Original article

Utilization of the prevention of parent-to-child transmission of HIV (PPTCT) services in a tertiary care hospital, Odisha, India

Dash M[1], Misra P[2], Subudhi K[3]

Abstract:

Aims: To assess seroprevalence of HIV among antenatal women and the extent of utilization of interventions to minimize the risk of mother-to-child transmission. ***Study Design:*** Descriptive cross-sectional study was carried out among antenatal women who attended integrated counseling and testing center (ICTC) of HIV. Sample sizes were determined from the number of pregnant women that attended ICTC. ***Place and Duration of Study:*** Data and samples were collected from a tertiary care hospital, Odisha, India during January 2009 to December 2012. ***Methodology:*** All pregnant women were counseled and tested for HIV by rapid test. All HIV-seropositive antenatal women (ANW) were linked to services and followed-up for institutional delivery, single-dose nevirapine (sdNVP) prophylaxis, infant feeding options and testing of children at 18 months. ***Results:*** Out of 11,508 ANW registered and pre-test counseled, 11,390 (98.97%) accepted HIV testing. Sixty women were found to be seropositive, thus showed seroprevalence rate of 0.53% (60/11,390). CD4 testing was carried out in all ANW and five (8.33%) were eligible for antiretroviral therapy (ART). Seven (11.67%) had opted for medical termination of pregnancy (MTP). All 48 ANW delivered institutionally, only 7 (14.58%) received cesarean delivery. Out of 46 live births, 5 (10.87%) ANW were on ART, 35/41 (85.37%) received sdNVP mother baby-pair prophylaxis and only 8/46 (17.39%) mother opted for replacement feeding. Twenty one children have reached 18 months till date and among them three (14.29%) were HIV-seropositive. All three were delivered vaginally, received sdNVP prophylaxis and were exclusively breast fed for 6 months. ***Conclusion:*** The HIV-seroprevalence rate among antenatal women was 0.53% and mother-to-child transmission (MTCT) rate was 14.29%. Reduction in MTCT rate needs pre or early antenatal HIV testing, prenatal antiretroviral medication, preference for cesarean delivery, 100% antiretroviral prophylaxis coverage and education on avoidance of breast feeding.

Key words: Antenatal women; MTCT; Single-dose nevirapine; Seroprevalence; HIV testing

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Introduction:

In recent years, acquired immune deficiency syndrome (AIDS) caused by human immunodeficiency virus (HIV) has emerged as greatest threat to human existence. The principal mode of HIV spread is through heterosexual activity; however, the vast majority of children acquire the infection by mother-to-child transmission (MTCT) which may occur during pregnancy, labor and delivery or through breast feeding. The vertical transmission of HIV infection without any intervention is reported in 25 to 35% of infants born to HIV positive women in Asia[1]. Effective MTCT interventions can reduce vertical transmission to 1% or less[2]. In India during, 2010-

1. Muktikesh Dash, Department of Microbiology, Maharaja Krushna Chandra Gajapati Medical College and Hospital, Berhampur University, Berhampur, Odisha, India
2. Pooja Misra, Department of Radio diagnosis, Maharaja Krushna Chandra Gajapati Medical College and Hospital, Berhampur University, Berhampur, Odisha, India
3. Khetrabasi Subudhi, Department of Obstetrics and Gynecology, Maharaja Krushna Chandra Gajapati Medical College and Hospital, Berhampur University, Berhampur, Odisha, India

Corresponds to: Muktikesh Dash, Department of Microbiology, Maharaja Krushna Chandra Gajapati Medical College and Hospital, Berhampur University, Berhampur, Odisha, India.
E-mail: mukti_mic@yahoo.co.in, drmuktikesh@mail.com

2011, 6.6 million pregnant women were counseled and tested and 16,954 HIV positive women were identified[3].

