

# A Review on HIV/AIDS Epidemiology, Risk Behaviour, Opportunistic Infections, Diagnosis, Management, and Preventive Measures in African Countries

Anandapandian.K.T.K<sup>1</sup>, Divya Rani R<sup>2</sup>, Pandia Rajan. K<sup>3</sup>,  
Ragav Somasundaram<sup>4</sup>

<sup>1</sup>Associate Professor, Department of Microbiology, College of Natural Sciences, Bule Hora University, Bule Hora, Oramia, Ethiopia.

<sup>2</sup>Lecturer, Department of Midwifery, College of Health Sciences, Bule Hora University, Bule Hora, Oramia, Ethiopia.

<sup>3</sup>Lecturer, Department of Medical Surgical, College of Health Sciences, Bule Hora University, Bule Hora, Oramia, Ethiopia.

<sup>4</sup>Lecturer, Department of Psychiatry, College of Health Sciences, Bule Hora University, Bule Hora, Oramia, Ethiopia.

Corresponding Author: Anandapandian.K.T.K

## ABSTRACT

This paper reviews HIV/AIDS epidemiology, risk behaviour, opportunistic infections, diagnosis, management, and preventive methods in African countries over the past one decade. Many articles on HIV/AIDS were found in search through a database dedicated to indexing all original data published in Africa between the years 2008 -2018. The review reveals that there is almost a universal awareness of HIV/AIDS in African countries, although there are still some deficiencies in comprehensive knowledge of the epidemic.

**Keywords:** HIV/AIDS, Epidemiology, Risk behaviour, Opportunistic infection, Diagnosis, Management, Preventive measures

## INTRODUCTION

The Human Immunodeficiency Virus (HIV) targets the immune system and weakens people's defense systems. The most advanced stage of HIV infection is Acquired Immuno Deficiency Syndrome (AIDS), which is evident by the development of certain cancers, infections, or other severe clinical manifestations. <sup>[1]</sup> HIV/AIDS is recognized as a global emergency demanding the attention on the international health agenda and one of the most public health issue. <sup>[2]</sup> For more than two decades,

HIV/AIDS has been a growing challenge worldwide. A total of 36.7 million people are estimated to be living with HIV across the globe, 1.8 million people became newly

infected with the virus and 1million people have lost their life due to AIDS. <sup>[3]</sup>

African Region is the most affected region, with 25.6 million people living with HIV in 2016. It also accounts for almost two thirds of the global total of new HIV infections. <sup>[1]</sup> Out of which East and Southern Africa is the region hardest hit by

HIV. It is home to 6.2% of the world's population but over half of the total number of people living with HIV in the world (19.4 million people). Ten countries, mostly in southern and eastern Africa, viz. South Africa (25%), Nigeria (13%), Mozambique (6%), Uganda (6%), Tanzania (6%), Zambia (4%), Zimbabwe (6%), Kenya (6%), Malawi (4%) and Ethiopia (3%), account for almost 80% of all people living with HIV. [4]

The main mode of transmission of HIV is through sexual intercourse with an infected person. However, one can also be infected with the disease through the use of infected syringes, the transfusion of infected blood products, intravenous drug use with infected needles and from infected mother to the fetus. Although East and Southern Africa's HIV epidemic is driven by sexual transmission, certain groups such as sex workers and men who have sex with men have significantly higher HIV prevalence rates. [5]

The level of immunity determines the occurrence and type of opportunistic infections. Some life threatening infections, such as pneumonia and TB, may occur early as well as later. When TB occurs later it is atypical, more disseminated and more extra pulmonary. Tuberculosis, bacterial infections, and malaria were identified as the leading causes of HIV-related morbidity across sub-Saharan Africa. [6]

HIV diagnostic testing has come a long way since its inception in the early 1980s. Current enzyme immunoassays are sensitive enough to detect antibody as early as one to two weeks after infection. A variety of other assays are essential to confirm positive antibody screens (Western blot, polymerase chain reaction [PCR]), provide an adjunct to antibody testing (p24 antigen, PCR), or provide additional information for the clinician treating HIV-positive patients (qualitative and quantitative PCR, and genotyping). Most diagnostic laboratories have complex testing algorithms to ensure accuracy of results and optimal use of laboratory resources. [7]

