

A Global Health Perspective on HIV/AIDS

HIV (human immunodeficiency virus) is a retrovirus generally transmitted by sexual or blood contact that interferes with the host's immune system, causing AIDS (acquired immunodeficiency syndrome) which if untreated results in death, often from cancers or opportunistic infections.

Transmission and clinical progression

HIV infects CD4+ immune cells and is predominantly transmitted horizontally via unprotected sexual contact or blood contact (often transfusion or intravenous needle), or vertically from mother to child. New, acute HIV infections manifest clinically as a variety of nonspecific, often flu-like symptoms, though rashes and other symptoms also occur (Daar 2008). Importantly, 10-60% of patients experience no symptoms (HHS 2013). The HIV-1 subtype accounts for a vast majority of infections.

Past this early stage, the infection is clinically latent for a period of six months to several years before it progresses to AIDS, defined by the concentration of CD4+ immune cells (which the virus infects) in the host's blood. As the CD4+ cells infected by HIV are critical in immune function, lower CD4+ cell counts indicate disease advancement, with a diagnostic cutoff for advanced AIDS of 350 cells/mm³ (WHO 2007a). At this stage of infection, patients succumb to infections like pneumonia or candidiasis, or a variety of immune-related tumors, with a median survival of 6-18 months.

Epidemiology and statistics

First identified in the 1980's, HIV/AIDS has killed more than 35 million individuals, 1.7 million in 2011 alone (WHO 2011). Though recognized as a global pandemic with roughly 34 million people living with HIV, sub-Saharan Africa has infection rates of nearly 5% and accounts for more than two thirds of all infected individuals (UNAIDS 2011).

As any unprotected sexual or blood contact may result in transmission of the virus, infection rates tend to be high in populations without access to sexual education or protection, homosexual populations, and intravenous drug users. There is also a 2-7% risk of infected mothers transmitting the virus to their child during pregnancy, childbirth, or breastfeeding, resulting in more than 400,000 new infections in 2007 (WHO 2007b). The burden of HIV is particularly heavy in poor countries with large rural populations. Despite large efforts, less than 25% of the at-risk population in sub-Saharan African has been tested for HIV, and treatment access is often less than 50-75% (UNAIDS 2011).

Treatment and prevention

There existed no effective treatment for HIV/AIDS until the advent of antiretroviral (ARV) drugs in the early 1990's. Now, many ARVs exist and are often administered in high-dose combinations to prevent development of resistance. Infamous for a high mutation rate, HIV can rapidly evolve resistance when improperly treated; consequently, maintaining consistent, effective dosing is crucial not only to maintain health in a single patient, but also to prevent the spread of mutated, resistant virus. Though there is no cure for HIV, patients can live near-normal lives while on antiretroviral regimens. Unfortunately, these drugs are costly – ARVs in South Africa cost \$500-900 USD/yr – and it can be hard to provide them consistently to patients in need (Meyer-Rath 2012). Though median survival in absence of treatment is less than two years, effective ARV treatment has been estimated to have saved more than 25 million cumulative life-years over the last two decades (UNAIDS 2012).

Because of the high cost and difficulty of treatment of HIV positive patients, vaccination would be the most effective cost-saving mechanism. Though much effort has been invested, no effective vaccine for HIV exists; the last five years, however, have seen significant progress and many forecast

the creation of a successful vaccine within one to two decades. Prevention, therefore, is viewed as the most effective management for HIV/AIDS. The simplest and most effective strategy has been sexual education and use of condoms to reduce transmission rates. Preventing use of shared needles in clinical or recreational drug settings has reduced transmission rates.

Awareness and testing have also proven highly effective. Aided by the advent of low cost point-of-care tests to diagnose and track progression, improved availability and reduced cost of testing sites has dramatically improved HIV identification and treatment (Laursen 2012). Because of the stigma and widespread misinformation associated with the virus, education has been difficult but worthwhile in reducing transmission and improving the likelihood of a patient to seek treatment before he or she infects others and becomes critically ill.

Incidence and care disparities

The high incidence rates seen in sub-Saharan Africa are largely due to disparities in health education, prevalence of condoms, and difficulties in obtaining ARV treatment. Though massive efforts have taken place to ensure availability of ARVS – more than 9.7 million HIV positive patients in the developing world received ARVs in 2012 – there are significant populations for whom these drugs are unavailable (WHO 2011). Treatment rates are less than 50-75% in many regions, largely a product of widespread rural populations, resulting in increased mortality and transmission rates (UNAIDS 2011).

Social factors like education, stigma associated with HIV, and even denial of the existence of the virus all play roles in both incidence and care disparities. Prevention, however, is highly effective, as proper use of condoms almost completely eliminates transmission and infected patients on ARV therapy are 96% less likely to transfer their infection to a partner (Cohen 2011). The use of ARV treatment in pregnant mothers has prevented an estimated 1 million transmission events (CDC 2013).

Critical goals

The most critical and cost-effective strategy is prevention of transmission. Appropriate education is crucial to reducing risk. Distribution of condoms and clean needles has proven highly effective in both educating and encouraging safe habits in at-risk populations. Preventing clear transmission risks by ARV treatment (e.g. from infected mothers to their child or in couples with a single infected partner) is very effective.

Identification, treatment, and management of HIV infection are costly and difficult. Even if a patient has access to treatment, ensuring appropriate dosing and consistency of therapy represents a significant logistical and cost barrier. Low cost clinical tools help this by providing easy access, improving diagnostic rates, and assisting in tracking progression and guiding treatment. Still, obtaining ARVs or physicians knowledgeable of their use is difficult in many regions, resulting in increased rates of transmission, morbidity, and mortality.

Summary

HIV is a global pandemic that has claimed the lives of millions and continues to do so, particularly across the developing world. Though no cure or vaccines exist, transmission is effectively prevented by education and a variety of preventative measures. Low cost point-of-care diagnostics can dramatically assist in diagnosis and tracking of disease, and appropriately used ARVs, though costly and difficult to supply steadily, are capable of rendering HIV a chronic and manageable disease. The situation is most dire in countries where infection rates are high, preventative measures are not widespread, and access to treatment is low.

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