HIV counseling and voluntary antenatal testing is an entry point cost effective intervention to detect HIV infection and to prevent transmission to the offspring. Accordingly, the data generated from antenatal women has been used to monitor the trends in the general population and to predict to predict the seroprevalence in young women[4]. Identification of the women with HIV infection during pregnancy allows women to take an informed decision about continuing the pregnancy and timely appropriate interventions to decrease the risk of MTCT.

In view of the above facts, the present study has been carried out to determine the seroprevalence of HIV infection among antenatal women, obstetric interventions, follow-up of mother and child, infant feeding options and testing of infants at 18 months of age as per National AIDS control organization (NACO) guidelines[5]. The main aim of structured interventions was to find out the efficacy of these interventions in terms of reducing transmission rates in HIV exposed infants.

Material and Methods:

The study area, population and methodology

The present descriptive cross-sectional study was carried out among antenatal women attending integrated counseling and testing center (ICTC) in the Departments of Obstetrics and Microbiology in a tertiary care referral hospital of Odisha, India. A retrospective collection of data from available records of all clients who attended ICTC of our hospital between January 2009 and December 2012 was carried out. Present study included 11,508 pregnant women, who were either volunteers or referred by Department of Obstetrics our institute. The ICTC counselors collected their anonymous and unlinked data in registers and logbooks as per National AIDS Control Organization (NACO) guidelines under strict confidentiality. Data accessed from the records included age, sex, marital status, parity, education and occupational status, contraceptives used, behavioral patterns and HIV status of the husbands, medical termination of pregnancy (MTP), mode of delivery, antiretroviral single-dose nevirapine (sdNVP) prophylaxis and infant feeding options.

Pre-test counseling, sample collection and processing

All the registered antenatal women were given relevant pre-test counseling at ICTC. Written informed consent was sought before HIV testing was carried out. Five milliliters (ml) venous blood sample was collected in a sterile plain container from all clients who consented for HIV testing. Blood was allowed to clot for 30 minutes at room temperature (25-30ºC) and serum was separated after centrifugation at low speed. The serum samples were then stored at 4ºC and were tested within 24 hours. All the tests were done in accordance with the Medical College institutional ethical committee guidelines.

HIV serology and CD4 cell counts

HIV antibodies were tested by the three Rapid tests protocol as per the guidelines laid down by the World Health Organization (WHO Testing strategy III) and testing policy of NACO, Government of India.[5] All positive test results were disclosed only after post test counseling of the patients maintaining strict confidentiality. Antibodies to HIV (1&2) were tested initially with a SD BIOLINE HIV-1/2 3.0 Rapid Test [Standard Diagnostics, Inc. Korea].The samples tested positive in the first method were subjected to tests with two different rapid tests i.e. PAREEKSHAK HIV 1/2 Triline Card Test [Bhat Bio-Tech India (P) Ltd.] and PAREEKSHAK HIV 1/2 Rapid Test Kit (TRISPOT) [Bhat Bio-Tech India (P) Ltd.]. The samples were considered as positive when found reactive by all three different methods. All tests were done according to manufacturer's instructions.

CD4 cell counts of all the HIV-seropositive antenatal women were analyzed using flow cytometry (Becton and Dickinson, USA, FACS caliber). Three antibody panels were used, i.e., BD Tri TEST™ CD3 fluorescein isothiocyanate (FITC), CD4 phycoerythrin (PE) and CD45 peridinin-chlorophyll-protein (PerCP), a three-color direct immunofluorescence reagent to identify and determine the percentages and absolute counts of mature T-lymphocytes ($CD3^+$) and helper T-lymphocyte ($CD3^+CD4^+$) subsets in erythrocyte-lysed whole-blood, by using Tru Count™ tubes.

Post-test counseling and subsequent follow-up

While seronegative antenatal women were counseled on HIV prevention and risk reduction behavior, HIV-seropositive women were additionally provided psychological support on disclosure issues and spousal testing, linkages to Tuberculosis testing and

antiretroviral therapy (ART) services based on CD4 cell counts, informed decisions about whether or not to continue pregnancy, importance of institutional delivery and intrapartum sdNVP, postpartum follow-up, and infant feeding options. Exposed infants were tested at the completion of 18 months through HIV rapid tests for seropositivity confirmation.

