

Vertical transmission of HIV, Where do we stand ? Study done in PPTCT center – in a tertiary level of hospital of Western Rajasthan

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ABSTRACT

Background: Human immunodeficiency virus (HIV) infection in pregnant women has an important role in its spread to the pediatric population through vertical transmission. Effective utilization of Prevention of Parent to Child Transmission (PPTCT) services can reduce this spread. This study aims to determine the vertical transmission of HIV, the seroprevalence of HIV in antenatal women, demographic factors of seropositive women, and utilization of PPTCT services to minimize the risk of mother-to-child transmission. **Methods:** This study was conducted to assess vertical transmission of HIV in the newborn of HIV pregnant women attending antenatal clinic (ANC) of a tertiary care hospital from August 2014 to December 2020. Pretest counseling, HIV testing, and posttest counseling were done as per National AIDS Control Organization (NACO) guidelines. Antiretroviral prophylaxis was given to seropositive women and their children. Analysis of demographic data of seropositive women and assessment of the utilization of PPTCT services were done according to available records. **Results:** In the study time, 139,619 new antenatal registrations were there, 68.21% of women attended pretest counseling and of them, 95.28% gave consent for HIV testing. Out of which, 0.14% were reported as HIV seropositive in PPTCT (tested according to NACO guidelines). In the study time, a total of 188 HIV-positive deliveries were conducted in our institute. Out of which, 144 (76.6%) were ANC-booked patients and 44 (23.4%) were unbooked patients and directly came in labor, deliveries were conducted according to NACO guidelines and all newborns were given nevirapine syrup. All newborns were followed up until 18 months and in study time, 78 dry blood samples (DBSs) were sent for DNA polymerase chain reaction (PCR) detection and all were reported negative by the reference laboratory at AIIMS, New Delhi. **Conclusions:** Adherence to testing, treatment, and follow-up in the antenatal and postnatal period can minimize the risk of HIV transmission from mother to child.

Keywords: ANC, ART, DBS, EID, HIV, ICTC, NACO guidelines, PPTCT

Introduction

In India, the Prevention of Parent to Child Transmission of HIV/AIDS (PPTCT) program was started in 2002. Currently,

there are more than 4,000 integrated counseling and testing centers (ICTCs) in the country.^[1]

Transmission of HIV infection is primarily the result of risk behavior. Hence, the National AIDS Control Program (NACP) emphasizes risk reduction—through Information, Education, and Communication (IEC)—within the general population and through targeted intervention (TI) programs among high-risk groups.

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The HIV status of an infected individual can be reliably determined only by laboratory testing. The National HIV testing strategies are defined by the national program and are aimed at obtaining an accurate result.^[2]

The National AIDS Control Organization (NACO) has established a network of laboratories, which includes ICTCs, SRLs, NRLs, and PPTCT. Designated National Reference Laboratories (NRLs) and State Reference Laboratories (SRLs) will be responsible to confirm the presence of HIV-2 infection.

NACP launched PPTCT of HIV in the year 2001–2002. PPTCT program aimed to prevent perinatal transmission by interruption at different levels. This access to HIV testing services to all pregnant women enrolled for antenatal care (ANC) with provision of drug antiretroviral therapy (ART) prophylaxis with nevirapine in a single dose at the time of delivery led to the decline in pediatric HIV seropositivity.

Patients with an HIV-positive report must be referred to the nearest ART center for care, support, and treatment by the ICTC or PPTCT. This would help to provide early protection against mother-to-child transmission (MTCT) for future pregnancy and also it can reduce HIV risk in discordant couples and improve health. Counseling and screening are a must to detect HIV infection and to improve access to HIV awareness.^[2]

Aim of Study

- 1) To study the vertical transmission of HIV in newborns delivered at a tertiary level hospital.
- 2) To study follow-up HIV testing of all newborns up to 18 months.

Method

This was a hospital-based prospective study done from August 2014 to 2020 at a PPTCT center in a tertiary level hospital. In study time, a total of 139,619 pregnant women attended ANC. Their pretest, posttest counseling, and HIV test were done according to NACO guidelines after taking written consent and all HIV-positive females were linked to ART for further management and were advised institutional delivery. All newborns were given nevirapine syrup till 6 weeks of age. After 6 weeks, dry blood samples (DBSs) were taken according to NACO guidelines and were sent to AIIMS, New Delhi for HIV DNA PCR testing. Follow-up of all newborns was done up to 18 months and at 6, 12, and 18 months, a repeat HIV testing was done according to NACO guidelines.^[2]

Testing procedures

HIV testing facilities are being provided free of cost by NACO and Rajasthan State AIDS Control Society (RSACS) at ICTCs. The commonest method to diagnose HIV infection is by detection of the presence of antibodies to HIV in the blood of an HIV-infected person.

