

# A retrospective cohort study on effect of literacy status of HIV-positive pregnant women on possibility of child getting HIV infected

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## ABSTRACT

**Introduction:** Prevention of parent-to-child transmission (PPTCT) program aims at reduction of HIV transmission through vertical route. Although medical intervention reduces chance of HIV transmission substantially, several demographic factors are often contributory. Minimum literacy is required for HIV-infected individuals to understand the course of medicine and to ensure compliance to the treatment which may have impact on vertical transmission. The objective of this study is to analyze relationship between maternal education and possibility of her babies to get HIV infected. **Materials and Methods:** A retrospective cohort study was carried out through analysis of secondary data during the period from April 13 to September 16 from all stand-alone integrated counseling and testing centers in West Bengal. A total number of 326 HIV-exposed babies, whose 6<sup>th</sup> week HIV-Polymerase Chain Reaction (PCR) reports are available and both the mother-baby received PPTCT services, were recruited in the study, and their maternal literacy status was substantiated and analyzed. **Results:** HIV positivity among HIV-exposed babies was found to be 6.67% whose mothers were illiterate as compared to 5.55% whose mothers were literate up to primary standard and 3.93% whose mothers were educated up to secondary standard. HIV positivity among the exposed babies whose mothers studied higher secondary standard or above showed zero HIV positivity. Chi-square was done to ascertain statistical significance but result was inconclusive although the trend shows increasing chance of HIV-exposed babies to get infected with decreasing literacy. **Conclusion:** Maternal literacy status favorably influences vertical transmission of HIV.

**Keywords:** Antiretroviral prophylaxis, HIV, literacy, prevention of parent-to-child transmission, vertical transmission

## Introduction

There are an estimated 2.1 million (2011) people living with HIV (PLHIV) in India, with National adult HIV prevalence of 0.27% (2011). Of these, women constitute 39% of all PLHIV, while children <15 years of age constitute 7% of all infections.<sup>[1]</sup> Mother-to-child transmission of HIV is the most important route of HIV transmission to children where transmission can happen from HIV-infected mother during

pregnancy, during labor, and during postnatal period through breastfeeding. This route is preventable to a large extent with multitude of interventions under prevention of parent-to-child transmission (PPTCT) program. With newer PPTCT regimen of lifelong antiretroviral treatment for HIV-infected mothers and extended antiretroviral prophylaxis of HIV-exposed newborn, this chance of transmission can be reduced from average 30% to <5%. Apart from the medical interventions, several social attributes sometimes determine the possibility of transmission such as maternal literacy, spouse involvement in PPTCT program, migration, socioeconomic status of the family,

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and social norms/customs. PPTCT which is globally known as PMTCT (prevention of mother-to-child transmission) is a multipronged program with multiple levels of interventions at multiple points of time. Adherence to the medicines, coping with side effects, coping with stigma, and discrimination from society even from family remain a major challenge toward success of this program. In a country like India, awareness level is still not to such an extent to accept HIV as a medical condition only. Although counseling is an effective method to help the HIV-infected individuals to cope up with several challenges, maternal literacy level is one of the important factors to deal with these challenges. Education actually empowers the HIV-infected individuals (e.g., with self-esteem) so that they can have better access to antiretroviral therapy and treatment for HIV infection, AIDS and AIDS-related diseases, and psychosocial support.<sup>[2]</sup> Therefore, to understand HIV-related medical issues as well as complying with PPTCT services in time-bound manner, minimum literacy level of the infected individuals is required. There is a dearth of literature trying to figure out the association of literacy level with PPTCT outcome. This study is intended to analyze the association of maternal literacy level with child HIV outcome when necessary medical prophylaxis was offered.