Statistical analysis

The mean, median, standard deviation and "exact" confidence intervals were calculated by using GraphPad QuickCalcs statistical software, Inc. 2236, Avanida de la Playla, La Jolla, CA92037, USA.

Results:

During the study period from January 2009 to December 2012, a total of 11,508 pregnant women had registered and counseled, out of which 11,390 (98.97%) accepted both counseling and testing and rest 118 (1.03%) did not agree for HIV testing. From 11, 390 antenatal women those who accepted HIV counseling and testing, only 60 (0.53%) were HIV-seropositive for HIV-1 antibodies and remaining 11,330 (99.47%) were HIV negative, thus showing a seroprevalence of 0.53% [Table-1]. No pregnant woman was found to be seropositive for HIV-2 antibodies.

Table 1 Seroprevalence rate of HIV among antenatal women in a tertiary care hospital in Odisha, India for the period 2009 to 2012

Year	No. of ANC registered and counseled	No. of HIV tested (% out of No. of ANC counseled)	No. of HIV-seropositive (% out of No. of HIV tested)
2009	2758	2640 (95.72)	13 (0.49)
2010	2623	2623 (100)	17 (0.65)
2011	2770	2770 (100)	13 (0.47)
2012	3357	3357 (100)	17 (0.51)
Total	11,508	11,390 (98.97)	60 (0.53)

HIV- Human immunodeficiency virus

Table-2 shows the demographic characteristics among HIV-seropositive women. The mean age of seropositive women was 24.12 years. (Standard deviation 3.91, median 24, minimum 18 and maximum 35 years). All the women were booked for institutional delivery. Majority of seropositive women were primigravidae, married, Hindu by religion, from rural areas with low socio-economic status, studied up to primary level , did not use any contraceptives and were housewife by occupation. High risk behavior was not significantly noticed among them. Most of their husbands were migrant workers to other states and had multiple sex partners. None of these women were aware of their HIV status before pregnancy.

Table 2 Demographic characteristics of antenatal seropositive women in a tertiary care hospital, Odisha, India (n=60)

Variables		No. of seropositive	Percentage (95% CI)
1.Age		24.12±3.91 (SD)	
2.Marital status	Married	59	98.33 (91.06 -99.96)
	Unmarried	01	1.67 (0.04 -8.94)
3.Parity	0	32	53.33 (40 -66.33)
	1	19	31.66 (20.26 -44.96)
	2	07	11.67 (4.82 -22.57)
	3	01	1.67 (0.04 -8.94)
	4	01	1.67 (0.04 -8.94)
4.Socio -economic status	Low	58	96.67 (88.47 -99.59)
	High	02	3.33 (0.41 -11.53)
5.Residence	Rural	51	85 (73.43 -92.90)
	Urban	09	15 (7.10 -26.57)
6.Religion	Hindu	58	96.67(88.47 -99.59)
	Others	02	3.33 (0.41 -11.53)
7.Occupation	Housewife	57	95 (86.08 -98.96)
	Others	03	5 (1.04 -13.92)
8.Education	Illiterate and primary level	53	88.33 (77.43 -95.18)
	Others	07	11.67 (4.82 -22.57)
9.Contraceptives used	None	47	78.33 (65.80 -87.93)
	Condom	06	10 (3.76 -20.51)
	Others	07	11.67(4.82 -22.57)
10.High risk behavior	Single sex partner	57	95 (86.08 -98.96)
	Multiple sex partner	02	3.33 (0.41 -11.53)
	Others	01	1.67(0.04 -8.94)
11.Occupation of husbands	Migrants	51	85 (73.43 -92.90)
	Others	09	15 (7.10 -26.57)
12.High risk behavior of husbands	Single sex partner	09	15 (7.10 -26.57)
	Multiple sex partner	48	80 (67.67 -89.22)
	Others	03	5 (1.04 -13.92)