Rapid tests used to diagnose HIV infection provide quick results. A variety of rapid tests are available and employ different principles. NACO recommends the use of rapid HIV test kits, which provide results within 30 min. Rapid test kits with a detection rate >99.5% of all HIV-infected individuals and false positive results in <2% of all those who are tested are recommended for general use. Testing is done free of cost in ICTCs in the government health sector in all stand-alone facilities providing ICTC supported by RSACS.

A person who has a negative result in one test is declared to be HIV-negative. A person is declared to be HIV-positive when the same blood sample is tested three times using kits with different antigens/principles and the result of all three tests is positive.^[3] Emergency testing is done for women with an unknown HIV status and in labor, the labor room nurses, resident doctors, or medical officer provides basic information on HIV/AIDS and about HIV testing. Thereafter, a single HIV test will be offered to determine the HIV status of the pregnant woman and requirements for antiretroviral prophylaxis to prevent MTCT. A repeat sample is collected and tested on the next working day at ICTC to confirm the HIV status.

HIV pretest information/education/counseling involves providing basic information on HIV and risk assessment to pregnant women attending ICTC. HIV posttest counseling helps pregnant women to understand and cope with the HIV test result:

In case of a negative test result, the counselor reiterates basic information on HIV and educates to adopt behavior that reduces the risk of getting infected with HIV in the future. In case the pregnant woman is in the window period, a repeat test is recommended.

In case of a positive test result, the ICTC counselor assists and educates to understand the implications of the positive test result and helps in coping with the test result. The counselor also ensures access to treatment and care and supports disclosure of the HIV status to the spouse.

Follow-up counseling includes reemphasis on the adoption of safe behavior to prevent transmission of HIV infection to others. Follow-up counseling also includes establishing linkages and referrals to services for care and support including antiretroviral therapy, nutrition, home-based care, and legal support.^[4]

Results

In study time 139,619 pregnant females attended ANC clinic [Table 1]. Out of which, 9529 (68.21%) pregnant females were precounselled, and after consent HIV test was done in 90,738 (95.28%) females. Out of 90,738 pregnant females, 135 (0.14%) females were reported HIV-positive in PPTCT center [Table 2]. In our hospital, 188 (0.13%) HIV-positive deliveries were conducted, of which 144 (76.6%) were ANC-booked patients and 44 (23.40%) patients came directly

Table 1: Showing spectrum PPTCT data in study time

Data	2014	2015	2016	2017	2018	2019	2020	Total	%
Total ANC	12,561	29304	26273	17624	18875	17563	17419	139619	
Counseling	6451	11548	15854	14364	14936	15768	16308	95229	68.21
Testing	5950	9461	14225	14335	14881	15760	16126	90738	95.28
Wrong address	0	0	0	0	3	1	1	5	-----
HIV positive	20	25	27	15	23	15	10	135	0.14
ART	18	25	27	15	23	15	10	133	-----
Refuse ART	2	0	0	0	0	0	0	2	-----
Total HIV Positive Delivery	37	20	19	32	29	19	32	188	0.13
Booked	34	15	9	21	23	13	29	144	76.6
Unbooked	3	5	10	11	6	6	3	44	23.40
Live	37	16	19	32	27	14	32	177	-----
Dead	0	4	0	0	2	1	0	7	-----
Follow-up	-----	-----	-----	-----	-----	14	32	-----	-----
Lost to follow-up	-----	-----	-----	-----	3	0	0	3	-----
18 months	-----	-----	-----	-----	-----	-----	-----	100 N/R	-----

Table 2: Showing spectrum of HIV Positivity in study time

Year	Total testing of HIV	HIV-positive	Percentage (%)
2014	5950	20	0.33
2015	9461	25	0.26
2016	14225	27	0.1
2017	14335	15	0.10
2018	14881	23	0.15
2019	15760	15	0.09
2020	16126	10	0.06
Total	90738	135	0.15

in labor (unbooked) and HIV test was done at the time of delivery [Table 3]. Five patients gave their wrong addresses and could not be followed up. Two HIV-positive female patients were refused ART in 2014, and the rest of 133 pregnant female patients were linked to the ART center for further management [Table 4]. Counseling and testing of their spouse and other family members were advised. Out of 184 newborns, seven newborns expired during delivery, and the rest of all 177 newborns were alive. At 6-weeks follow-up, 78 DBS samples were sent to AIIMS, New Delhi, and all were reported negative for HIV DNA PCR test. In 18 months follow-up, all 52 newborns were reported HIV-negative [Table 5].

