HIV/AIDS: Mother to Child Transmission

MPH 500: Fundamentals of Public Health

Maria Jorgensen

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While the estimated number of new HIV infections among women and girls has been decreasing in recent years, HIV/AIDS is still a serious public health issue for females. Factors such as higher rates of HIV within the community, limited access to high-quality health care, poverty, stigma, and discrimination contribute to increased risk of infection. No matter what an individual’s risk level, everyone should be sure to get tested for HIV. Early detection and treatment of the virus plays an important role in slowing the progression to AIDS and helps many people with HIV lead relatively normal lives (American Foundation for AIDS Research (amfAR), 2013). Mother to child transmission represents a vector that is not commonly thought of when HIV/AIDS topics are brought up. HIV can pass from an HIV-positive mother to her child in many ways including during the pregnancy, at childbirth, and during breastfeeding. Due to the ease of transmission during different times of the child’s life, it is important the mother is on consistent and continual treatment to reduce her viral load (National AIDS Manual (NAM), 2014). Strategies that educate, treat, and prevent transmission throughout pregnancy and through breastfeeding of the child are most effective.

**Epidemiology and Biostatistics**

In the last 30 years, 25 million lives have been taken by AIDS. The prevalence among many groups has decreased but the groups that deserve new treatment options include those who have no choice. AIDS is the final clinical stage of HIV infection – a disease that has a lengthy incubation period (the estimated median is at least 8 to 9 years) from initial infection to the development of the disease. The children born with the disease due to Mother to Child Transmission are the new targets for clinical trials for treatment of the disease. “Many advances have been made in the prevention of HIV transmission and management of HIV/AIDS since the virus was discovered in the early 1980s. One of the most important discoveries has been
antiretroviral treatment, which can halt the replication of HIV and ease symptoms, turning AIDS into a chronic condition instead of a rapidly terminal illness. Despite advances, HIV remains a major public health challenge” (Joseph Anthony Moss, 2013).

Approximately 1.2 million people in the United States are infected with HIV, including approximately 500,000 living with AIDS. Although the global vulnerability to HIV is decreasing, the incidence of infection varies in parts of the world. Africa still has the highest incidence rate with 70% of new cases in 2010 (Joseph Anthony Moss, 2013). It is unlikely the epidemic will end any time soon but treatment and clinical trials are becoming more advanced and prevalent to discovering cures to the disease. Women of color have been disproportionately affected by the disease—approximately 52 percent of women with AIDS are black 20 percent are Hispanic and 27 percent are white. As a result black and Hispanic women have cumulative AIDS incidence rates respectively that are 13 and 9 times that of white women (Institute of Medicine). The women infected with HIV also need to be aware of the possibility that this virus can be spread to any children they become pregnant with. This brings about the need for prenatal screening and newborn HIV screenings. Screenings were initially introduced in the 1980s for surveillance purposes (Institute of Medicine: National Research Council, 1999). In 1997, 432 cases of AIDS were attributed to Mother to Child Transmission. These cases only represent a small portion of the problem however and do not address those who were unaware of their disease or not reported due to lack of prenatal treatment (Institute of Medicine: National Research Council, 1999). Most pediatric AIDS cases are the result of perinatal transmission, information on reported AIDS in children provides only limited insight into the problem because children do not develop AIDS until later on. Forty-eight percent of children born with HIV will develop AIDS by the time they are 3 years old. Sometimes by the time the children develop
AIDS, they are no longer considered pediatric cases (Institute of Medicine: National Research Council, 1999). Globally, there were an estimated 2 million adolescents living with HIV in 2009 with young women making up more than 60% of all young people living with HIV. In sub-Saharan Africa, young women make up 72% of HIV/AIDS cases. Thus young African women make up a majority of HIV/AIDS cases internationally (The United Nations Children's Fund (UNICEF), 2011a).

Contraction of HIV is through vertical or horizontal transmission. Vertical transmission is through mother-to-child transmission and horizontal transmission includes unprotected sex (including rape or child abuse) or through unsterilized needles (The United Nations Children's Fund (UNICEF), 2011a). Young people who contracted the virus from mother-to-child transmission represent a whole realm of challenges that were not addressed prior to transmission. Services may not have been available to their parents, or their parents did not use these services, and as children they were not tested themselves” (The United Nations Children's Fund (UNICEF), 2011a). “Only 26 per cent of an estimated 125 million pregnant women in low- and middle-income countries received an HIV test in 2009. In sub-Saharan Africa, there are an estimated 1,260,000 pregnant women living with HIV” (The United Nations Children's Fund (UNICEF), 2011a).

“Only an estimated 53 per cent of HIV-positive pregnant women in sub-Saharan Africa received antiretroviral drugs for prevention of mother-to-child transmission in 2009” (The United Nations Children's Fund (UNICEF), 2011a). Health service availability in these countries not only plays a heavy role in education and transmission of the virus but it is also relative to the treatment and it’s prominence as a cause of death. HIV/AIDS is estimated to be only the eighth leading cause of death among adolescents aged 15-19 and the sixth leading cause among 10-14
year olds (United Nations Children's Fund (UNICEF), 2011b). In order to protect adolescents and infants from this viral epidemic, communities need to address the needs for access to education, health services, and treatment.