SD- Standard deviation, CI- Confidence intervals

Table-3 shows the utilization of specific interventions offered to the HIV-seropositive women to reduce mother-to-child transmission of HIV. Out of 60 seropositive women, 7 (11.66%) opted for medical termination for pregnancy and 5 pregnant women have not delivered yet. Among 48 antenatal women who had opted for delivery, majority 41 (85.42%) were delivered through normal vaginal procedure, and rest 7 (14.58%) had to require cesarean section. Except 2 (4.17%) infants who were still borne, rest 46 (95.83%) were live births. All 46 infants received antiretroviral (ARV) prophylaxis in the form of Nevirapine (NVP) syrup where as only 35/41(85.37%) mothers had received NVP prophylaxis. Six antenatal women reached the hospital during or after delivery and based on CD4 cell counts and five (10.87%) pregnant women were put on antiretroviral therapy (ART), did not require NVP prophylaxis. After counseling, only 8 (17.39%) infants received replacement feeding and rest 38 (82.61%) mothers decided to feed their infants only breast milk. As observed in Table-4, out of 21 babies who had already attended the age of 18 months, only 3 (14.29%) babies were confirmed as HIV-seropositive. The record showed that all three babies had delivered through vaginally; both mother and baby received NVP and was exclusively breast fed for 6 months.

Table 3 Utilization of PPTCT services in a tertiary care hospital, Odisha, India

Interventions	No. of antenatal women or infants	Percentage (95% CI)
Medical termination of pregnancy	07/60	11.67 (4.82 -22.57)
Total delivery *	48/60	80 (67.67 -89.22)
Cesarean section	07/48	14.58 (6.07 -27.76)
Vaginal	41/48	85.42 (72.24 -93.93)
Live birth	46/48	95.83 (85.75 -99.49)
Still birth	02/48	4.17 (0.51 -14.25)
On antiretroviral therapy	05/46	10.87 (3.62 -23.57)
Antiretroviral prophylaxis - Nevirapine in pair **(both mother and infant)	35/41	85.37 (70.83 -94.43)
Infant only***	46/46	100 (92.29 -100)
Infant feeding options		
Exclusive breast feeding	38/46	82.61 (68.58 -92.18)
Replacement feeding	08/46	17.39 (7.82 -31.42)

*Yet to be delivered-5, ** Antenatal women on antiretroviral therapy- 5 and antenatal women reached at hospital during or after delivery-6, *** All infants received nevirapine prophylaxis, CI- Confidence intervals

Table 4 HIV status of the babies at 18 months of age (n=21)

Type of interventions received by the mother and baby	HIV result of the baby at the age of 18 months	
	HIV-seronegative (%)	HIV-seropositive (%)
CS+NVP pair+EBF	01	0
CS+NVP pair+RF	01	0
NVD+NVP pair+EBF	12	03
NVD+NVP pair+RF	02	0
NVD+NVP only baby+EBF	02	0
Total	18 (85.71)	03 (14.29)

Discussion:

Counseling and testing services are an entry point to comprehensive HIV/AIDS care and treatment. Appropriate and timely interventions i.e., safe obstetric practices, antiretroviral prophylaxis and choice of infant-feeding options can reduce the risk of mother-to-child transmission (MTCT) to 1% or less.[2] There are two common approaches to HIV testing after obtaining informed consent and maintaining confidentiality. In 'opt-in' approach pregnant women are given pre-test counseling and they explicitly request to be tested either in writing or oral. In 'opt-out' approach HIV test is offered as a routine part of a package of prenatal tests. It emphasizes that HIV testing is an expected part of antenatal care; however testing is voluntary and women have the right to refuse. Center for Disease Control and Prevention (CDC) recommends an 'opt-out' approach as the testing rate is high i.e., 85-98%[6].The World Health Organization (WHO) and the Joint United Nations Programme on HIV/AIDS (UNAIDS) have also introduced routine 'opt-out' approach in countries with high prevalence so that increase number of women can be tested for HIV[7]. In this present study, the overall acceptance of HIV testing after counseling with 'opt-out' approach was 98.97% (11,390/11,508). Similar acceptance rate of 100% and 96% was reported by Parameswari et al. and Chaudhari et al. in India respectively[8,9]. Study conducted by Joshi et.al. and Sinha et al. the acceptance rate in 'opt-out' approach was 83% and 79% respectively, lower than our study[10,11]. This emphasizes there is need for good counseling skills by the counselors to achieve both counseling and testing close to 100%.

