

Co-Morbidity of HIV and Malaria in Sub-Saharan Africa

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Abstract

HIV and Malaria remain two of the greatest risks of global health, accounting for massive morbidity and mortality rates. These diseases are of greatest prevalence in low-income and tropical areas, and overlap most significantly in Sub-Saharan Africa. This is a review of the interactions between these infections, and their treatments. Key words used in the search include HIV and Malaria comorbidity, HIV and Malaria and Developing world, HIV and Malaria and Africa, HIV and Malaria Treatment, HIV and plasmodium falciparum. Research articles had to be published within the past 5 years and peer reviewed to be included in this review.

Key Words: *HIV, Malaria, Africa, Global Health*

Introduction

Malaria remains one of the greatest global health concerns with 3.3 billion people at risk for the disease worldwide. According to a report published by the World Health Organization (2015) in 2014 an estimated 198 million cases of malaria occurred worldwide in 2013, with an estimated 584,000 deaths (p.20). It is reported that 82% of those cases, and 90% of those deaths occurred in Africa (p.20). These numbers sound gloomy but due to initiatives and funding the incidence of Malaria is down 30% globally from 2000-2013, while deaths are down 47% (p. 21) in the same time period. Malaria remains a great concern, but it's rapidly moving in the right direction and is estimated to far exceed the goals set for 2015 if it continues at this rate.

HIV is another disease of great world health concern. Unlike Malaria, the incidence and mortality of HIV is growing, according to the World Health Organization (2014) an estimated 1.5 million deaths in 2013 were related to HIV. Despite the increase in HIV mortality, the WHO (2014) reports "substantial progress in the past 3-4 years" (p. 5) this is evidenced by the increased availability of treatment, with 12.9 million people receiving ART at the end of 2013, however, only 36% of the people living with HIV in low-income areas receiving ART (p. 8).

Malaria and HIV are huge global health concerns, with areas of greatest incidence and mortality overlapping and focusing in Sub-Saharan Africa. Because of their prevalence it seems it would be important to explore any relationship between these infections, their risk factors, and treatments. The purpose of this review is to examine the current body of research on the prevalence of HIV and Malaria comorbidity in Sub-Saharan Africa, the synergistic and bi-directional relationship of HIV and Malaria, the effect this might have on mortality in Sub-Saharan Africa, and the interactions between different pharmacological treatments for HIV and Malaria.

Results

HIV acts on the immune system, weakening the response by decrease the CD4+Tcell count. Because of this weakened immune function, individuals with HIV are at greater risk for other infections, and have decreased ability to resist these secondary infections. Individuals with HIV eventually die from the secondary infections after HIV has weakened their immune systems to the point where the individual can no longer fight the infection. There is some conflicting data about the incidence of Malaria as a secondary infection in HIV, however, according to Foca et al, (2012) Malaria is the third leading cause of death in HIV positive individuals.

It has been thought that while HIV impacts CD4 counts, Malaria attacks at a completely different part of a person's immune system, meaning that HIV might not create an environment at greater risk for Malaria as it does for some other infections. More recent data indicates that this might not be entirely the case, as it appears that decreased CD4 counts may impact the entire immune system, either way, individuals infected with HIV do contract Malaria, regardless of whether HIV increases the risk of Malaria. Foca et al (2012) explains it this way "HIV

replication impairs immune system and consequently malaria control; on the other hand, malaria itself enhances HIV replication by cytokines release and T-cell activation” (p.2). There is also evidence that Malaria could potentiate the destruction of CD4+Tcell counts and increase the viral load in HIV positive individuals speeding the progression to AIDs and indicating an increased rate of HIV transmission in co-infected individuals (Foca et al, 2012). Van geertruyden (2014) supports this when he explains co-infection of HIV and Malaria increases the viral load and writes “There is a strong correlation between viral load and the risk of heterosexual HIV-I transmission” (p. 279), indicating the idea that Malaria not only leads to mortality in HIV positive individuals, but that it could also cause more people to become infected.

Both Malaria and HIV pharmacological treatments involve combination therapies that follow the same metabolic pathways. This indicates interactions between the medications, but also provides the hope that perhaps some medications could be used in the treatment of both infections which could have a great impact in the low-income area of Sub-Saharan Africa.

HAART therapy, used in HIV, includes a combination of three drugs, usually a NRTI, a NNRTI or PI, and a RTV “booster” the goal of this treatment is to increase the CD4+Tcell count and slowing the progression to AIDs (Foca et al 2012). Individuals on HAART therapy are often given co-trimoxazole, in addition to the other medications, to prevent opportunistic infections. It’s reported by Foca et al (2012) that in HIV positive individuals taking co-trimoxazole and sleeping under an insecticide-treated mosquito net (ITN) reduces their risk of contracting Malaria by 97% (p.4). In fact, according to Van geertruyden in his article *HIV-malaria interactions*, states “HIV infection may therefore no longer be considered to be a risk factor for malaria among those accessing care for HIV infection...” (p. 283).

There are some negative drug interactions that still pose a risk to individuals who are both HIV and Malaria infected. Several antimalarials, quinine, halofiantrine, lumefantrine, all act on the cytochrome P-450 enzyme, the same as NNRTIs used for HIV. When an individual is taking these medications concurrently the antimalarials have less of an effect, while the efficacy of the NNRTIs is increased. Foca et al (2012) concludes that this could lead to “increased risk of treatment failure of both infections and the risk for development of drug resistance” (p.5). Van geertuyden (2014) states, “Interactions may affect antimalarial activity and exacerbate toxicity” (p.282). This is apparent when antimalarials, such as amodiaguine are taken with efavirenz based HIV treatment, which can increase the risk for severe cutaneous or hepatic toxicity.

Further treatment options are continually being researched. Vamvaka et al (2014) suggests the use of plants grown local in areas of high HIV and Malaria prevalence as more accessible options for treatment. Specifically preparations from the plants *Artemisia annua* and *Moringa Oleifera* have proven effective antimalarial agents and have shown some efficacy in inhibiting HIV (p. 578). The use of these plants has still not been studied extensively, and their interactions with other treatment options should be evaluated before they are accepted and prescribed as less expensive, more accessible options.

Conclusion

HIV and Malaria pose a threat to similar population and are areas of great concern for global health. These infections have a synergistic and bi-directional relationship which results in each individual infection increasing the risk for the other, however, because of the similar way they act on the human body, it's possible that the treatment for one may help treat or prevent the other. As with much of global health, access remains a huge problem. These diseases are prevalent in the Sub-Saharan Africa, where the majority of the at risk population lives far from healthcare and far below poverty lines. If these people would have treatment for their HIV, research supports that the risk for Malaria could significantly decrease, as well as transmission rates of HIV might be further controlled. Research should continue to be conducted as there seems to be much conflicting data on the interactions between HIV, Malaria, and their treatment options. Perhaps further studies on local plants and herbs could lead to findings supporting their efficacy as treatment options. This could provide a local source for treatment which could bring the cost down and perhaps increase the accessibility for those living on a low income.

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