The management of HIV/AIDS normally includes the use of multiple antiretroviral drugs in an attempt to control HIV infection. The HIV management field has evolved rapidly over the last five years. Numerous interventions to prevent HIV acquisition are available. In May 2017, the South African National AIDS Council released the fourth National Strategic Plan (NSP) for HIV, tuberculosis and sexually transmitted infections. This five-year plan (2017-2022), which aims to track the progress towards transitioning these epidemics to no longer being public health threats by the year 2030. [8] This review article focuses on the epidemiology, risk behaviour, opportunistic infections, diagnosis, management and knowledge of preventive measures.

## EPIDEMIOLOGY

In the 1980s' Africa experienced a rise in the national prevalence of HIV spreading across East Africa through Southern Africa, and reaching peak prevalence in the Southern African region. [9] Sub-Saharan Africa remains the region most heavily affected by HIV/AIDS in the world. It is estimated that 68% of all people living with HIV infections reside in these countries, and this group represents 12% of the global population (UNAIDS, 2011). [10] Specific estimates using 2009 data published in 2010 indicate that the number of people living with HIV in Kenya totals 1.5 million, Tanzania 1.4 million and Uganda 1.2 million. Sub-Saharan Africa has about 22.5 million people living with HIV/AIDS.

There are unique factors in individual African countries that influence the prevalence and spread of HIV/AIDS. For instance, paid sex is a significant factor in Kenya and Uganda, while injected drug abuse is the main mode of HIV transmission in Tanzania. [11] The prevalence of HIV/AIDS in Sub-Saharan Africa is an outcome of poverty with sexual trade, migration, polygamy, and teenage marriages as its predictors in the Sub Saharan region.

[12] Recent study which is conducted in 18 countries across Sub Sahara Africa showed that prevalence ratio was higher for the younger age group compared to the age group 25-49 years. Women continue to carry the greater burden of HIV in SSA. [13] A study which is done on seven countries in eastern and southern Africa showed that in Ethiopia and Malawi, HIV prevalence was higher in more educated women and in Lesotho, Kenya and Zimbabwe, HIV prevalence was lower in higher educated women. [14] The differences in HIV prevalence between east Africa and developed countries are due to poverty, ignorance, high prevalence of other STDs and associated cultural and traditional practices which prevail and facilitate HIV transmission in the region. While more than 80% of HIV infection in east Africa is transmitted through heterosexual intercourse, 5-15% of cases are perinatally transmitted and the remaining cases are transmitted through blood and blood products. [15]

Infant mortality rate was estimated 6.3 times higher in children born to HIV-infected mothers compared to HIV-uninfected mothers in Congo. [16] In Kenya, Women's high mobility and evidence that it is associated with higher-risk sexual behavior. High HIV prevalence and risk behavior among women in this study warrant accelerated attention to HIV prevention and care needs of mobile women, including market traders. [11] Bio-behavioral surveillance surveys among hard-to-reach key populations at Middle East and North Africa (MENA) reported appreciable and growing HIV prevalence as much as 87.2% HIV prevalence among people who inject drugs in Tripoli, Libya. The discovery of these hitherto hidden epidemics was unsettling to some authorities after years in which the importance of a focus on HIV prevention among key populations was not recognized. [17]

## RISK BEHAVIOUR

### Young women and HIV

A cross-sectional data from Demographic and Health Surveys from ten countries in sub-Saharan Africa showed consistent and strong associations between HIV infection in women and physical violence, emotional violence, and male controlling behavior. [18] Young women in South Africa are at great risk of being infected with HIV. In 2005, HIV infection prevalence in the age group 15-24 years was 16.9% in women and 4.4% in men. [19]

