Vertical Transmission of HIV

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The Human Immunodeficiency Virus (HIV) epidemic continues to affect many people worldwide today. While there is much that has been and is being done to prevent the spread of HIV among drug users, sexual partners, and blood bank donations, these are not the only means of transmission. Vertical transmission of HIV from positive mothers to children during pregnancy, childbirth, and breastfeeding is the primary method of HIV transmission to children. Antiretrovirals have been developed and are currently being used to reduce the viral load and maintain functional CD4 count levels in affected mothers. As this is a topic of great importance and concern for communities worldwide, the global nursing community, and the drug companies that manufacture antiretrovirals, there has been much research conducted with the purpose of improving prevention, treatment, and progression of HIV transmission between the mother and child. Our research question, developed using the PICO method, explores the factors associated with mothers on antiretroviral treatment and its efficacy alongside the different birthing processes: in HIV positive pregnant women on antiretroviral therapy (ART), what is the effect of delivery method (caesarean section vs. vaginal) on the vertical transmission rate of HIV? The information obtained through our research will help nurses to better understand the impact of HIV on individuals as well as implement the necessary care to ensure patients’ comfort and quality of life.

**Research Process**

The process of finding quality studies that meet the necessary criteria to be considered reliable research is quite extensive. We began with 18 studies retrieved using databases such as EBSCOhost, Google Scholar, and PubMed. The preliminary criteria used to locate acceptable studies were that they were quantitative studies and not qualitative studies, were done in the last five years and, therefore, recent studies, and were generally related to HIV and antiretroviral therapy. Once our preliminary bibliography was compiled, nine studies were chosen that were level II evidence, mostly prognosis cohort studies with two cross-sectional survey studies. These studies were also chosen because of their focus on the transmission of HIV during the intrapartum period of the mother-to-child relationship. We expanded the choice in articles to include external factors that contribute to HIV transmission during this period in order to get a broad selection of information to better understand the process of transmission.

**Article Summaries**

Barker, Mphatswe, and Rollins (2011) studied the effect that health systems performances have on the rates of mother-to-child-transmission (MTCT) of HIV. They used a combination of hypothetical and reported data to compare model predictions of 6 intervention scenarios with the reported outcomes of MTCT patients from South Africa. This study not only looked at the effects of antiretroviral drugs in the prevention of MTCT, but also considered the effect of the health care systems on MTCT. It was found that the reliability of the delivery of the PMTCT pathway should be increased to 90%, and the CD4 count threshold at which ART delivery begins may need to be raised as well.

In their article, Forbes et al. (2012) reviewed the “rate of vertical HIV transmission and changing epidemiology of HIV-affected pregnancies in Canada” (p. 757). The study used 2,692 mother-infant pairs from 22 clinics across Canada. This large sample and the retrospective nature of the study provided the researchers with a great deal of data regarding HIV transmission. The type of highly active antiretroviral therapy (HAART) and length of time on HAART was measured along with the comparison of vaginal versus caesarean delivery to determine the effects on MTCT of HIV. The data was analyzed using summary statistics. It was found that every pregnant woman should be evaluated for HIV infection and that Canada’s programs need expansion in order to reach all susceptible populations.

Hoffman et al. (2010) studied the effects of HAART therapy and its effect on MTCT. 1,142 women were followed over the course of four years at antenatal and antiretroviral clinics in Johannesburg, South Africa. Different regimens were compared as well as the length of time the mothers were on HAART. Multivariate logistic regression was used to assess predictors of MTCT. Delayed initiation of HAART is associated with increased risk of MTCT. The study concluded that strategies are needed to facilitate earlier identification of HIV-infected women

The 2012 article, “Factors associated with viral load suppression in HIV-infected pregnant women in Rio de Janeiro, Brazil,” by Joao et al., designed a retrospective cohort study of 707 women. The HIV-positive pregnant women were treated with either HAART or non-HAART antiretroviral therapy for at least four weeks during pregnancy and mother-to-child-transmission was monitored. The mothers’ viral load (VL) and CD4+ cell counts were taken at the start of therapy as well as at delivery. A multivariate analysis was performed using logistic regression to evaluate the association of the variables studied with the dependent variable, viral load suppression. The use of HAART for 12 weeks or more produced a higher proportion of women with VL suppression compared to those who used it for a shorter duration, but both were greater than the non-HAART group. There was an independent association between both VL and CD4+ cell count at delivery with and mother-to-child-transmission. MTCT rate was 1.6% overall.

The research article “Cost-effectiveness of childbirth strategies for prevention of mother-to-child transmission of HIV among mothers receiving nevirapine in India” (Mukherjee, 2010) compares the effectiveness at prevention of MTCT with the cost of normal delivery and caesarean section when women are taking HAART medication. This cohort study of 362 women is a retrospective analysis and includes a comparison group. The mothers and children were followed and a test of the baby at one month was used to determine infection status. A model was developed to compare normal delivery and caesarean section and sensitivity analysis was used for comparison of cost per prevented infection. The HIV vertical transmission rate was only slightly higher for vaginal delivery in mothers on nevirapine compared to mothers who underwent elective caesarean section also on nevirapine. Thus, with the cost of vaginal delivery per mother Rs. 3,750 compared to Rs. 7,550, vaginal delivery was concluded to be more cost-effective.

