., & Jayaseelan, V. (2012). Study to assess the prevalence, nature, and extent of cognitive impairment in people living with AIDS. *Indian Journal of Psychiatry, 54*(2), 149-153.

Puri, P., Kumar, J., & Ramesh, V. (2010). Circumcision. *Indian Journal of Sexually Transmitted Diseases, 31*(2), 69-74.

Purnell, L. (2005). The Purnell model for cultural competence. *The Journal of Multicultural Nursing and Health, 11*(2), 7-15.

Reniers, G. & Tfaily, R. (2012). Polygyny, partnership concurrency, and HIV transmission in Sub-Saharan Africa. *Population Association of America, 49*, 1074-1101.

Renzaho, A. M. N. & Clarke, M. (2013). Introducing the D4 diagnostic quadrant as a targeting tool: Developing a framework for the effectiveness of HIV/AIDS interventions in Tanzania and beyond. *Australian Journal of Primary Health, 19*(3), 219-227.

Saddiq, A., Tolhurst, R., Lalloo, D., & Theobald, S. (2010). Promoting vulnerability or resilience to HIV? A qualitative study on polygamy in Maiduguri, Nigeria. *AIDS Care 22*(2), 146-151.

Sipsma, H. J., Chen, P. G., Ofori-Attaa, A., Ilozomba, U. K., Karfo, K., & Bradley, E. H. (2011). Female genital cutting: Current practices and beliefs in western Africa. *Bulletin of the World Health Organization, 90*, 120-127.

Small, E., Nikolova, S.P., & Narendorf, S. C. (2013). Synthesizing gender based HIV interventions in Sub-Sahara Africa: A systematic review of the evidence. *AIDS and Behavior 17*(9), 2831-2844.

Sommer, C. (2009). Innate and adaptive immunity. In C. Porth, & G. Matfin (Eds.), *Pathophysiology: Concepts of altered health states*. (8th ed., p. 362-365). Philadelphia: Lippincott Williams & Wilkins.

Spencer-Oatey, H. (2012). What is culture? A compilation of quotation. *GlobalPAD Core Concepts.* Available at GlobalPAD Open House.

The World Bank. n.d. Sub-Saharan Africa (developing only). Retrieved from: http://data.worldbank.org/region/SSA#