Nevirapine syrup and clotrimazole were given to all newborns as per NACO guidelines.^[2] Follow-up of all newborns was done at 6 months, 12 months, and 18 months for repeat HIV testing according to NACO guidelines^[2] and in our study, all newborns were HIV-negative after 18 months of follow-up.

Discussion

India's socioeconomic status, traditional social ills, cultural myths on sexuality, and people who are excluded from mainstream social, economic, and cultural life make it extremely vulnerable to HIV/AIDS.^[5]

Over the years, HIV has spread rapidly from urban to rural areas in India and from high-risk groups to the general population and is heterogeneous in its spread.^[6,7]

The NACO Technical Estimate Report (2015) estimated that out of 29 million annual pregnancies in India, 35,255 occur in HIV-positive pregnant women. In the absence of any intervention, an estimated (2015) cohort of 10,361 infected babies will be born annually.^[8]

The PPTCT program aims to prevent the perinatal transmission of HIV from an HIV-infected pregnant mother to her newborn baby.^[2]

In the present study, the total number of ANC tested for HIV infection was decreasing continuously from August 2014 to 2020. The overall seroprevalence of HIV infection in pregnant women is 0.14% (135/90738). Pretest and posttest counseling was improved from 33853 (2014–2016) to 61376 (2017–s2020). This may be due to increased awareness and availability of HIV tests in various centers (like PPTCT, ICTC) and counseling for institutional deliveries.

In a study by Kwatra *et al.*^[9], a total of 12,719 pregnant women attending the antenatal clinic, 10,491 (82.48%) were accepted for pretest counseling and HIV testing. A total of 145 women were found to be seropositive with a seroprevalence rate of 1.38%. Although a study done by Gupta *et al.* in north India revealed that the prevalence of HIV was found to be 0.88%.^[10]

Similarly, Mehta *et al.*^[11] study indicates a lower trend of HIV prevalence. In his study seropositivity of HIV was 0.38%.

Different authors have reported different seropositivity rates, ranging from 0.1% to 2.3%. Maitra *et al.*^[12] reported seropositivity of 0.4–1.09% in Gujarat. Parmeshwari *et al.*^[13] reported a seroprevalence of 1.14% (2002) and 0.7% (2007) among antenatal women. Joshi U *et al.* reported a seroprevalence of 0.35% (2006–2007)

Table 3: Status of HIV Positive pregnant females and their pregnancy outcome

Year	HIV-positive delivered		Booked	Unbooked
	Live child delivered	Dead child		
August 2014	37	37	34	3
2015	20	16	15	5
2016	19	19	9	10
2017	32	32	21	11
2018	29	27	23	6
2019	19	14	13	6
2020	32	32	29	3
7 years (Total)	188	177	144	44

Table 4: Showing follow up description of HIV positive pregnant patients and their treatment seeking behaviour

Year	HIV-positive in ANC registered booked patient	Status of spouse		HIV-positive delivered	ART linked	ART refused	Wrong addresses
		Positive	Negative				
August 2014	20	1	6	37	18	2	0
2015	25	0	2	20	25	0	0
2016	27	0	7	19	27	0	0
2017	15	0	6	32	15	0	0
2018	23	0	5	29	23	0	3
2019	15	10	5	19	15	0	1
2020	10	5	5	32	10	0	1
7 years (Total)	135	16	36	188	133	2	5

Table 5: Follow up study of HIV Testing in Newborns up to 18 months

Year	Total sample sent for DBS	DBS result	6 months follow-up	12 months follow-up	18 months follow-up	Final result
August 2014	-----	-----	-----	-----	-----	-----
2015	-----	-----	-----	-----	-----	-----
2016	-----	-----	-----	-----	-----	-----
2017	-----	-----	-----	-----	-----	-----
2018	30	N/R	30	18	8	N/R
2019	25	N/R	23	20	28	N/R
2020	23	N/R	22	20	16	N/R
7 years (Total)	78	N/R	75	58	52	N/R

among antenatal women.^[14] The Rajasthan State AIDS Control Society (RSACS)^[15] reported 0.1%–0.2% seropositivity for 5 years (2006–2010). A Tamil Nadu Sentinel Surveillance showed that a median positivity rate of HIV infection among antenatal women was 0.65% in 2004 and 0.5% in 2005.^[16] HIV Sentinel Surveillance conducted by Maharashtra State AIDS Control Society (MSACS) revealed a decline in seropositivity among antenatal women from 1.25% (2005) to 0.75% (2006–2007) in urban areas.^[17]

These findings have significance as per the official data obtained from India's NACO.^[8]

The possible reason for ignorance about HIV infection could be a lack of knowledge about HIV infection. The risk of vertical transmission of HIV infection from mother to child during pregnancy, delivery, or breastfeeding is responsible.