“The impact of a HIV prevention of mother to child transmission program in a Nigerian early infant diagnosis centre” (Chukwuemeka, Fatima, Ovavi, & Olukayode, 2014) is a retrospective study of 515 children exposed to HIV in Nigeria. The study assessed the infection status of the children from received dried blood spots, comparing it with the factors around their birth. The infection percentage for newborns who were delivered via a caesarean section was fond to be half of that for vaginal births, but only about a 3% difference was found. A higher prevalence of HIV was found in breastfed infants than in those who were not breastfed. As the children progressed in age from birth to 18 months, the number who tested positive also increased. The study found that receipt of ARVs during the mother’s pregnancy and postpartum created a 1.3% prevalence rate of HIV infection in the child.

The research by Chi et al. (2014) was performed in rural Zambia and studied the effects of a prevention of mother-to child-transmission (PMTCT) program with the rate of mother-to-child HIV transmission. The study was performed in two rounds, the first study involving 1,778 women and their children and the second study involving 2,386 women and their children. The program was implemented in four different health-care facilities. Women received standard antiretroviral medication during the pregnancy and were surveyed throughout their pregnancy and post partum care. The study used the 24-month trial to study the women and their respective children. In addition to studying women who gave birth in the care facilities, the team did community surveys to identify other undocumented births in the area and gather information through a questionnaire. Overall, 31 community zones were evaluated in two different surveys. Each survey studied different groups of people and the research identifies maternal characteristics, child characteristics and household characteristics. In all, the implementation of the PMTCT program decreased the transmission rates.

The study by Jasseron et al. (2013) analyzed the effects of transmission of HIV from mother to child with mothers who did not disclose their HIV status to their partner. The study focused on health clinics throughout France and aimed to discover factors associated with non-disclosure of the disease. Through the study, the researches were able to analyze a woman’s socio demographics and the effects of PMTCT. During the late pregnancy stages, midwives would identify if and when the male partner became aware of the woman’s HIV status. Four different answers were recorded from each of the men that described the detail and extent of their partners’ awareness. In addition to awareness, other characteristics of the mother and father were identified. Nonoptimal PMTCT practice was identified as inappropriate antenatal care, late initiation of ART and problems with viral load, birth, and breastfeeding. The study found that nonoptimal PMTCT was due to social and psychological disadvantage. Overall, disclosure of a woman’s HIV status helped to eliminate poor PMTCT practice.

This study by Araujo et al. (2014) focused on the rate of mother-to-child HIV transmission in the metropolitan area of Rio de Janeiro, Brazil, with areas that lacked access to proper interventions. The research aimed to identify and define the barriers to intervention and prevention with mothers with HIV in this area. During the time period of 1999 to 2009, mothers with HIV who presented to the hospital were studied during the pregnancy process. The article detailed the women’s presenting characteristics and showed that HIV rates during this time period remained high in women who were seen at the referral center. The results found in Brazil are said to be higher than in other wealthier states and developed countries. The study suggests that during antenatal care, delay in HIV diagnosis can lead to longer fetal exposure and increased risk of transmission as well as improper post-partum care of the child. 25% of their clients were below the poverty line and had little access to health care services. Overall, they found Brazil needed much work to improve their HIV mother-to-child transmission rates.

