

POVERTY AND DISEASE: ARE THEY THE MAJOR IMPEDIMENTS IN SUB-SAHARAN AFRICA?

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ABSTRACT

Background: This was a review of poverty and disease in Sub-Saharan Africa. Poverty related infections are major public health problems worldwide contributing significantly to high morbidity and mortality. With the Sub-Saharan Africa having the world's poorest people, the effects of these infections is predominant in this region of the world. The most significant poverty related infections are malaria, tuberculosis and HIV.

Method: Information in this article was sought for and obtained from a thorough search of titles related to this study using PUBMED and other bibliographic databases. The abstracts of related articles available on line were accessed and references were reviewed to extend the search.

Result: Data available show that the major poverty related infections are malaria, HIV and tuberculosis with Sub-Saharan Africa bearing the greatest burdens of these infections. NTDs have also had great impact in this region. These poverty-related infections have killed millions of people with more persons still infected. The risk factors associated with these infections include poor shelter, poor sanitation, lack of potable water, malnutrition and lack of access to quality medical services. There is therefore need to formulate and enforce policies by the governments and every other stakeholder in order to promote the health conditions of those living in Sub-Saharan Africa and every other vulnerable society of the world.

Keywords: Malaria, HIV, Tuberculosis, NTDs, Poverty, Infections, Sub-Saharan Africa

INTRODUCTION

According to the World Bank, ^[1] an estimated 1.2 billion are extremely poor (those who live on <US \$1.25 per day) globally. More than 50% of the world poorest people reside in Sub-Saharan Africa. In 2015, there was an increase of 9 million

affecting 413 million people living on <US\$1.90 a day, in the majority of other regions combined. There will be nearly 9 out of 10 extreme poor in Sub-Saharan Africa if the trend continues by 2030.[1]

Table 1: Poverty in Sub-Saharan Africa

Income Level	Total Population of Sub-Saharan Africa	% of the Sub-Saharan Africa	% of the World population living in Sub-Saharan Africa
Less than US\$1.25 per day	390.6 million	51%	28%
Less than US\$2 per day	556.7 million	73%	22%

Source: WHO [2]

Terms such as "neglected tropical diseases (NTDs)" and "infectious diseases of poverty" are employed to define a number of infectious diseases more commonly found in areas where poverty is high.^[3] Poverty related infections describe those infections which are more prevalent in low-income populations. These include infectious diseases as well as diseases related to malnutrition and poor health related behaviours. As a significant social determinants of health,^[4] destitution expands the possibility of having these infections because it compels people to live in environments that make them sick, with no standard shelter, potable water, poor sanitation, proper nutrition and inadequate health services are contributors towards poor health behaviours. These diseases also negatively affect economic growth of many families due to the financial burdens in the treatment of these diseases thereby increasing the rate of poverty in communities.^[4] Poverty related infections remain a devastating set of health and socioeconomic problems in many low-income countries, particularly in Sub-Saharan Africa.^[3]

NTDs are said to be historically overlooked diseases that have been neglected at the community, national international levels and are endemic in many resource-poor populations and developing countries.^[5-7] Poverty related infections in Sub-Saharan Africa also include NTDs which are a group of diseases caused by parasites which persist for a long period of time commonly found

among the most impoverish people of the world.^[8] Most of these common NTDs such as soil-transmitted helminth (STH) infections, schistosomiasis, lymphatic filariasis (LF), trachoma and onchocerciasis collectively affect over 500 million people globally.^[5,9-11]

According to the World Health Organization (WHO), the major poverty related infections are malaria, human immunodeficiency virus (HIV)/AIDS and tuberculosis.^[12] They are classified as the major poverty related infections because according to WHO,^[13] the infections together account for nearly 18% of the disease burden in the poorest countries. In Sub-Saharan Africa, majority of the reports on infectious diseases and drug resistance are limited to the pressing problems associated with Human Immune Virus, Tuberculosis, Malaria and other emerging and re-emerging resistant pathogens.^[14]

According to WHO,^[15] 45% of the disease burden in the poorest countries are the poverty related infections. Most deaths associated with these diseases are capable of being treated with therapies or prevented from occurring.^[4] The interplay of these infections of poverty is Substantial and can hardly be overlooked. This review is aimed at highlighting on the burden of the poverty related infections and their risk factors in Sub-Saharan Africa.