The female adolescents are highly vulnerable to HIV infection and its effects; they were by far less likely to have comprehensive HIV/AIDS knowledge. Thus, HIV/AIDS information, education and communication activities need to be intensified in high schools, including further attention being put on gender, the family wealth disparity, the positive influences of peers, mass media and teaching methods of HIV/AIDS and related issues at schools. [20] Age-disparate sex continues to be a risk factor for young women aged 15-24 in South Africa at a national level. [21] Sexual relationships with older men expose young women to increased risk of HIV acquisition in Manicaland, which did not change over time, even with introduction of antiretroviral therapy. [22]

### Children and HIV

The main mode of transmission among children is through birth. Sub Sahara is occupied by 12% of the global population but disproportionately has more than 90% of children younger than 15 years. [23] Africa is also home to 15 of the 20 countries with the highest prevalence rates of child marriage. Niger, Chad, and the Central African Republic top the list of child marriage "hot spots" with 75, 68, and 68 percent, respectively, of women who married before the age of 18. Eastern and Southern Africa, girls account for more than 80 percent of all new HIV infections among adolescents; approximately 7,000 girls between 15 and 24 years-old become HIV-positive every

week. [24] Girls who marry as virgins under age 18 face a distinctly elevated HIV risk because these marriages tend to shift girls directly from a protected state of virginity into an unprotected (and often unwilling) state of frequent sexual relations. [25]

Across the globe approximately 34 % fewer children were infected with HIV through the perinatal or breastfeeding route in 2011 (est. 330,000) than in 2001 (est. 500,000), but ongoing mother-to-child HIV transmission is concentrated in sub-Saharan Africa, where fully 90 % of 2011 cases are estimated to have occurred. [26]

### Sex Workers

Globally sex workers make up 9% of the total number of new HIV infections. In eastern and southern Africa, HIV prevalence among female sex workers is often extremely high. In Eswatini, Lesotho, Malawi, South Africa and Zimbabwe more than 50% of sex workers are living with HIV. In 2013, it was found that HIV prevalence was 50 times higher among sex workers than in the general population in four countries. [27] Female sex workers (FSWs) comprise an important sub-population in the epidemiology of HIV infection in many countries as evidenced by HIV prevalence amongst FSWs and their clients often being 10-20-fold higher than that in the rest of the general population. For example, in Ethiopia, after the first HIV infection was reported in 1984, only 4 years later, the HIV prevalence amongst FSWs had already risen to 17%. [28]

Sex worker, drinkers were more likely to report unprotected sex and sexual violence and to have syphilis, *Neisseria gonorrhoeae* or *Trichomonas vaginalis* infection. [29] Unsafe sex, partner violence and HIV incidence were higher in women with alcohol use disorders. Possible mechanisms include increased unprotected sex, condom accidents and exposure to sexual violence. [30] Police harass and abuse sex workers who carry condoms and use the threat of arrest on the grounds of condom possession to extort and exploit them. Some

sex workers opt not to carry condoms because they fear police harassment and detention, thus increasing their risk of exposure to HIV and compromising their health and the health of their sexual partners. [31]

### Men Who Have Sex With Men (MSM)

In sub-Saharan Africa, men who have sex with men experience high HIV prevalence, in part, due to stigma and discrimination creating barriers to engagement in prevention and care services. Health care providers were not knowledgeable to handle MSM needs. It highlights the need for interventions to reduce stigma and create a more inclusive health system. [32] The Soweto Men's Study assessed HIV prevalence and associated risk factors among MSM in Soweto, South Africa. Study confirms that MSM are at high risk for HIV infection, with gay men at highest risk. [33] Concurrency of sexual partnerships with partners of both genders may play important roles in HIV spread in these population. [34] Bisexual men were 3 times more likely to have unprotected sex with a female partner as with their male partner.