**Biomedical Basis of the Virus**

HIV is classified as a retrovirus. Retroviruses are viruses that involve RNA (ribonucleic acid. The virus infects cells, and uses enzymes to convert its RNA to DNA and then continuously replicates itself using the cell it takes over. HIV primarily infects immune system cells, which causes deficiency against fighting secondary infections. CD4+ T cells are the cells directly involved with fighting infections and healthy immune systems. Unfortunately HIV destroys CD4+ T cells to the point that the immune system is no longer able to regenerate and fight other infections (Curran, 2006).

HIV is protected by a viral envelope composed of fatty lipid molecules. Inside the envelope is the capsid surrounds the RNA strand which contains the viral gene sequences. The gene sequences allow the cell to make new structural proteins and virus particles. The virus has six regulatory genes that code for proteins that control the cells ability to infect other cells, produce new copies of itself and cause disease.

AIDS is diagnosed when the immune system of a person infected with HIV becomes severely compromised. This measurement is determined by remaining CD4 cell count. HIV stages are broken into four categories as follows:

*HIV infection, stage 1:* No AIDS-defining condition and either CD4+T-lymphocyte count of greater than 500cells/uL or CD4+T-lymphocyte percentage of total lymphocytes of greater than 29.
**HIV infection, stage 2:** No AIDS-defining condition either CD4+ T-lymphocyte count of 200–499 cells/μL or CD4+ T-lymphocyte percentage of total lymphocytes of 14-28.

**HIV infection, stage 3 (AIDS):** CD4+ T-lymphocyte count of <200 cells/μL or CD4+ T-lymphocyte percentage of total lymphocytes of <14, or documentation of an AIDS-defining condition. Documentation of an AIDS-defining condition supersedes a CD4+ T-lymphocyte count of ≥200 cells/μL and a CD4+ T-lymphocyte percentage of total lymphocytes of ≥14.

**HIV infection, stage unknown:** No information available on CD4+ T-lymphocyte count or percentage and no information available on AIDS-defining conditions.

(Center for Disease Control and Prevention, 2012)

HIV severity is also measured by viral load through blood testing. “Generally, anti-HIV medications are called for it the viral load is 100,000 copies/mL or more” (Curran, 2006). The viral load and CD4 cell count heavily apply to retroviral therapies given to pregnant women. “Since the early 1990s, the U.S. Public Health Services has recommended that all pregnant women in the U.S. receive voluntary HIV testing during pregnancy” (Curran, 2006). This recommendation has helped with prevention of mother-to-child transmission of the virus through early detection and the implementation of antiretroviral drugs prior to birth. “Since the mid 1990s, HIV testing and preventative interventions have resulted in a decline of more than 90% in the number of cases of mother-to-child transmission in the United States” (Minkoff, 2013). Still there remains 27% of mothers of HIV-infected infants were diagnosed post delivery and only 29% of the mothers of the infected infants received any therapies during pregnancy (Minkoff, 2013). Women who enter pregnancy with HIV infections are encouraged to take on a
combination antiretroviral therapy and continue that regimen without disruption to provide the greatest preventative outcome for the infant.

Currently there are numerous combinations of antiretroviral therapies available that are split into four classes of treatment types. The four classes include:

- Nucleoside Reverse Transcriptase Inhibitors: NRTIs, faulty versions of building blocks needed by HIV to replicate, lure HIV away from normal building blocks and stall reproduction of the virus
- Protease Inhibitors: PIs disable protease, another protein needed by HIV to replicate
- Non-nucleoside Reverse Transcriptase Inhibitors: NNRTIs bind to reverse transcriptase and disable this protein needed by HIV to replicate
- Fusion Inhibitors: FI’s prevent HIV from entering cells (Curran, 2006)

Today these drugs attack the virus at the source and can possibly suppress it to undetectable levels. These treatments are not to the point of absolute removal of the virus from the host but allow the individual to live longer lives.

**Environmental Factors**

“Reducing the toll of HIV on communities that are disproportionately affected requires confronting the complex social, economic, and environmental factors that fuel the epidemic in these communities” (Center for Disease Control and Prevention, 2013). The HIV/AIDS epidemic is increasingly regarded as a socioeconomic problem with factors contributing to poverty, culture including religion and traditions, discrimination, prevalence of HIV and other STDs in the community, and access to treatment and clinics (Center for Disease Control and
Prevention, 2013). The community individuals live in and its prevalence of poverty and lower socioeconomic status and other demographics lend to correlates of viral prevalence. Those communities with individuals living below the poverty line had 2.3 percent prevalence in comparison to a 1.0 percent prevalence of those with individuals within the same community but living above the poverty line (Center for Disease Control and Prevention, 2013). “In addition to being more common in low income households, HIV infection was also more common among those who were unemployed and had less than a high school education” (Center for Disease Control and Prevention, 2013). These findings cite a priority population to target an environmental intervention. Creating an environment with education regarding HIV/AIDS prevention, transmission, treatment and programming would hit high prevalence zones and reduce their transmission significantly. Prioritizing these disproportionately affected communities by changing the environmental influences at both the individual, community and policy levels should be considered in the design and implementation of prevention efforts.