In our hospital, the overall seroprevalence of HIV among pregnant women was 0.53% (60/11,390). Similar seroprevalence of 0.56%, 0.41%, and 0.40% was reported by Mandal et al., Giri et al. and Joshi et al. respectively[12,13,14]. In comparison, higher prevalence rate of 0.77% and 1.12% was observed by Parameswari et al. and Vellanki et al. respectively in India[8,15]. Also the lower prevalence of 0.17% was reported by Chaudhari et al[9]. This wide variability in HIV seroprevalence among antenatal women may be attributed to the difference in health seeking and risk behaviors in different parts within and outside India which mostly depends on socio cultural milieu of the community.

Among HIV-seropositive pregnant women in this study, majority (98.3%) were married and 32 (53.3%) were primigravidae. Similarly, the study conducted by Giri et al. had revealed 64% of HIV-seropositive antenatal women were primigravidae[13]. The percentage of primigravidae coming for institutional delivery is more than multigravidae as there is strong belief in the community that delivery process is safe among multigravidae so they usually prefer delivery at home. We observed that, most of the HIV-seropositive antenatal women were from rural areas, low socio-economic background, studied up to primary level, did not use any contraceptives. High risk behavior was not noticed in most of them. Principal mode of transmission was heterosexual contact from their husband. Higher level of education and high socio-economic status could facilitate the spread of HIV awareness and increase the use of

barrier contraceptives[16].

Strikingly, the present study depicted that majority (85%) of the husbands of these women were out-migrants and had migrated to high HIV destination areas (Surat district in Gujarat, Mumbai and Thane district in Maharashtra). They usually work there as unskilled or semi-skilled worker in the unorganized sector such as power loom, diamond polishing and construction industries. Migration into the other cities enhances casual and commercial contacts, because of spousal separation and weaker social control[17]. More-ever migration increases the size of sexual networks by linking networks from different locations[18]. Although migrant men are believed to acquire HIV infection in destination areas, they transmit the virus to their sexual partners upon returning to their home towns[19].

A threefold strategy is needed to prevent child from acquiring HIV infection from their mothers (i) by preventing HIV infection among prospective parents (ii) avoiding unwanted pregnancies among HIV-seropositive women and (iii) preventing the transmission of HIV from HIV-seropositive mothers to their infants during pregnancy, delivery and breast feeding. Seven (11.67%) HIV-seropositive women had opted for medical termination of pregnancy (MTP) and rest 53/60 (88.33%) women continued their pregnancy. A study conducted in West Bengal showed 12.24% underwent MTP and Vellanki et al. reported 18.86% had opted for MTP[15,20]. This necessitates for early and effective HIV counseling and testing so that pregnant women who know their HIV status can make informed decisions about whether or not to continue their pregnancy.

Among 53 (88.33%) antenatal women who decided to continue their pregnancy, 48 delivered a baby (2 still births and 46 live births) and rest 5 not yet delivered. The cesarean section (CS) method of delivery in the present study was 14.58% (7/48), in comparison, high CS rate of 32.55% was noticed by Vellanki et al.[15] A study done by Joshi et al. in Gujarat, India the CS rate was 12.06% among HIV-seropositive women, similar to our study[10]. Evidence shows that performing CS prior to the onset of labor can reduce the risk of infection up to fourfold because it minimizes the exposure of the neonate to maternal body fluids[6].