## Materials and Methods

The present study design is a retrospective record-based cohort study carried out through analysis of secondary data. The data were collected for 3½ years (April 13 to September 16) from various stand-alone integrated counseling and testing centers (ICTCs) across the state of West Bengal to cater representative study population. HIV-infected mothers of the babies, whose antigen-based HIV test result by polymerase chain reaction results had been received at the time of study and both of them received PPTCT intervention as per standard guideline, were selected as study population. The HIV-infected mother with twin or multiple pregnancies and the mother who did not receive PPTCT prophylaxis or her baby did not receive necessary prophylaxis or both did not receive PPTCT prophylaxis were excluded from the study population. Necessary data were collected from all ICTCs across the state of West Bengal from existing PPTCT line list registers in a predesigned format. All the babies born of HIV-infected women were tested minimum at the 6<sup>th</sup> week, using nucleic acid polymerase chain reaction testing method. The PPTCT outcome was standardized based on the test results obtained. A total number of 326 HIV-infected pregnant women with different literacy status were recruited in the study group, and the data were computed and compiled in an excel sheet of Microsoft Office packages. The data were analyzed in the Statistical Package for Social Science Software (SPSS 17, International Business Machines (IBM) Corp., New Orchard Road, Armonk, New York) to determine statistical significance. Regarding ethical consideration, shared confidentiality was maintained while collecting and analyzing the data. All HIV screening was done with prior consent of the client/parent of the HIV-exposed babies as per standard guideline of the National

AIDS Control Organization. Necessary approval was taken for publishing the paper from the Institutional Ethics Committee, Calcutta National Medical College. Some operational case definitions relevant to this study are given below:

- a. HIV-exposed baby: a baby born of HIV-infected mother
- b. HIV-infected baby: a baby who was tested for dry blood spot nucleic acid test and reactive result was obtained in polymerase chain reaction testing
- c. PPTCT intervention: it includes antiretroviral prophylaxis/antiretroviral treatment for HIV-infected pregnant women and antiretroviral prophylaxis for the HIV-exposed babies
- d. Illiterate: unable to read and write
- e. Primary educated: from just literate up to Class IV standard
- f. Secondary educated: from Class V to Class X.

## Results

The study involving 326 positive pregnant women showed that HIV positivity among HIV-exposed babies was found to be as high as 6.67% whose mothers were illiterate as compared to 5.55% whose mothers were literate up to primary standard and 3.93% whose mothers were educated up to secondary standard as evident in Table 1. HIV positivity among the exposed babies whose mothers studied higher secondary standard or above showed zero percent HIV positivity in this study.

No change ( $\chi^2 = 1.438$  and  $P = 0.697$ ) was observed among HIV reactivity of HIV-exposed babies depending on educational qualification of positive pregnant women as demonstrated in Tables 2 and 3.

Although this study fails to show statistical significance for the association of literacy status of HIV-positive pregnant women and PPTCT outcome in terms of HIV positivity among their HIV-exposed children most likely due to small sample size, data trend shows a higher chance of HIV positivity of HIV-exposed babies as depicted in the Chart 1 with decreasing education status of HIV-positive pregnant women.

## Discussion

In this present study, 326 HIV-exposed babies were retrospectively followed up to determine maternal education status. All these mother-baby pairs received antiretroviral prophylaxis. The study shows decreasing possibility of transmission of HIV infection from HIV-infected mothers with increasing educational status. Successful management of HIV requires patient understanding and ability to act on treatment information. Patients with limited literacy skills may lack essential knowledge related to their HIV treatment.<sup>[3]</sup>

Illiteracy does not directly contribute to the spread of the HIV. However, as illiterate women and men have no access to written information, therefore unable to know what HIV is and how it is spread, they are unable to protect themselves.<sup>[4]</sup>

**Table 1: Distribution of HIV-positive pregnant women and their HIV-infected babies among the different educational status**

Education status	Number of HIV-infected women	Number of HIV-infected babies	Percentage of positivity
Illiterate	60	4	6.67
Primary	126	7	5.56
Secondary	127	5	3.94
Higher secondary and above	13	0	0.00
Total	326	16	4.91

**Table 2: Odd ratio calculation between HIV-negative and HIV-positive infants among different education group**

Distribution: Educational qualification of HIV-positive pregnant women according to HIV-positive status of baby