Most of the deliveries occurred before the introduction of a triple-drug ART regimen for all pregnant women under the

PPTCT program in India. In a study by Potty, the prevalence of pediatric HIV be 7.8% in maternally HIV-exposed children by age of 24 months.^[18]

Earlier, an overall MTCT rate of 18.6% was identified by the age of 18 months among HIV-exposed children born during 2005–2007 in West Bengal.^[19]

In a study conducted in the Ananthapur district, where all HIV-infected pregnant women were given triple ART regardless of the CD4 lymphocyte count, the MTCT rate reported was 3.7%.^[20] Studies conducted in Delhi and Ahmedabad found an overall MTCT rate of 8.3% and 8.5%^[21,22] among exposed children by 18 months of age, respectively.

The difference in results of MTCT in the studies mentioned above is probably related to the coverage of ART among HIV-positive pregnant women. The studies conducted in Delhi and Ahmedabad reported an ART coverage of 58% and 32%,

respectively, among mothers before delivery. However, the study in Ananthpur included only the mothers who were on ART before delivery.^[20-22]

In India, the PPTCT program was started in 2002 and the declining trend of seropositivity is seen afterward. This may be due to the success of the PPTCT program in the state. Initially in this program, HIV-positive pregnant women were given a single dose of NVP tablet at the time of labor; their newborn babies also get a single dose of syrup NVP within 72 h after birth to prevent transmission of HIV from mother to child, but recently according to newer guidelines (December 2013), syrup NVP to the infants should be continued for a minimum of 6 weeks after birth.^[23] Among the babies of HIV-positive mothers who received full coverage of the PPTCT program, 85% HIV-negative status was achieved that indicated the protective role of NVP in vertical transmission.^[24-26]

The main determinant of pediatric HIV infection is the scale and magnitude of adult HIV infection. There is an overall reduction of 57% in the new HIV infections per year among the adult population from 2.74 lakh in 2000 to 1.16 lakh in 2011, which demonstrates the impact of various preventive strategies under the NACP.^[27]

Overall, in our study, 0.14% of pregnant women had been initiated on ART. In this study, vertical transmission of HIV infection in newborns who were regular in follow-up up to 18 months was zero. However, in our study as DNA PCR testing was done in 2018 and this is a limitation of our study and HIV testing was not done in stillbirth deliveries.

As a protocol and NACO guidelines all newborn were given Nevirapine syrup. Mothers were advised to come for follow up HIV testing of Newborns up to 18 months.

According to NACO,^[2] the transmission rate is 15%–35% if no intervention is undertaken, but if nevirapine is used it may reduce to 10%. MTCT (perinatal transmission) in a study by Khokher *et al.*^[28] is 16.0%. Similar results have been reported by Vyas *et al.*, Hooja *et al.*, and Singal *et al.*^[29] in their study (from 5.6%–12%). Parmeshwari *et al.*, Diana *et al.*, and Mary *et al.* (2008)^[30] in their study have reported this transmission as 15%.

Recommendation and Conclusion

1. Mandatory HIV testing and counseling in all-new ANC should be done.
2. HIV tests of all pregnant females should be done at the level of CHC, PHC, Anganwadi, etc., Moreover, all HIV-positive pregnant females should be linked to ART centers for further management.
3. There should be 100% adherence for HIV treatment and follow-up. Institutional deliveries should be advised to minimize vertical transmission of HIV.
4. All newborns should be given HIV prophylactic treatment after birth. There should be 100% adherence for HIV treatment

and follow-up. For emergency management availability of drugs should be ensured.

5. All positive females should continue their ARV therapy irrespective of CD4 count.

Limitation of the study

In our institute, DBS testing was done from 2018 hence DNA PCR test results of 104 newborns were not available. DBS testing was done only for those patients who came for follow-up.

Declaration of patient consent

The authors certify that they have obtained all appropriate patient consent forms. In the form, the patient(s) has/have given his/her/their consent for his/her/their images and other clinical information to be reported in the journal. The patients understand that their names and initials will not be published and due efforts will be made to conceal their identity, but anonymity cannot be guaranteed.

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Conflicts of interest

There are no conflicts of interest.

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