### Transgender

Transgender populations have been underrepresented in HIV epidemiologic studies and consequently in HIV prevention, care, and treatment programs. Since 2012, there has been a dramatic increase in research focused on transgender people. Transfeminine individuals have some of the highest concentrated HIV epidemics in the world laboratory-confirmed prevalence up to 40%. The data suggest potential increased risk for trans masculine men who have sex with men. [35]

### Injecting Drug Users (IDUs)

Injection drug use continues to account for a substantial proportion of HIV infections. injecting drug users often have worse outcomes from HIV treatment than non-injection drug users. Inferior

outcomes are explained by a range of barriers to antiretroviral access and adherence, which often stem from the negative influences of illicit drug policies, as well as issues within medical systems, including lack of physician education about substance abuse. [36]

## OPPORTUNISTIC INFECTIONS

Opportunistic infections (OIs) are infections that are more frequent or more severe because of immune-suppression in HIV-infected persons, and they are the major clinical manifestation of HIV patients. They indirectly affect the natural history of HIV disease. [37] Tuberculosis and malaria were identified as the leading causes of HIV-related morbidity across sub-Saharan Africa. [38]

### Bacterial Infection

An estimated 1.37 million new cases of HIV-TB occurred in 2007, representing 15% of the total global burden of TB. In addition, an estimated 456,000 HIV-TB deaths accounted for 23% of global HIV/AIDS mortality. Sub-Saharan Africa is the worst affected region with 79% of the disease burden. [39] Severity of HIV disease is the strongest risk factor for prevalent and early incident TB, and response to ART the strongest risk factor for late incident. [40]

There was higher TB mortality among the economically active age group and older patients, among those who were HIV positive, those that had smear negative Pulmonary TB (PTP), those with Extra Pulmonary TB (EPTB), and among those on retreatment than for the other categories of TB patients. [41] Drug users remain a high risk group for TB infection and disease, and injection drug use has been an important factor in HIV-associated epidemics of TB worldwide. [42] Males with HIV that smoke are at greater odds for developing PTB than non-smokers. [43]

Streptococcus pneumoniae infection is an increased risk of Zambian mothers with HIV. [44] Prevalence of pneumococcal carriage among the HIV infected children was 27.1% in Ghana. [45] Occurrence,

incidence and case fatality rate (CFR) of invasive nontyphoidal *Salmonella* (iNTS) disease in Africa from 1966 to 2014 confirms that invasive nontyphoidal *Salmonella* (iNTS) disease is more prevalent amongst Human Immunodeficiency Virus (HIV)-infected individuals, infants. [46] In Kenya, Trichomoniasis was the most common STI in women (10.9%) and men (2.8%); prevalence of gonorrhoea, chlamydia, and syphilis were low (<1%-2%). 598 HIV-infected men in the study had significantly lower prevalence of most STI when compared with women. [47]

### Fungal Infection

Invasive fungal infections (IFIs) are a major cause of HIV related mortality globally. Despite widespread rollout of combined antiretroviral therapy, there are still up to 1 million deaths annually from IFIs, accounting for 50% of all AIDS-related death. [48]

Oral candidiasis is the most common opportunistic infection in patients with HIV infection. The *Candida* carrier rate is higher in the South African population than elsewhere. HIV-positive patients carry more and a greater variety of yeasts than HIV-negative subjects. Exposure to antifungal drugs has no effect on the level of yeast carriage in HIV-positive patients. [49] In Tanzania patient with Oral candidiasis was the commonest (23.5%), followed by mucosal hyperpigmentation (4.7%). [50]

### Parasitic Infection

The magnitude of opportunistic and non-opportunistic, intestinal parasitic infections among AIDS patients and HIV positive carrier individuals, in south west Ethiopia. The highest rate 36 (69.2%) of intestinal parasites were observed among HIV/AIDS patients. *I. belli*, *C. parvum*, *S. stercoralis* and *Blastocystis* are the major opportunistic intestinal parasites observed in HIV/AIDS patients. [51]

In Nigeria, the prevalence of intestinal parasitic infections in HIV infected patients was 24.7 %; while in HIV negative persons, it was 17.6%. The most

prevalent parasite detected in HIV/AIDS patients was *E. histolytica*. Four different parasites namely; *Entamoeba coli*, *G. lamblia*, *S. stercoralis*, and *T. trichiura* were detected only in HIV seropositive individuals. [52]

In SubSahara Africa searching major electronic databases showed HIV increases the prevalence and severity of clinical malaria in adults and children, increases the risk of placental malaria in pregnancy, and undermines malaria treatment in adults and pregnant women. On the other hand, malaria increases the probability of HIV transmission from pregnant mothers to their children and hastens the progression of HIV to AIDS. [53]

## DIAGNOSIS

Viral load diagnostic measurement is a key indicator that determines patients' response to treatment and risk for disease progression. Efforts are ongoing in different countries to scale-up access to viral load testing to meet the Joint United Nations Programme on HIV and AIDS target of achieving 90% viral suppression among HIV-infected patients receiving antiretroviral therapy.

