

## Outcome of children born to human immunodeficiency virus positive mothers - A retrospective study

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### ABSTRACT

**Background:** Mother-to-child transmission of human immunodeficiency virus (HIV) is a major route of new infections in children. The use of anti-retroviral therapy and nevirapine to mother-baby pairs has shown to be quite effective in preventing the transmission of virus from mother-to-child. **Objectives:** To analyze the incidence of HIV transmission in children born to HIV-infected pregnant women and to analyze the outcome of these children. **Methods:** This retrospective study was conducted in a tertiary care referral hospital of central India for a period of 3 years. Data analysis of the mothers with HIV-positive serology up to their delivery and follow-up of their babies for 18 months was performed. Perinatal mortality rate (PMR) and neonatal mortality rates (NMRs), mother-to-child transmission rate, and the outcome of their children on the basis of various factors - such as maternal CD4 count, treatment taken, and feeding practices - were analyzed. **Results:** 161 HIV-positive mothers gave birth to 164 babies (including 1 triplet and 1 twin) during the study period. An incidence of mother-to-child transmission was 8.06% and it was influenced by maternal CD4 count, maternal comorbidities, mode of delivery, and feeding practices. In our study, PMR was 48.78/1000 live births; NMR was 54.87/1000 live births as compared to 25/1000 live births in children born to seronegative mothers. **Conclusion:** The risk of vertical transmission of HIV from mother-to-baby was 8%. Maternal HIV transmission is the primary means by which infants become infected. Hence, the prevention of maternal HIV transmission is of paramount importance.

**Key words:** *Comorbidities, Human immunodeficiency virus infants, Prevention of mother-to-child transmission*

The pregnant women and her unborn child who are human immunodeficiency virus (HIV) reactive are mostly innocent bearers of the brunt of the infection. Mother-to-child transmission of HIV is a major route of new infections in children [1-3]. India has the third largest HIV epidemic in the world. The use of anti-retroviral therapy (ART) to mother-baby pairs has shown to be quite effective in the preventing the transmission of virus from mother-to-child [1,3,4]. The early diagnosis of children born to HIV-positive mother using HIV DNA-polymerase chain reaction (PCR) and treating children who are diagnosed HIV-positive with anti-retroviral (ARV) drugs within their first 12 weeks of life reduces the mortality by 75% [2,3].

This retrospective study was conducted to analyze the incidence of HIV transmission in children born to HIV-infected pregnant women, the effect of maternal highly active ART, various maternal comorbidities, on ultimate outcome of the children.

### METHODS

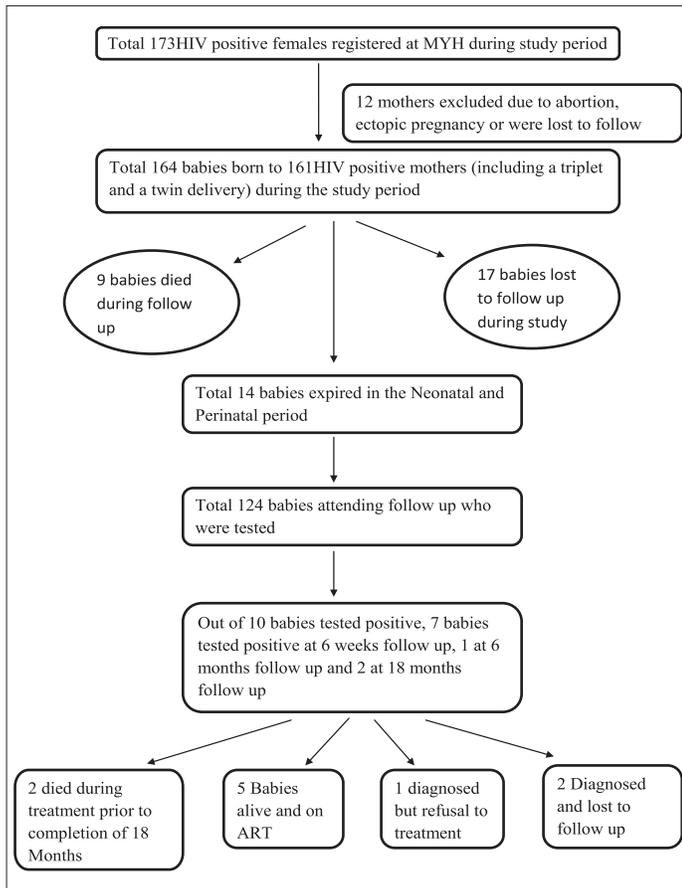
This retrospective study was done on mothers with HIV-positive serology and their infants. The analysis of the records of HIV-positive mothers up to their delivery and follow-up records of their babies for 18 months of age was done who were admitted in

M. Y. Group of Hospitals, Indore from January 2011 to December 2013. Data were collected from PPTCT center in the Department of Obstetrics and Gynecology, Labor room records, Nursery records, and ART center. All HIV-positive pregnant women, who attended antenatal clinic and delivered at M.Y. Hospital and where complete records were available, were included in the study. HIV-positive mothers who were delivered outside or did not receive single dose nevirapine or those with incomplete records were excluded from the study.