Short course ARV prophylaxis regimens can reduce MTCT. The main therapies use zidovudine (ZDV), lamivudine (3TC) and nevirapine (NVP). Regimens can be simple or complex, and can be given at different times or through pregnancy, labor, delivery and the postpartum period. Because of simplicity, low-cost and efficacy, single dose nevirapine (sdNVP) prophylaxis to both mother and infant is being provided in resource-constrained countries for MTCT programs globally as well as in India[21]. Six (06/48) pregnant women were on ART when pregnancy was detected, they continued with triple combination regimens ZDV, 3TC and NVP throughout pregnancy and their infants received sdNVP plus ZDV for one week. Five women did receive sdNVP prophylaxis as they delivered during transportation to hospital or reached hospital within 72 hours of delivery, thus NVP prophylaxis uptake was 35/41 (85.37%). All the infants received sdNVP prophylaxis. Coverage of sdNVP to mother baby-pair was reported in 92.13% of the live births by Joshi et al[10]. Though all HIV-seropositive pregnant women reached hospital, there need for educating women about self administering of sdNVP if they go into labor at home during their antenatal counseling visits to achieve 100% NVP prophylaxis among mother baby pairs.

It has been estimated that up to 20% of infants breast fed by HIV-seropositive mothers remain at risk of acquiring HIV infection[21]. In our hospital pregnant mothers and their families were counseled about best feeding options for their infants. Where women can accept, afford, sustain, feasible and safe avoidance of exclusive breast feeding (EBF) is recommended. In our study, only 17.39% (08/46) mothers opted for replacement commercial feeding in the form of commercial formula or home prepared modified animal milk and rest 82.61% infants received exclusive breast feeding for 6 months.

Maternal antibodies can cross the placenta and persist. Antibody testing prior to 18 months cannot provide reliable diagnosis of infant infection status especially when the child is breast feeding[21]. Thus, the rapid test detecting antibodies are designated for 18 months. The follow up of babies after their birth in order to get them tested at 18 months is difficult task in rural settings considering migration and social factors. Twenty one exposed babies could be traced at the age of 18 months and among them only 3 (14.29%) were confirmed HIV-seropositive infants. Joshi et al. in Gujarat, Parameswari et al. in Tamil Nadu and Achanta et al. in Andhra Pradesh had reported HIV-seropositivity among exposed

infants at 18 months of age was 3.6%, 4.35% and 8% respectively, lower values in comparison our study[8,10,22]. All three HIV-seropositive infants were delivered vaginally, received sdNVP and were on exclusive breast feeding for 6 months. In case of seropositive ANCs, elective CS is preferred as well as mixed feeding and exclusive breast feeding for longer period is not recommended[21]. Also the emergence of sdNVP prophylaxis resistance could not be neglected. There is published report of emergence of drug resistance mutations after sdNVP exposure in HIV-1 subtype C-infected infants in India[23].

This present study was limited by some incomplete documentation including missing documentation. The results are based on reporting and data collection by counselor employed in the ICTC, therefore may be subject to bias. The data used tertiary care facility-based and might not be true presentation of the community. More active follow up of the seropositive infants is needed including infant feeding practices and drug resistance study on sdNVP prophylaxis.

Conclusion:

The HIV-seroprevalence rate among antenatal women was 0.53%. The interventions in MTCT program reduced the mother-to-child transmission rate to 14.29%, but still the result is high in comparison to ideal goal of 1% or less. Infant infections can be associated with interruptions of care at any stage of pregnancy for HIV-infected women and their infants. To minimize MTCT further there is requirement of enhanced primary HIV prevention strategies for women to prevent new infections, increased uptake of routine 'opt-out' HIV testing in all women during every pregnancy, avoidance of unintended pregnancies, appropriate prenatal care and ARV medication, preference for cesarean delivery, 100% ARV prophylaxis coverage and education on avoidance on breast feeding. Other factors that pose prevention challenges include low socio-economic status, low level of education, limited access to safe conception methods and services, substance abuse and lack of awareness that pre-chewing of food for infants is a transmission risk.

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Conflicting Of Interest

None declared

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