**Social and Behavioral Factors**

New intervention strategies need to be put into place for those who are currently infected as well as those who are not impacted by this virus. Having doctors, nurses, and mid-level providers counsel those on prevention of HIV transmission post diagnosis would curb risky behavior from continuing. Making prevention of HIV transmission a priority in daily practice defuses the behavior and informs those infected how to bring the virus to an undetectable level and subdues the virus’s ability to be transmitted from that individual. Treating HIV positive patients with antiretroviral therapy is the most important maneuver to put transmission of HIV in the past. These same principles can be applied to mothers who are pregnant and HIV positive. If
mothers can be on an antiretroviral treatment prior to the birth of their children the possibility of mother to child transmission would be limited (National AIDS Manual (NAM), 2014).

High risk transmission groups include people with high viral loads, gay and bisexual men, injection a non-injection drug users and people with mental health problems. Pregnant women with undiagnosed HIV or living in places without ready antiretroviral treatments are high risk for transmission to their offspring (Center for Disease Control and Prevention, 2013). Curbing sexual and drug injecting transmissions would lower incidence of exposure to women and in turn lower the possibility of mother to child transmission. Research proves simple counseling by HIV providers defuses risky behavior and transmission. HIV prevention in the US is mainly focused on those who are not yet infected but more emphasis needs to be put onto those spreading the virus.

A multilevel framework developed to address multiple spheres of influence is needed for individual treatment plans that look at the individual, interpersonal, organizational and policy levels. The individual level addresses the person’s knowledge and attitude of the disease, its transmission and their susceptibility. At this level it is best to educate both those who are and are not infected with the virus on safe practices, treatment and increase their perceived risk. The interpersonal level is reached by and through individuals and their networks and can involve sexual partners, drug use partners etc. The community and organizations are reached through local gatekeeper’s employers, educators, local government, kin groups and neighbors. Using local agencies like free clinics to provide more information for the community would create a greater knowledge base of the disease and its prevalence. The policy level is reached through political groups, lawmakers, religious leaders and further influenced by cultural values, gender norms, and national policies and laws. Using the policy level to enact treatment programming
and the funding for the participants involved in the programming develops a greater help network for those infected and also provides them adequate treatment of the disease to reduce viral loads and transmission risk.

**Global Health Policy and Programming**

The Federal government works with local community organizations to provide and support HIV testing programs and initiatives. The World Bank developed The Global HIV/AIDS Program in 2002 to address the HIV/AIDS pandemic in underserved areas of the world. The program develops best practice approaches through research and offers global education and interventions to addressing HIV/AIDS. The Global HIV/AIDS program is also in charge of monitoring and evaluation of efforts from the program efforts of the United Nations Program on HIV/AIDS (UNAIDS) at the country level (The World Bank, 2013). The Program is actively working to:

- Strengthen the Bank's capacity to respond to the needs of national governments, civil society and other stakeholders;
- Share and expand available knowledge about effective approaches to HIV/AIDS, and develop new approaches;
- Improve the quality of monitoring and evaluation, and build capacity in this area among partners working in AIDS-related projects and programs at country level (The World Bank, 2013)

The partnership of global organizations responding to the HIV/AIDS pandemic and providing initiatives at the country level include the United Nations Children’s Fund (UNICEF), the United Nations Development Program (UNDP), the United Nations Population Fund (UNPFA), the World Health Organization (WHO), the United Nations Education, Scientific and
Cultural Organization (UNESCO), the United Nations International Drug Control Program (UNDCP), the International Labor Organization (ILO), and the World Bank (The World Bank, 2013). These organizations are playing a key role in shaping the global response to the HIV/AIDS epidemic. The alliance against the global HIV/AIDS pandemic has also spread to the private sector.

The global efforts to silence the HIV/AIDS pandemic by creating new treatment, prevention, education and initiatives have made large impacts on the prevalence of HIV/AIDS throughout the world. More initiatives targeting the source of transmission have been started and must be continued to discontinue the spread of this debilitating virus. Making impacts in Mother-to-child transmission through early and consistent antiretroviral treatments can pin the source of the virus and keep it localized rather than spreading it to the infant. More data collection techniques should be developed in order to fully understand the loss created by this disease at the adolescent and pediatric levels due to deaths being attributed to secondary diseases. Standardizing the methods of data collection can lend a better look at where to prioritize future initiatives.

Mother to child transmission of HIV/AIDS is entirely preventable but yet a common issue worldwide. Pediatric and adolescent HIV/AIDS cases can be prevented easily through antiretroviral therapies for both the mother and the infant if the virus is detected and treated early to reduce viral load. Government action must be increased to target infected individuals and provide intervention and prevention strategies at the individual, community and policy levels for the greatest impact.
References


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