METHODS

Information in this article was sought for and obtained from a thorough search of titles related to this study using PUBMED and other bibliographic databases. The abstracts of related articles available on line were accessed and references were reviewed to extend the search.

RESULTS

The collectively burden of malaria, malaria and tuberculosis is about 5 times the total burden of NTDs in Sub-Saharan Africa with HIV recording the highest disease followed by malaria (Table 2).

The region also accounts for the most global burdens of those infections with Nigeria accounting for most malaria and tuberculosis cases in the region while South Africa accounts for majority of the HIV cases in the region (Table 3). These are major public health problems in the region which require a robust attention in order to combat the menace. Apart from the disease burdens of the 3 major poverty related infections, the high DALYs of NTDs presented in

Table 2 is suggestive of the fact that NTDs represent a strong public health condition in the region.

Table 2: Disease Burden of HIV/AIDS, Tuberculosis, and Malaria by Disability Adjusted Life Years (DALYs) against the total NTDs Sub-Saharan Africa

Disease	DALYs in Sub-Saharan Africa
HIV/AIDS	64.0 million
Malaria	40.9 million
Tuberculosis	9.3 million
NTDs	8.6–21.2 million

Source: WHO[13]

Table 3: Ranking of HIV/AIDS, Tuberculosis, and Malaria in Sub-Saharan Africa by Prevalence and Distribution

Disease	Estimated Infected Population	Global Estimated Infected Population in Sub-Saharan African (%)	Country with the Highest Prevalence in the Region	Reference
HIV/AIDS	36.9 million	25.7 million (69.6)	South Africa	WHO ^[16]
Malaria	219 million	200 million (91.3)	Nigeria	CDC ^[17]
Tuberculosis	10 million	2.5 million (25.0)	Nigeria	Gordon ^[18]

DISCUSSION

Major Poverty Related Infections

Malaria is one of the major poverty related diseases. This is a protozoan disease caused by *Plasmodium* caused by four different species: *P. falciparum*, *P. malariae*, *P. ovale* and *P. vivax*. Humans occasionally become infected with *Plasmodium* species that normally infect animals, such as *P. knowlesi*.^[19] The natural history of malaria involves cyclical infection of humans and female *Anopheles* mosquitoes. When the *Anopheles* mosquito (vector) takes a blood meal on human, anticoagulant saliva is injected together with the malaria parasites into the human system.^[20] Thus, infected human carries the parasites from one human to the other acting as the vector while infected humans transmit the parasite to the mosquito. Different from human host, the mosquito vector does not suffer from the presence of the parasites.^[20]

Tuberculosis is an airborne disease caused by the bacterium, *Mycobacterium tuberculosis*.^[21] Humans are the only known reservoirs of *Mycobacterium tuberculosis*. It can only be spread through air droplets originating from a person who has the disease through coughing, sneezing, speaking, and singing.^[22]

The human immunodeficiency virus (HIV) infection is associated with two species of *Lentivirus* of retrovirus subtype. Over time, this infection if not adequately managed, progresses to acquired immunodeficiency syndrome (AIDS).^[23,24] AIDS is as a result of gradual and progressive failure of the immune system to combat the infectious virus which gives room for deadly opportunistic infections and cancers to grow. In the absence of chemotherapy, the average lifespan of an infected person after contracting this virus is estimated at 9 to 11 years depending on the HIV Subtype.^[25] Most infections with this virus is transmitted sexually. It can also be transmitted through blood transfusion and an infected mother to her child during pregnancy and childbirth.^[26–28]

Epidemiology of Poverty Related Infections

Malaria is a devastating disease with some 40% of the world's population in 107 countries at risk today and It kills a child every 30 seconds and some 3 million people a year with the large majority in the poorest countries of Sub-Saharan Africa.^[29] Africa

accounts for a majority of malaria infections and deaths worldwide. Over 80% of the 300 to 500 million malaria infections occurring annually worldwide are in Africa.^[30] Each year, about one million children under the age of five die from malaria.^[31] Children who are poor, have mothers with little to no education, and live in rural areas are more susceptible to malaria and more likely to die from it.^[32]