**Table of Evidence**

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| Citation  (Write citation using APA format), Level of evidence | Purpose, Sample, and Setting | Research Question or Hypothesis  (State actual or implied research question) | Variables  (State dependent and independent variables) | Design (Include details, not just type) | Outcomes with Measures and Time Administered | Findings |
| Barker, P., Mphatswe, W., & Rollins, N. (2011). Antiretroviral drugs in the cupboard are not enough: The impact of health systems' performance on mother-to-child transmission of HIV. Journal of Acquired Immune Deficiency Syndromes, 56(2), 45-48.  **Study Design:** prospective cohort study  **Level 2 Evidence** | **Purpose:** The purpose of this study is, “to model the effect of health systems performance on rates of mother-to-child HIV transmission” (p. 45).  **Sample:** Barker, Mphatswe, and Rollins used hypothetical and reported data from a large province in South Africa for their study.  **Setting:** Their setting was described as, “data from a PMTCT program in a large province in South Africa was used to compare model predictions with reported outcomes for mother-to-child HIV transmission” (p. 45). | **Hypothesis:** Their hypothesis was that “perinatal HIV transmission was predicted for infants of 6 weeks of age” (p.45). | **Independent Variables:**   * the different health systems performances and different PMTCT protocols   **Dependent Variables:**   * the rates of mother-to-child HIV transmission rates | **Design:**   * “Data from a PMTCT program in a large province in South Africa was used to compare model predictions with reported outcomes for mother-to-child HIV transmission” (p. 45).   **Treatment:**   * PMTCT Program | **Measurements:**   * “Perinatal HIV transmission was predicted for infants of 6 weeks of age” (p. 45)   **Analyses:**   * 6 “intervention scenarios were tested in a model that used reported performance data from South Africa (SA) for each of the 3 core steps” (p. 46).   **Analyses:**   * “Summary statistics were used to describe the demo- graphic characteristics of the population. Least-square regression statistical analysis was used to test the significance of time trend. Changes in time trends were formally tested using piecewise linear regression analysis. The rate of vertical HIV transmission across different populations was compared using Fisher’s exact test. Analyses were conducted using the R statistical package” (p. 758). | **Findings:**   * Through their reported data and model their results stated, “HIV-infected pregnant women who fulfill eligibility criteria are initiated on lifelong antiretroviral treatment, whereas noneligible HIV-infected women and their infants receive single-dose nevirapine in a health system functioning at reported performance levels, and the overall vertical transmission rate would be 19.5%” (p. 45). * “Adding azidothymidine for women not eligible for lifelong treatment would further decrease the overall transmission rates only marginally to 17%. If the same steps were accomplished at 95% reliability, then the overall transmission rates would be 9.4% and 4.1%, respectively” (p. 45).   **Conclusions:**   * “The principal finding is that to reduce the number of infants who become infected with HIV and ensure that mothers receive interventions that will save their lives, each step of the PMTCT pathway needs to be delivered with greater than 90% reliability. Equally important to recognize is that introducing more effective drug interventions, or raising the CD4 threshold at which ART would be offered, will have limited effect unless health system performance is addressed” (p.47). |
| Forbes, J., Alimenti, A., Singer, J., Brophy, J., Bitnun, A., Samson, L., Money, D., Lee, T., Lapointe, N., Read, S. (2012). A national review of vertical HIV transmission. AIDS, 26, 757-763.  **Study Design:** retrospective cohort study  **Level 2 Evidence** | **Purpose:**  The purpose of this study was, “to describe the surveillance programme used, rate of vertical HIV transmission and changing epidemiology of HIV-affected pregnancies in Canada” (p. 757).  **Sample:** Two thousand, six hundred and ninety-two mother-infant pairs were studied.  **Setting:** The mother-infant pairs were studied through a national perinatal HIV surveillance program. | **Hypothesis:** Different HIV surveillance programs affect the rates of mother-to-child HIV transmission. | **Independent Variables:**   * The different HIV surveillance programs used for pregnant mothers   **Dependent Variables:**   * Rates of vertical HIV transmission | **Design:**   * “national perinatal HIV surveillance programme. From 1990, annual retrospective data was collected on demographic and clinical characteristics of HIV-infected mothers and their infants referred to 22 participating sites across Canada either before/during pregnancy or within 3 months after delivery. Factors impacting HIV transmission and demographic features were explored” (p. 757).   **Treatment:** Canadian Perinatal HIV Surveillance Program (CPHSP) | **Measurements:**   * “Data collected include maternal country of birth, self-reported race/ethnicity according to national surveillance definitions, maternal risk category for acquiring HIV, antiretroviral regimen and duration of therapy in pregnancy, mode of delivery, gestational age and birth weight. The subsequent HIV status of the infant is reported with confirmation by virologic testing for HIV by PCR or peripheral blood mononuclear cell viral culture (confirmed on two separate samples) and/or by HIV serology beyond 18 months of life” (p. 758).   **Analysis:**   * “Summary statistics were used to describe the demographic characteristics of the population. Least-square regression statistical analysis was used to test the significance of time trend” (p. 758). | **Findings:**   * Forbes et al., stated, “Two thousand, six hundred and ninety-two mother–infant pairs were identified. The overall rate of vertical HIV transmission was 5.2%, declining to 2.9% since 1997. The rate of transmission for mothers who received HAART was 1%, and 0.4% if more than 4 weeks of HAART was given. Forty percent of women delivered by caesarean section, with no difference in transmission rate compared with vaginal delivery for women treated with HAART (1.4 vs. 0.6%, P.0.129) but significant risk reduction for those who did not receive HAART (3.8 vs. 10.3%, P.0.016). Black women were the largest group; proportions of black and aboriginal women increased significantly over time (P<0.001 for both). Heterosexual contact was the most common risk category for maternal infection (65%), followed by injection drug use (IDU) (25%)” (p. 757).   **Conclusions:**   * “Vertical HIV transmission in Canada has decreased dramatically for women treated with HAART therapy. All pregnant women should be evaluated for HIV infection and programmes expanded to reach vulnerable populations including aboriginal, immigrant and IDU women” (p. 757). |