Educational qualification of PPW	Whether baby is HIV positive?		OR
	No	Yes	
Illiterate	56	4	-
Primary	119	7	0.82 (0.23-2.93)
Secondary	122	5	0.70 (0.22-2.26)
Higher secondary and above	13	0	0.00 (0.00-0.00)

OR: Odds ratio; PPW: Positive pregnant women

**Table 3: Univariate analysis for determination of association (n=326)**

	Chi-square tests		
	Value	df	Asymptotic significance (two-sided)
Pearson Chi-square	1.438 <sup>a</sup>	3	0.697

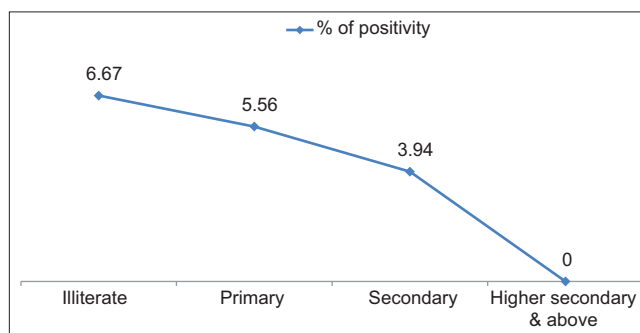
<sup>a</sup>2 cells (25.0%) have expected count <5. The minimum expected count is .64

Actually, there are very few studies which tried to establish this association.

Actually, utilization of PPTCT program is largely influenced by education level of the pregnant women. A study conducted by WODI (2005) suggested that low literacy in pregnant women is one of the factors that prevent them to access PPTCT services in sub-Saharan Africa.<sup>[5]</sup>

In one Malawi and Nigeria-based study, sociocultural and socioeconomic factors were identified as most important barrier preventing successful implementation of PMTCT program, and literacy was mentioned as one of the most important socioeconomic attributes.<sup>[6]</sup>

A report prepared for the UNESCO Global Monitoring Report 2005 substantiated relationship between education and HIV prevalence in Africa. This study was not related to PMTCT outcome, but it was related to a positive relationship between literacy rates and HIV infection rates. More literate countries have higher rates of HIV infection. More literate African countries tend to be the most developed on the continent, and they share a number of features that make them vulnerable to high rates of HIV infection. The evidence suggests that there is a strong relationship between education and HIV prevalence in the early stages of an epidemic but a weaker relationship or no relationship



**Chart 1:** The trend of positivity as outcome of prevention of parent-to-child transmission program among different education status

in more mature epidemics. This analysis is consistent with the hypothesis that education prepares individuals better to mount a response to the HIV/AIDS epidemic. This hypothesis has been tested (Simon Gregson *et al.*, 2001) by comparing the relationship between adult HIV prevalence in 1999 and adult literacy in 1998 in three different regions of sub-Saharan Africa. In two regions, the epidemic is more mature, and the relationship between HIV prevalence and literacy is relatively weak.<sup>[7]</sup>

Similarly, a multivariate study in Northeastern Brazil to identify maternal factors affecting HIV-exposed infant in terms of acquiring HIV infection substantiates maternal education as maternal demographic and clinical predictor variable influencing HIV transmission through vertical route.<sup>[8]</sup>

Vieira *et al.* found that the prevalence of HIV infection among pregnant women and the incidence of vertical transmission were associated with lower urban quality including education of residential neighborhood in Brazil.<sup>[9]</sup>

A Sub-Saharan PMTCT meta-analysis states that mothers with postsecondary level of education and male infants were less likely to be infected compared with female infants.<sup>[10]</sup>

Our study is unique as it exclusively deals with literacy to determine the PPTCT outcome. This correlation is independent of the medical intervention as per national guideline as all mother-baby pairs under this study received antiretroviral prophylaxis. Most of the prevailing studies identify maternal education as a sociodemographic attribute affecting PPTCT outcome. This study actually tried to correlate the PPTCT outcome with different grades of maternal education.

## Conclusion

The chance of HIV transmission through vertical route depends on maternal education, and it decreases with increasing maternal literacy. This is independent of antiretroviral treatment or prophylaxis.

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## Conflicts of interest

There are no conflicts of interest.

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