Children in low- and middle-income countries (LMIC) are the least touched by recent successes in the diagnosis and treatment of HIV/AIDS globally. Data were gathered from November 2009 to August 2010 during the scale-up of prevention of mother to child transmission and early infant diagnosis programs in the region of East Africa. Reports on 1776 children indicate that 31.7% of all children were reported to have been tested, including only 42.9% of children with an HIV-seropositive caregiver. The persistence of low testing rates is discussed in terms of the accessibility and acceptability of child testing in resource poor settings. [54]

The recent findings shows that progress is being made in some countries to scale-up viral load, many others still face numerous challenges that may affect scale-up efficiencies. The result concluded that

there should be a renewed focus to address efficiencies across the entire spectrum, including factors related to access, uptake, and impact of test results. [55] HIV self-testing (HIVST) is an empowering process in which an individual performs an HIV rapid diagnostic test and interprets the result in private. [56]

The gap in HIV testing remains significant and new modalities such as HIV self-testing (HIVST) have been recommended to reach key and under-tested populations. In South Africa, HIVST was included as a supplementary strategy in the National HIV Testing Services Policy in 2016, and recently, guidelines for HIVST were included in the South African National Strategic Plan for HIV, sexually transmitted infections and tuberculosis 2017-2022. This document serves as an additional guidance for the National HIV Testing Services Policy 2016, with specific focus on HIVST. [57]

## MANAGEMENT

Global health priority is now universal health coverage, the principle that no-one should be denied effective care, kept or driven into poverty, because they cannot afford to pay for their care. AIDS response has not engaged with the universal health coverage movement in many high burden countries in Africa. Many countries developing fledgling universal health coverage systems in Africa have excluded HIV from emerging benefit packages. [58] The determinants of HIV/AIDS prevention activity and pre-employment health checks by private firms in Kenya, Uganda and Tanzania. The determinants of HIV/AIDS prevention including condom distribution and voluntary counselling and testing (VCT); The worker surveys showed a high degree of willingness on the part of workers to be tested for HIV in the three East African countries. [59] Patterns of suboptimal immune recovery (SO-IR) and associated HIV-related-illnesses during the first 5 years following first-line antiretroviral therapy (ART) in east Africa. [60]

Sustainable East Africa Research on Community Health (SEARCH) 'test-and-treat' trial in rural Uganda and Kenya. They measured retention in care at 12 months among HIV-infected adults who linked to care and were offered ART regardless of CD4 cell count, following community-wide HIV-testing. The result concluded that high retention in care and viral suppression after 1 year were achieved in a streamlined HIV care delivery system in the context of a universal test-and-treat intervention. [61] Health services for adolescents are increasingly recognized as a priority in low- and middle-income countries (LMICs). The Adolescent and Youth Friendly Service (AYFS) approach has been promoted in South Africa by the National Department of Health and partners, AYFS is a government priority, but additional support for facilities is needed to achieve the agreed standards. Meeting these standards could make a major contribution to securing adolescents' health, especially in preventing unintended pregnancies and HIV as well as improving psycho-social management. [62]

The use of antiretroviral therapy (ART) is a core strategy proposed by the World Health Organization in preventing mother to child transmission (MTCT) of HIV. Enhanced effort is needed to facilitate women's knowledge of their HIV status before pregnancy to enable disease acceptance and management, and to support pregnant women and her partner and family in dealing with fear, stigma and discrimination about HIV. [63]

The evidence of effective approaches to improve action on addressing the social and structural drivers of the HIV epidemic remains a priority, to meet the 2030 sustainable development agenda, and to achieve key HIV targets, including the 90-90-90 target and the Treatment as Prevention (TasP) intervention. [64] In a Reality trial (Reduction of Early mortality) in HIV infected adults and children starting antiretroviral therapy, was conducted in Uganda and Zimbabwe in 2015. People did not consider themselves as presenting