Studies have shown a direct correlation between malaria and HIV spread in Sub-Saharan Africa. The viral load is seven to ten times increased due to malaria coinfection, thus, increasing the chances of HIV transmission. HIV can also decrease the immunity to malaria after neonatal delivery. This has led to an increase in the vulnerability to HIV and higher HIV associated deaths particularly mothers and infants. The cyclic interaction between HIV and malaria means that being infected with malaria increases susceptibility to HIV infection and HIV infections increase malarial episodes^[33–36]

Sub-Saharan Africa is the home to 66% of the worlds' Human Immunodeficiency Virus (HIV) cases with, more than 1.1 million new infections and 660,000 deaths due to HIV/AIDS related illnesses in 2017.^[25] Also, Sub-Saharan Africa is home to 70% of the poorest people in the world. This region has the lowest gross domestic product (GDP) in the world, with more than 60% of the population spending less than US \$1 a day.^[37]

Poor socioeconomic conditions in this region lead other factors which describe the high prevalence of AIDS. The challenging factors faced by poor people in most African countries include malnutrition, inaccessible to potable water, and lack of adequate sanitation. Absence of clean water can significantly increase the chances of progression to AIDS. This is due to compromised immune system which may be contributed by high infestation of intestinal parasites.^[38] The high prevalence of genital schistosomiasis in the topical areas of Sub-Saharan Africa and many countries worldwide worsens HIV infection because there is a production of genital lesions and attraction of CD4 cells to the genital region. These parasitic infections affect the body's immune response to HIV, making people more susceptible to contracting the disease once exposed.^[38]

Sub-Saharan Africa records the highest prevalence of active tuberculosis per capita facilitated primarily by the HIV epidemic.^[39] With an increasing rate of 6% per year in Sub-Saharan Africa, tuberculosis is the leading cause of mortality HIV

in Africa. Tuberculosis is closely associated with poverty, overcrowding, alcoholism, stress, drug addiction and poor nutrition.[40] HIV infection and tuberculosis are knitted together because infection with HIV increases the rate at which latent tuberculosis infection is activated and while tuberculosis infection increases the rate of HIV replication thereby facilitating the advancement to AIDS.[40] The developing countries record 95% of the world AIDS prevalence and 98% of active tuberculosis infections while 90% of death malaria cases occur in Sub-Saharan Africa.[41–43] Together, these three diseases account for nearly 5 million cases of global mortality.[44]

Risk Factors associated with Poverty Related Infections

Due to many environmental and social factors such as poor housing conditions and poor working conditions, inadequate sanitation and disproportionate occupation, the impoverished people have the more likelihood to be infected with infectious diseases. Poor nutrition, mental strain, excessive working, poor knowledge and lack health access care can barrier recovery and worsen the diseases.[45] Poor living environments are good enough for the springing up and spread of infectious diseases. A typical poor communities around the world are juxtapose to livestock and other animals which make zoonotic diseases thrive.[46]

Each year, many children and adults die as a result of a lack of access to clean drinking water and poor sanitation. Many poverty-related diseases such as diarrhoea are acquired and spread as a result of inadequate access to clean drinking water. According to UNICEF,[47] Contaminated water and inadequate sanitation are related to diseases of poverty such as malaria, parasitic diseases and schistosomiasis.[48] These infections act as cofactors that increase the risk of HIV transmission.[49]

Malnutrition disproportionately affects those in Sub-Saharan Africa. In Sub-Saharan Africa, over 35% of under 5 children present with signs of malnutrition.[20] The cyclic relationship between malnutrition, the immune system and infectious diseases cannot be ignored. This is because infectious diseases have directly cause damaging effects on nutritional status which can cause malnourishments, resulting to weakening of the immune system and in turn, negatively affecting the body's ability to fight against infections.[50]

Malnutrition can as well increase vulnerability to HIV infections by impeding the immune system and couple with other biological mechanisms promotes viral replication that contributes to greater risks of HIV growth. HIV is capable producing hormones which can negatively affect the body's metabolism of carbohydrates, proteins and fats.[50,51] Furthermore, anaemia (a decrease in the number of red blood cells) increases viral shedding in the birth canal and thus, increasing the risk of mother-to-child transmission.[52] All these occur because the body uses both the micronutrients and the macronutrients to boost the immune system in order to resist infections and in the absence of these vital nutrients, the immune system will be weakened.[50]