| Hoffman, R., Black, V., Technau, K., Merwe, K., Currier, J., Coovadia, A., & Chersich, M. (2010). Effects of Highly Active Antiretroviral Therapy Duration and Regimen on Risk for Mother-to-Child Transmission of HIV in Johannesburg, South Africa. JAIDS Journal of Acquired Immune Deficiency Syndromes, 1-14.  **Study Design:** prospective cohort study  **Level 2 Evidence** | **Purpose:** The purpose of this study was to shed more light on the effects of highly active antiretroviral therapy (HAART) and it’s effects on mother-to-child transmission (MTCT) of HIV as, “Limited information exists about effects of different HAART regimens and duration of regimens on MTCT of HIV among women in Africa who start treatment for advanced immunosuppression” (p. 1).  **Sample:** The study followed 1,142 women.  **Setting:** They used women from various antenatal and antiretroviral clinics in Johannesburg. | **Hypothesis:** The study wanted to research if the length of time on HAART and different HAART regimens altered MTCT. | **Independent Variables**:   * the “different highly active antiretroviral therapy (HAART) regimens and duration of regimens” (p. 1)   **Dependent Variables**:   * the rates of “mother-to-child (MTCT) of HIV among women in Africa” (p. 1). | **Design:**   * “Predictors of MTCT (positive infant HIV DNA PCR at 4-6 weeks) were assessed with multivariate logistic regression” (p. 1).   **Treatment:**   * Different HAART regimens with varied lengths | **Measurements:**   * “Data collected at each visit was entered in an ACCESS database (Microsoft 2003) and included demographics, laboratory values, HAART regimens, and pregnancy complications” (p. 3)   **Analyses:**   * Multivariate logistic regression was used to assess predictors of MTCT | **Findings:**  Hoffman et al., stated, “HAART duration at time of delivery was a mean 10.7 weeks (SD=7.4) for the 85% of  women who initiated treatment during pregnancy and 93.4 weeks (SD=37.7) for those who became  pregnant on HAART. Overall MTCT rate was 4.9% (43/874), with no differences detected between  HAART regimens. MTCT rates were lower in women who became pregnant on HAART than those  initiating HAART during pregnancy (0.7% versus 5.7%; p =0.01). In the latter group, each additional  week of treatment reduced odds of transmission by 8% (95% CI: 0.87-0.99, p =0.02)” (p. 1).  **Conclusions:**  Hoffman et al., stated, “Late initiation of HAART is associated with increased risk of MTCT. Strategies are  needed to facilitate earlier identification of HIV-infected women” (p. 1). |
| Joao, E., Gouvêa, M., Menezes, J., Sidi, L., Cruz, M., Berardo, P., Cece, L., Cardoso, C. A., Teixera, M. de L. B., Calvet, G. A. & Matos, H. (2012). Factors associated with viral load suppression in HIV-infected pregnant women in Rio de Janeiro, Brazil. International Journal Of STD & AIDS, 23(1), 44-47.  **Study Design:** retrospective cohort study  **Level 2 Evidence** | **Purpose:** “To evaluate factors  associated with an undetectable VL near delivery in HIV-infected pregnant women receiving highly active antiretroviral therapy  (HAART) and non-HAART regimens.”  **Sample:** Consecutive sample of 707 women.  **Setting:** Taken from January 1996 to December 2006 at a public hospital in Rio de Janeiro.  **Methods:**  All patients over a ten year period were entered into study.  **Critique:**   * Adequate sample size * Narrow population of study | **Implied Research Question:** What effect do use of HAART vs non HAART ARVs, length of ARV use, CD4 cell count,  have on HIV vertical transmission rates? | **Independent Variables:**  Receipt of HAART or non-HAART therapy during pregnancy  **Dependent Variable:** Viral load (VL) near delivery | **Design:**   * + Retrospective cohort study   + Design appropriate for the research question: *What effect* *do use of HAART vs non HAART ARVs, length of ARV use, CD4 cell count,*   *have on HIV vertical transmission rates?*   * + “This study was approved by the local Institutional Review Board” (p. 45).   **Treatment**   * Either a HAART “three-drug regimen including two nucleoside reverse transcriptase inhibitors (NRTIs) plus either nevirapine (NVP) or a protease inhibitor (PI)” (p. 44) or a non-HAART of “zidovudine alone or two NRTIs” (p. 44). | **Measurements:**   * + “ARVs were started according to the current version of the guidelines of the Brazilian Ministry of Health” (p. 44).   + Viral load was measured near delivery   + Undetectable viral load set at 400 copies/mL   **Analyses**   * + “Multivariate analysis was employed using binary logistic unconditional models” (p. 44).   + “Means and/or median were compared using t-test   Mann-Whitney, analysis of variance or Kruskal–Wallis  methods as indicated. Categorical variables were compared  using chi-square test, or Fisher’s exact test, as indicated.  Statistical significance was established as P, 0.05.” (p. 45). | **Findings:**   * 65.4% of pregnant women receiving HAART achieved an undetectable VL at delivery * 74.2% of women had an undetectable VL who used HAART for at least 12 weeks * 25.8% of women who used HAART for less than 12   weeks had an undetectable VL   * “Overall, an undetectable VL   was achieved in 403 women (57%): 364/557 (65.4%) in the  HAART subset and 39/150 (26%) in the non-HAART group  (P, 0.001)” (p. 46).  **Conclusions**   * The use of HAART is important. * The “use of HAART for at least 12 weeks, baseline Log VL and CD4 cell count near   delivery are factors independently associated with the achievement  of an undetectable VL near delivery” (. 47). |