“late”, and treatment was not considered urgent as long as they considered their health to be “good enough”. [65]

## PREVENTIVE MEASURES

At present HIV infection and AIDS account for more than 50% of adult medical admissions into some of the national and provincial hospitals as well as for 10-15% of paediatric admissions in east Africa. The differences in HIV prevalence between east Africa and developed countries are due to poverty, ignorance, high prevalence of other STDs and associated cultural and traditional practices which prevail and facilitate HIV transmission in the region. [66]

Adolescents are the only age group with growing AIDS-related morbidity and mortality in Eastern and Southern Africa. Structural deprivations are key drivers of adolescent HIV infection in this region. There is growing evidence that social protection has the potential to reduce the risk of HIV infection among children and adolescents. [67] There is an urgent need to develop positive prevention interventions for adolescents living with HIV in high endemic regions. The systematic adaptation was guided by the Centers for Diseases Control's map for the adaptation process, describing an iterative process. [68]

Recent literature suggests that PMTCT in Africa is optimized when interventions engage and empower community members, including male partners, to support program implementation and confront the social, cultural and economic barriers that facilitate continued vertical transmission of HIV. [26] Ending intimate partner violence (IPV) and reducing gender inequalities are recognised as critical to "ending AIDS" by 2030. Amongst women, experiencing IPV has been shown to increase HIV acquisition, reduce women's ability to use HIV prevention strategies and reduce adherence to antiretroviral therapy (ART). In Southern and Eastern Africa there has recently been a significant push to strengthen programming around this through broad funding and

programming streams. [69] In Ghana, male respondents between 15 and 24 years are more aware of the preventive measures than their female counterparts. Against the backdrop that women are more affected by the epidemic than men, there is the need to intensify the knowledge and preventive methods of HIV/AIDS especially among the women in their reproductive age. [70]

Antiretroviral therapy (ART) saves lives and prevents new HIV/AIDS infections. Successful efforts to increase the number of people receiving ART create important public health challenges, some of which may be considered counter-intuitive, trial results, demonstrating 96% (95% confidence interval, 73%-99%) efficacy of prevention in discordant couples with earlier ART treatment initiation, engaging greater numbers of men with HIV in treatment could have important prevention benefits for women and girls, and for primary prevention of vertical transmission. [71]

Since 2002, ART programs have been slowly rolled out in Africa. Initially, HIV-infected people had to wait until they were seriously immunocompromised, with a CD4 T-cell count below 200 per cubic millimetre, to begin ART. The threshold was raised to 350 and then 500, as the importance of earlier initiation of treatment was recognized. [72]

UNAIDS defines combination prevention as; biomedical, behavioural, and structural interventions, prioritised to meet the current HIV prevention needs of particular individuals and communities, so as to have the greatest sustained impact on reducing new infections. [73] In order to end the HIV epidemic as a public health threat, in 2014 UNAIDS set ambitious worldwide targets to reduce annual new infections to below 500,000 by 2020 - a 75% reduction from 2010 - and to 200,000 by 2030. This is known as the UNAIDS Fast-Track Strategy. However, with new infections in 2015 almost four-times the 2020 target, progress is off track. [74]

## CONCLUSION

This paper reviewed that epidemiology, risk factor, opportunistic infections, diagnosis and preventive measures in African countries in last one decade. Studies on the prevalence of HIV have provided reliable insight in to the magnitude of the problem in Africa. It is also shown that East and southern Africa is the most affected by HIV in the world and is home to the largest number of people living with HIV. The number of people living with HIV in African countries continues to increase, although the access of antiviral treatment is increasing well. The review also affirms that, African continent has achieved substantial success in slowing the epidemic, and continues to be a major public health concern.

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How to cite this article: Anandapandian.K.T.K, Divya R.R, Pandia R.K. et.al. A review on HIV/AIDS epidemiology, risk behaviour, opportunistic infections, diagnosis, management, and preventive measures in African countries. *Int J Health Sci Res.* 2019; 9(3):287-298.

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