For screening of antenatal care patients, ELISA was used. For the children, HIV-DNA was used for the diagnosis at 6 weeks and at 6 months follow-up. The HIV-DNA test was done by sending the dried blood smear on the blot paper and it was sent to the reference laboratory Kasturbha Hospital in Mumbai. In the case of positive result, the whole blood sample was sent for confirmation. At 18 months of age, antibody testing was done. A statistical analysis was performed using Chi-square test, and Z-test to test the significance (p value) between the two groups.

### RESULTS

During the study period, 173 cases of HIV positive pregnant women were registered, out of which 161 gave birth to 164



**Figure 1: Study population**

babies (including 1 triplet and 1 twin) as shown in Fig. 1. Out of the 164 babies delivered, 6 babies were still born, 2 died within 7 days, and another 6 died during the neonatal period. The perinatal mortality rate (PMR) was 48.78/1000 live births, and neonatal mortality rate (NMR) was 54.87/1000 live births. Both were significantly higher than the mortality rate in children born to seronegative mother during the same period which was 25/1000 live births.

In this study, maximum women were belonging to age group <25 years; however, age of the mother did not affect the HIV transmission rates ( $p=0.851$ ). Most of the mothers were of younger age in which 41 (25%) were primigravida, 73 (44.51%) second gravida. Most of the antenatal women were housewife 40 (70%) and husbands of 93 (56.70%) women were unskilled workers, 26 (15.85%) drivers, and 16 (9.75%) were on other jobs. The occupation of father did not affect the mother-to-child transmission, as the majority of HIV-negative infants were born to same father's occupation ( $p=0.350$ ).

The normal labor (60%) was the most common mode of delivery and lower segment caesarean section (40%) was done only for obstetrics indication as per the current guidelines. The rate of transmission was not significantly affected by the mode of delivery ( $p=0.0787$ ). The incidence of preterm (<37 weeks) deliveries was maximum (52%). The maximum transmission of HIV occurs in the third trimester, and the rate of transmission of HIV was more in term babies (70%) as compared to preterm babies (30%).

Only 55 (34.16%) HIV-positive mothers were eligible for treatment as they had low CD4 counts or other comorbidities such as tuberculosis in 8 and hepatitis B infection in one mother. The treatment was started but was not effective in preventing HIV transmission as 60% were HIV-positive against 30% babies where mothers did not receive any treatment. The difference was statistically significant with ( $p=0.032$ ). The CD4 counts were less than 500 in 70% (7 out of 10) mothers with HIV positive babies and 47.2% (60 out of 151) mothers with HIV-negative babies ( $p=0.040$ ).

The birth weight was below 2500 g in 40% HIV-positive babies and 47.67% of the HIV-negative babies ( $p=0.780$ ). There were 42 admissions to the nursery of which 36 were discharged with mother. NICU admission was required in 40% of seropositive and 27.27% of seronegative babies ( $p=0.385$ ). Prematurity and low birth weight (LBW) was the most common indications for admission in both the groups, followed by septicemia, NNHB and birth asphyxia. 14 children died during neonatal period and the most common cause of deaths was prematurity followed by septicemia.

Out of 164 babies, 17 children were lost to follow-up (16.95%) and 9 died during follow-up; however, none was admitted at MYH. The diagnoses of only 4 babies were known and out of them, 2 died of respiratory complaints, and 2 due to failure to thrive and diarrhea. HIV status of expired babies was not known; although, PPTCT center tried to call the phone numbers provided but other information was not available. Out of the 10 HIV-positive babies, 5 babies were started on ART irrespective of their CD4 counts. Two babies were lost to follow-up, 2 died before ART was started and parents of one child refused treatment as the mother was terminally ill and father had abandoned them. A cause of death was malnutrition and diarrhea in one child, and in another child, it was not known.