| Mukherjee K. (2010). Cost-effectiveness of childbirth strategies for prevention of mother-to-child transmission of HIV among mothers receiving nevirapine in India. Indian J Community Med, 2010, 35(1), 29-33. doi: 10.4103/0970-0218.62550  **Study Design:** retrospective cohort study  **Level 2 Evidence** | **Purpose:** “to compare the cost-effectiveness of alternative  childbirth strategies among HIV-positive mothers receiving nevirapine in government ICTCs in Tamil Nadu, India..”  **Sample:** Consecutive sample of 362 women.  **Setting:** Taken in 2001-2005 from Tamil Nadu State  Districts Chennai, Theni, and Dharmapuri.  **Methods:**  Patients meeting criteria over a four year period were included in this study, assignment to group based on their choice to have caesarean section or vaginal delivery.  **Critique:**   * Adequate sample size * Uneven distribution between groups * Narrow population of study | **Implied Research Question:** What is the cost-effectiveness of an elective caesarean section compered to a vaginal delivery for women on HAART to prevent vertical transmission of HIV? | **Independent variables:**   * Caesarean section * Normal vaginal delivery   **Dependent variable:**   * Post delivery HIV status at 1 month | **Design:**   * + “Retrospective cohort analysis with a comparison group*”* (p. 1).   + Design appropriate for the research question: *What is the cost-effectiveness of an elective caesarean section compered to a vaginal delivery for women on HAART to prevent vertical transmission of HIV?*   + “Data was obtained with permission from TANSACS,” (p. 2).   **Treatment:**   * + Vaginal delivery or caesarean section | **Measurements**   * Sentinel surveillance data was taken about the mothers. * HIV status of child at one month * “Cost-effectiveness of the alternative childbirth strategies is evaluated in terms of their vertical transmission probabilities and the average costs per woman for each strategy” (p. 2).   **Analyses**   * “Sensitivity analysis was applied to evaluate cost per HIV infection prevented” (p. 1).   “Costs, outcomes, and probabilities were entered into Tree-Age software for cost-effectiveness and sensitivity analysis” (p. 2) | **Findings**   * Vaginal delivery HIV transmission rate was 6.10% * Caesarean section HIV transmission rate was 1.5% * “Incremental cost for preventing an additional HIV infection through caesarian section was Rs. 76,000” (p. 2)   **Conclusions**  “Vaginal delivery plus nevirapine is a cost-effective strategy as compared to caesarian section plus nevirapine” (p. 2). |
| Chukwuemeka I. K., Fatima C. I., Kabiru Z. K., & Olukayode O. (2014). The impact of a HIV prevention of mother to child transmission program in a Nigerian early infant diagnosis centre. *Nigerian Medical Journal,* *55*(3), 204-208. doi: 10.4103/0300-1652.132039  **Study Design:** retrospective cohort study  **Level 2 Evidence** | **Purpose:** This study evaluated the various PMTCT methods used  by mother and child pairs and the effect this had on the  outcome of the infants’ HIV status.  **Sample:** Consecutive sample of 515.  **Setting:** The National Hospital  Abuja, Nigeria.  **Methods:**  All patients over a two year period were entered into study.  **Critique:**   * Adequate sample size * Narrow population of study | **Implied Research Question:** What effect do antiretroviral (ARV) therapy commencement for mother and baby, infant feeding choices, mode of delivery, have on HIV test results of exposed infants? | **Independent Variable:**   * antiretroviral (ARV) therapy commencement for mother * antiretroviral (ARV) therapy for baby * infant feeding choices * mode of delivery   **Dependent variables:** HIV test results | **Design:**   * + Retrospective cohort study design. Data about patients over a two year period was obtained and analyzed in association with HIV test results.   + Design appropriate for the research question: *What effect do antiretroviral (ARV) therapy commencement for mother and baby, infant feeding choices, mode of delivery, have on HIV test results of exposed infants?*   + Receipt of informed consent not noted. | **Measurements**   * Percentages were created from data gathered about “age, sex, ARV therapy for mother and baby, infant   feeding choices, mode of delivery and HIV DNA results” (p. 205).  **Analyses**   * + “Statistical analysis was done using the Pearson’s Chi-square test and Fisher’s exact test” (p. 205).   + STATA version 12 software was applied to results to create data in the form of averages and percentages. | **Findings**   * Overall prevalence of positive HIV test is 7% for exposed babies. * Prevalence of 9.1% HIV positive in breastfed babies * Prevalence of 3.6% HIV positive in non breastfed babies * Prevalence of 3.3% HIV positive in caesarean sections * Prevalence of 6.1% HIV positive in vaginal deliveries * Prevalence of 66.7% when neither mother nor baby received ARVs * Prevalence of 20.0% when only baby received ARVs * Prevalence of 4.6% when only mother received   ARVs   * prevalence of 1.3% when both mother and   baby received ARVs  **Conclusions**  “The use of ARVs remains the single most important  intervention in PMTCT programmes and when both mother and child receive adequate therapy there is a  much more reduction of MTCT than when given to either  alone” (p. 207). |
| Chi, B. H., Musonda, P., Lembalemba, M. K., Chintu, N. T., Gartland, M. G., Mulenga, S. N. … Stringer, J. A. (2014). Universal combination antiretroviral regimens to prevent mother-to-child transmission of HIV in rural Zambia: A two-round cross-sectional study. Bulletin of the World Health Organization, 92(8), 582-592B. doi:10.2471/BLT.13.129833  **Study** **Design**: two-round cross-sectional study  **Level 2 Evidence** | **Purpose:** “To evaluate if a pilot programme to prevent mother-to-child transmission (PMTCT) of the human immunodeficiency virus (HIV) was associated with changes in early childhood survival at the population level in rural Zambia”(p. 582).  **Sample** Size: 2386 women and their newly born children  **Setting:** households in rural Zambia  **Methods**: households were selected randomly, convenient sample  **Critique**: large variation in ages of woman and number of pregnancies, great data on household characteristics | **Question:**  Will implementing a PMTCT program for pregnant mothers with HIV decrease mother-to-child transmission rates in rural Zambia?  **Hypothesis:** If a PMTCT program is implemented in rural Zambia, the mother-to-child transmission rates will decrease. | **Independent Variables:**   * initiation of pilot program to prevent mother-to-child transmission * antiretroviral treatment regimen   **Dependent Variables:**   * early childhood survival rates * child HIV exposure * maternal death | **Design:**   * A two-round cross-sectional study * Design appropriate for the research question: *Will implementing a PMTCT program for pregnant mothers with HIV decrease mother-to-child transmission rates in rural Zambia?