Quality and affordability of housing are one of the major concerns in public health. Poor housing conditions can be described as leaks, molds, indoor air pollutant, overcrowding, hazardous structures, affordability of home heating and poor economic structure for the home. Housing insecurities are very common among the poor. This condition is often associated with infectious diseases, lead exposure, injuries, and mental health.[53]

According to WHO, approximately 30% of the global populations do not have regular access to good drugs and adequate services.[53] In the poorest parts of Africa, this figure goes up to 50% because population below the poverty line lacks as a result of their economic situations are unable to purchase these drugs.[53] Political priority is also one of the contributing factors to lack of access medical care. Minimal funding is many times allocated to public health by the government of poor countries due to the scarcity of resources.[54]

Burden of Poverty Related Infections

Poverty related infections show a symbiotic relationship between poverty and poor health. While such diseases result directly from poverty, they cause and worsen impoverishment by sapping personal and national health and financial resources. Malaria has decreased GDP growth in some developing nations by up to 1.3% and has killed tens of millions in Sub-Saharan Africa.[55]

More than 65 million people have been infected with HIV and 30 million people have died due to AIDS related causes since the emergence of AIDS in 1981.[56] In 2010, HIV related deaths were reported to be about 1.5 million[57] with over two-third of the global burden in Sub-Saharan Africa,[58] followed by Asia and the Pacific, where nearly 372,000 people became newly infected in 2011.[59] Those under 15 years were 3.3 million out of the 34 million HIV infected individuals and 16.7 million were women in 2011.[59] Adolescents are also susceptible because according to UNAID[60], about 2.1 million adolescents (aged 10–19 years) were infected with HIV in lower and middle-income countries in 2012. The prevalence among young women were twice as high as that among young men throughout Sub-Saharan Africa.[60] With the ongoing campaign against HIV, there has been a decline in HIV infection. The UNAIDS[59] reported a 50% reduction in HIV incidence in 25 lower income countries between 2001 and 2011 while in Sub-Saharan Africa, the number of newly infected children declined by 24% between 2009 and 2011[58]. With this burden of HIV, the chances of co-infection with leishmaniasis and tuberculosis is also on the increase and in spite of adequate treatment, relapse is common and many times results in death.[61]

Tuberculosis is the second deadliest infection caused by a single infectious agent after HIV/AIDS in the world. In 2010, the death cases associated with tuberculosis were 1.2 million.[57] Over 95% of tuberculosis deaths occur in lower middle countries mostly in Asia and Africa. African records about 24% of the world's tuberculosis cases and the highest rates of cases and deaths per capita.[39] There is also the emerging issue of multi-drug resistant tuberculosis (MDR-TB) with about 60,000 cases in the 27 high MDR-TB burden countries worldwide in 2011.[39] Although the Millennium Development Goal target to halt and reverse the tuberculosis epidemic by 2015 has been already achieved, the disease burden remains enormous with resurgence in many areas due to HIV/AIDS. An estimated 13% of the tuberculosis cases in 2011 were co-infected with HIV and 430,000 deaths were among the HIV-positive population.[39]

Prevention and Control of Poverty Related Infections

The governments should enforce public health regulations; assist communities to properly dispose human wastes and provide potable water; organize programs to prevent exposure to tuberculosis, sexual transmitted infections, malaria and waterborne epidemic infections; enforce regulation of health practitioners, drugs and other products; provide information that will enable people effectively cope with health problems and make use of available resources.[62]

O'Farrell [63] raises doubt about the correlation between high HIV poverty and HIV in Sub-Saharan Africa. "Alleviation of poverty alone, however politically acceptable and justifiable, will divert attention away from biological risk factors such as male circumcision status and poor genital hygiene in core groups that may be the determining influences that drive high-prevalence HIV epidemics".

Minimizing poverty related infections, WHO[64] has proposed that daily living conditions should be improved; there should be equitable distribution of money, power and resources by building stronger public sectors and changing the way in which society is organized; and there should be measurement and understanding the problem and assessment of the impact of action through the training of policy makers and healthcare practitioners to recognize problems and form policy solutions.

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