## DISCUSSION

The overall parent to child transmission rate in our study was 8.06% with single dose nevirapine alone. This transmission rate was less than the expected 10-20% in a pilot project study done by NACO [1]. However, it is similar to a study from Chennai with MCT rate of 8.3% from a sample of 218 DNA-PCR and double from a study from Southern India which showed a transmission rate of 4% [5,6]. Others have shown even high transmission rates [7,8]. The maximum number of cases detected was young women, thus, emphasizing the growing pandemic and its propensity to involve young age group. Mandatory screening of HIV in school and colleges would be next seen if adequate prevention of HIV is not possible.

In our study, only 55% of pregnant women were eligible for ARV drugs for low CD4 counts and co-morbidities, but the HIV transmission rate was 60% in them compared to 30% babies who did not received any treatment which was statistically significant. The main reason of ineffectiveness of treatment in preventing transmission may be delayed commencement of treatment and presence of various comorbidities like tuberculosis. Marinda

**Table 1: Maternal and infant demographics**

Parameters	HIV positive infants	HIV negative infants	p value
Maternal demographics			
Age			
<20	1	13	0.851
20-30	9	138	
Gravida			
G1	1	40	0.544
G2	7	60	
G3	1	34	
>G3	1	6	
ART status			
Yes	6	49	0.032
No	3	105	
CD4 count			
500-1000	3	66	0.040
<500	7	60	
Mode of delivery			
LSCS	4	54	0.787
Vaginal	6	97	
Occupation of father			
Worker	7	86	0.350
Driver	2	26	
Other	1	31	
Infant demographics			
Gestational age (weeks)			
<37	3	90	0.126
37-40	7	61	
Birth weight			
VLBW	1	23	0.780
LBW	3	52	
>2.5	6	78	
Nursery admission			
PMR	48.78	23	0.008
NMR	54.87	25	0.005
IMR	109.76	40	0.001

HIV: Human immunodeficiency virus, ART: Anti-retroviral therapy, LSCS: Lower segment caesarean section, VLBW: Very low-birth weight, LBW: Low-birth weight, PMR: Perinatal mortality rate, NMR: Neonatal mortality rate, IMR: Infant mortality rate

et al. [9] showed that HIV-positive mothers with high viral load are likely to transmit infection more to their infants. Other studies and also recent guidelines by WHO and NACO had shown that timely initiation of triple ARVs is helpful in suppression of viral load and thus preventing MCT [10-12].

The CD4 counts was  $<500/\text{mm}^3$  in 70% mothers with HIV-positive babies compared to 47.2% mothers with HIV-negative babies, which was comparable to a study done by Marazzi et al. [13], which showed transmission rate of 50% with pregnant women without therapy. Some associated maternal risk factors together with low CD4 counts are anemia, advanced maternal disease, mastitis and acute maternal seroconversion

during pregnancy and breastfeeding. Our study showed that the maximum transmission of HIV occurs in the third trimester, the rate of HIV transmission was about 70% as compared with 30% in preterm babies.

Although exclusive breastfeeding was advised as per the recent recommendations, mothers in both groups practiced top feeding and mixed feeding. Faulty feeding practices were responsible for 30% of transmission in HIV-positive group as babies turn positive after 6 months of age. However, this difference was not statistically significant as faulty feeding practices were seen in both the groups [14].

The cause of mother-to-child transmission was low immunity status of mother, time of ARVs initiation, and mixed feeding practices. These all parameters of transmission have been taken into care by NACO PPCT recent guidelines which say ART should be given to all HIV-positive pregnant women irrespective of their CD4 counts. For babies born to HIV-positive mother, exclusive breastfeeding should be continued for 6 months along with daily nevirapine, and after that breastfeeding should be continued with proper complimentary feeding until 1 year of age followed by slow cessation of breastfeeding. Hope this recent trend will benefit both mother and their babies for better survival and also HIV free life to the babies.

The incidence of high PMR and NMR in our study was because of the high incidence of intrauterine growth restriction, LBW babies, which may be due to low immune status of mother which makes them more prone to infection and other complications. However, the actual underlying cause remains undetermined. Growth failure was also seen in children born to HIV-positive mothers; however, we could not label HIV as the cause of growth failure because of other confounding factors like faulty feeding practices, and improper weaning which were prevalent in this population.

Limitations of the study were high incidence of lost to follow-up, which was due to lack of knowledge, parental ignorance, social stigma related to their HIV status leading to poor follow-up data not only during infancy but also during their further monthly ART center visits.

## CONCLUSION

The risk of vertical transmission of HIV from mother-to-baby was 8%. Maternal HIV transmission is the primary means by which infants become infected. Hence, the prevention of maternal HIV transmission is of paramount importance.

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