* * Subjects gave approval of experimentation/ research, subjects gave written consent | **Measurements:**   * “The primary outcome measure was the proportion of HIV-exposed children that were alive and HIV-uninfected at 24 months of age (i.e. 24-month HIV-free survival)” (p.583). * time administered: at birth of child until 24 months   **Analyses:**   * “Multivariate analysis showed that the risk of HIV infection or death was significantly lower in the children of mothers who started a com- bination antiretroviral regimen during pregnancy than in those whose mothers had no antiretroviral prophylaxis” (p. 585). | **Findings:**   * “In the first survey (2008–2009), 335 of 1778 women (18.8%) tested positive for HIV. In the second (2011), 390 of 2386 (16.3%) tested positive. The 24-month HIV-free survival in HIV-exposed children was 0.66 (95% confidence interval, CI: 0.63–0.76) in the first survey and 0.89 (95% CI: 0.83–0.94) in the second” (p. 592). * Antiretroviral regimen use associated with lower risk of HIV infection or death in children * Maternal understanding, knowledge and use of HIV testing increased between the surveys   **Conclusions**:   * Initiation of PMTCT program in Zambia has a positive affect on childhood development and has decreased the HIV transmission rates |
| Jasseron, C., Mandelbrot, L., Dollfus, C., Trocmé, N., Tubiana, R., Teglas, J. P., Faye, A., Rouzioux, C., Blanche, S.,& Warszawski, J. (2013). Non-disclosure of a pregnant woman's HIV status to her partner is associated with non-optimal prevention of mother-to-child transmission. AIDS And Behavior, 17(2), 488-497. doi:10.1007/s10461-011-0084-y  **Study Design:**  Prospective cohort study  **Level 2 Evidence** | **Purpose:**  The purpose of this research is “to study relations between non-disclosure of HIV to partner, socio demographics and prevention of HIV mother-to-child transmission (PMTCT), among HIV-infected pregnant women” (p.488)  **Sample:** 2952 Women  **Setting:** 96 Health Care centers throughout France  **Methods:** HIV-infected women were chosen, convenient sample  **Critique:** the cases were collected over a number of years instead of one year period, no necessary OB requirements, strong mother characteristic details | **Question:**  Do women who reveal their HIV status to their partner decrease the risk of non-optimal PMTCT?  **Hypothesis:** If HIV infected woman reveal their status to their partners, there will be decreased risk of non-optimal PMTCT. | **Independent Variables:**   * disclosure of maternal HIV status to partner before or during pregnancy * HIV status of partner revealed * maternal age * geographic origin * OB history * ART regimen during pregnancy   **Dependent Variables:**   * disclosure of HIV status * implementation of PMTCT * child HIV transmission rate | **Design:**   * Prospective cohort study * Design appropriate for the research question: *Do women who reveal their HIV status to their partner decrease the risk of non-optimal PMTCT?* * Informed consent from the mothers at 95% | **Measurements:**   * HIV status of women recorded * ART during pregnancy * Obstetric and HIV care * disclosure of HIV to partner * time administered: before birth   **Analyses:**   * **“**We used the v 2 test or two-tailed Fisher’s exact tests to compare percentages, and Student’s t tests or Wilcoxon tests to compare the means of continuous variables. Statistical analyses were performed with SAS” (p. 490). | **Findings:**   * “Sub- Saharan African origin, being single, late HIV diagnosis during pregnancy, late booking, and unknown or HIV- seronegative status of the partner were independently related to non-disclosure” (p. 495).   **Conclusions:**   * factors associated with non-disclosure show its use of PMTCT * non-disclosure reflects social and psychological vulnerability, these may lead to lack of adherence to PMTCT |
| Araujo, P. E. S., Friedman, K. R., Camacho, B. L. A., Derrico, M., Moreira, I. R., Calvet, A. G., de Oliveira, S. M., Veloso, G. V., Pilotto, H. J., Grinsztejn, B. (2014). Cascade of access to interventions to prevent HIV mother to child transmission in the metropolitan area of Rio de Janeiro, Brazil. The Brazilian Journal Of Infectious Diseases, 18(3), 252-260. doi:10.1016/j.bjid.2013.11.002  **Study Design:**  retrospective cohort study  **Level of Evidence:** Level2 | **Purpose: “**To describe the access to the interventions for the prevention of Human Immuno-deficiency Virus (HIV) mother to child transmission and mother to child transmission rates in the outskirts of Rio de Janeiro, from 1999 to 2009” (p. 252).  **Sample:** 1269 new borns and 997 mothers  **Setting:** The HIV Family Care Clinic (HHFCC) in the Hospi- tal Geral de Nova Iguac ̧u (HGNI) in Brazil.  **Methods:** retrospective cohort study, HIV transmission interventions assessed and transmission rates calculated  **Critique:** primarily studied mothers of young age, sample size appears adequate | **Question:** Does having access to the full package of interventions for prevention of HIV mother-to-child transmission decrease the rate of transmission?  **Hypothesis:**  If women have access to the full package of interventions of HIV mother-to-child then the transmission rate of HIV will decrease. | **Independent Variables:**   * characteristics of pregnant women * mode of delivery * gestational age delivery * access to interventions   **Dependent Variables:**   * mother to child HIV transmission * intervention use | **Design**   * A retrospective cohort study * Design appropriate for the research question: *Does having access to the full package of interventions for prevention of HIV mother-to-child transmission decrease the rate of transmission?* * Subjects gave consent for study   **Treatment:** | **Measurements**   * access to interventions in specific areas * HIV transmission rate * time administered: before mothers gave birth   **Analyses:**   * “Trend analysis was carried out in order to evaluate the access to recommended package of interventions according to the moment of maternal mother HIV diagnosis over time” (p. 254). | **Findings:**   * 997 women were included with 1326 pregnancies * 62% had less than 8 years of schooling * few women understood partner to have HIV, only 47.1% understood * “among the 289 subsequent pregnancies that resulted in live births during the study period, only 67.8% received the full package of PMTCT interventions” (p. 258).   **Conclusions:**   * “Access to the full package of interventions for the prevention of HIV vertical transmission was low, with no significant trend of improvement over the years. The verti- cal transmission rates observed were higher than those found in reference services in the municipality of Rio de Janeiro and in the richest regions of the country” (p. 252). |

**Literature Review**

The nine articles analyzed all held common themes revolving around ART therapies, health systems, and HIV awareness. The themes were congruent throughout the articles and helped bring a greater understanding to the proposed research question. There were three major themes identified through analyzing the articles, beginning with antiretroviral treatments. Many of the articles identified highly active antiretroviral therapy (HAART) and antiretroviral (ARV) treatment as a carrying theme. The type of treatment greatly impacted the study and the results. Another major theme throughout the articles dealt with varying forms of health systems ranging from public hospitals to community clinics. Within this larger theme of health systems, subcategories of cost effectiveness and access to specific treatments and programs were of common focus. A few articles identified access to resources as great contributing factors to mother to child HIV transmission. The third major theme prevalent in the articles was the disclosure of HIV to health care professionals and partners and its ability to impact transmission rates. Collectively the articles carried themes of ARV treatment, health care facilities and resources alongside HIV disclosure and understanding.

There was a wide range of variables, both dependent and independent, presented within the research articles. The major independent variables are as follows, ARV therapy, pilot programs, access to resources. disclosure of HIV status to partner, and mode of delivery. Five articles directly had HAART as a major independent variable in their study, while two articles varied their pilot programs for prevention of mother-to-child-transmission (PMTCT), three articles discussed access to resources, one article focused on the disclosure of HIV status to a partner and two articles focused on the mode of delivery for a variable. Multiple articles including (Chukwuemeka, Fatima, Ovavi, & Olukayode, 2014), Forbes et al. (2012), Jasseron et al. (2013), and Araujo et al. (2014) had two or more independent variables. The most prevalent dependent variables are as follows; rate of HIV transmission, survival rate of children exposed to HIV, viral load of infected mother and maternal death. Eight of nine articles measured the transmission rate for the dependent variable, one measured survival rate of children, one measured the viral load of the mother, one measured the cost of treatment, and two measured maternal death. Overall, the articles held similar independent and dependent variables.

After identifying themes and articles, research findings are compared. Collectively, each article supported with evidence that either ARV or HAART therapy and treatment regimens were the key to reducing mother-to-child transmission rates. Even if transmission rate was not the primary dependent variable, each article gave support to ARV treatment for preventing and lessening spread of HIV. In addition to treatment methods, the articles disclosed other findings in their research. Four articles specifically found that the longer an individual is on HAART, they have a decreased risk for transmission. Mukherjee (2015) found that vaginal delivery plus ARV/HAART is better and more cost effective than caesarian sections. Other studies focused on resources and found that people who lacked access to resources had increased rates of transmission to their children. Another key factor discovered through research was that woman who did not disclose their HIV status to their partner, specifically in low-income areas, had increased rate of HIV transmission. One final insight gained through these articles was that the implementation of a pilot program to prevent mother-to-child-transmission increased survival rates. In all, the nine articles examined supported findings that ARV and HAART therapies are necessary to preventing transmission, while identifying other methods of prevention and implementation that decrease rate of transmission.

**Critical Analysis**

The experiments and studies analyzed in our research of the vertical transmission of HIV were all level II evidence. Although level I evidence has the most credible findings, these articles were still found to be valid and reliable. The five retrospective cohort or correlational studies, including Forbes et al. (2012), Joao et al. (2012), Mukherjee (2010), Chukwuemeka, Fatima, Ovavi, & Olukayode, (2014), Araujo et al. (2014), were constructed as such by the researchers because they were cost-effective and the necessary information was easily attainable through this study design. The three prospective cohort studies, Barker (2011), Jasseron et al. (2013), and Hoffman et al. (2010), are much stronger than the retrospective studies because “any ambiguity about the temporal sequence of phenomena is resolved in prospective research” (Polit & Beck, 2014, p. 160). Retrospective cohort studies are not as reliable as randomized controlled trials are because the factors of the two groups being analyzed are not completely comparable. Chi et al.’s cross-sectional study, while still a level two evidence, is in between the two previous designs in its strength. However, for the research question being asked in the studies all designs produced findings that were reliable and valid.

Had the studies, as previously discussed, used research designs that produced a higher level of evidence, then the findings may have been different. Weisburd, Lum, & Petrosino (2001) stated the following:

The weaker a design, indicated by internal validity, the more likely a study is to report a result in favor of treatment and the less likely it is to report a harmful effect of treatment. Even when comparing randomized studies with strong quasi-experimental research designs, systematic and statistically significant differences are observed. (p. 50)

Therefore, the outcomes of all nine studies that aligned in favor of use of antiretroviral therapy may have been skewed due to weak research design and a lack of internal validity. While no specific statistical differences were noted in the research studies we analyzed, the design of the studies must be considered in regard to how the findings of the research are obtained.

However, the findings of the various studies were confirmed by other research as discussed in the articles. This helps to confirm the articles’ validity and reliability despite their weaker design and lower level of evidence. Another form of validity present in the research articles we analyzed was construct validity. The studies were constructed to test hypotheses about the effects of different independent variables on transmission of HIV and thus testing the transmission rates reflected the correlation between the variables studied and mother-to-child transmission. The use of a control group, or in the retrospective cohort studies comparing with a group that did not receive treatment, also increases the validity and reliability of the studies as well as eliminates bias. In analyzing the effects of various independent variables on HIV transmission rates as the dependent variable, the studies included those who were not on antiretrovirals, a HAART regimen, or who underwent vaginal deliveries. In the study by Forbes et al. (2012), which focuses on different surveillance programs, more than one program was analyzed, thus decreasing any bias.

Reliability was present in the cohort studies due to large sample sizes and repetition of similar results. A test-retest design was used in the studies by testing patient after patient and obtaining similar results. Stability in the cohort studies is high as many of these experiments collected data over a long period of time and thus were not susceptible to “time-related influences” (Polit & Beck, 2014, p. 202). The study by Chi et al. (2014) utilized a two-round cross-sectional survey, which also accounts for the changes that may occur over time. Many of the studies analyzed the correlation between use of ARVs and transmission rates as well as other factors included related to the transmission rates such as birth method, health system programs (clinic and hospital), length of ARV treatment. All of these other variables tested increased the internal consistency as they directly relate to the transmission rates of HIV from mother to child. In all the cohort studies, there was some level of construct validity because the research designs were constructed to test hypotheses about the effects of the different independent variables on transmission of HIV. Thus, testing the transmission rates reflected the correlation between the variables and transmission and the studies measured what was meant to be tested. Face validity is also present, as the research studies all appeared to measure what their hypothesis proposed. The advisement or study of other research on the same topic helps to assure content validity, which refers to whether the factors measured are appropriate for the question asked by the research (Polit & Beck, 2014). In all of the studies about antiretroviral therapy, the results and conclusions were compared with previously published research. The apparent worldwide consensus about the effectiveness of antiretrovirals further increases the validity and reliability of the research articles we analyzed the results of, which indicated that antiretroviral therapy decreases the mother-to-child transmission of HIV.

**Nursing Implications**

According to the examined research articles, cesarean sections compared with vaginal births did not have a significant effect on the rate of mother to child transmission (MTCT) of HIV (Mukherjee, 2010; Forbes et al., 2012). Researchers found that HAART therapy along with vaginal births was a more cost effective and successful method to reduce MTCT of HIV. Based on these findings, increased and prolonged HAART therapy should be implemented into the health care plan of pregnant women or women at risk for becoming pregnant (Barker et al., 2011; Forbes et al., 2012; Hoffman et al., 2010; Joao et al., 2012; Mukherjee, 2010; Chukwuemeka, Fatima, Ovavi, & Olukayode, 2014; Chi et al., 2014; Jasseron et al., 2013; Araujo et al., 2014). Longer duration of HAART therapy showed a decreased risk of MTCT. HIV positive women should be started on increased HAART therapy if planning for pregnancy (Hoffman et al., 2010). Vaginal birthing methods can be used rather than cesarean sections with little or no increased risk for MTCT of HIV (Forbes et al., 2012; Mukherjee, 2010).

Patient education has shown to be pivotal in improving an individual's health for it provides patients with relevant knowledge for personal care. Educating the patient gives them the opportunity take charge of their health and advocate for themselves. Based upon the research findings above, to prevent MTCT of HIV, education must be provided for both men and women at an early age, including disease process, prevention and treatment. With increased knowledge, an individual will be proactive in preventing the spread and protecting the well being of him/herself and others. Education is applicable in all settings of nursing and can be applied in school settings, hospital settings and community outreach clinics. HIV status testing should also be encouraged with HIV education as, “increasing the number of women who know their status will have the greatest impact on the number of infant infections that can be averted” (Barker et al., 2011, p. 47). With new knowledge, comes the opportunity for further education. Nurses must take the initiative to educate patients within hospital settings and communities alike about new insight and understanding.

**Conclusion**

After determining the topic of interest, HIV positive pregnant woman on ART and the effect of delivery methods, a PICO question was developed that, through research, would help to improve nursing care. The question is as follows, in HIV positive pregnant women on antiretroviral therapy (ART), what is the effect of delivery method (caesarean section vs. vaginal) on the vertical transmission rate of HIV? With this focus, extensive research took place to collect evidence and articles to bring greater understanding to the question. After the collection of articles, time was set aside to consider the strengths and weaknesses of the articles. Through thorough reading and examining, key themes were identified and each of the nine articles were tested for validity. The finals steps of this research identified the similarities and findings of the articles and applied them to discover nursing implications. Research proved that the method of delivery did not have a major impact on the transmission rate of HIV, but instead ARV and HAART therapies were proven to hold greatest impact. The nursing implications are great as a result of this research for it is identified that education holds great value when dealing with HIV transmission. Overall, research into HIV transmission is key to strengthening understanding and reducing the spread of HIV.

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