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Original Research Article

A PROSPECTIVE OBSERVATIONAL STUDY ON INCIDENCE AND MATERNAL OUTCOMES OF HIV IN ANTENENATAL MOTHERS DELIVERING IN A RURAL TERTIARY CARE MEDICAL COLLEGE AND HOSPITAL OF DARJEELING DISTRICT

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Abstract

Background: Since the 1980s, the prevalence of HIV has increased in developing countries, leading to significant economic, demographic, and social implications. HIV during pregnancy is a critical concern, especially as many women are first diagnosed during pregnancy. In India, the incidence of HIV in pregnant women has shown a decrease in recent years, with HIV transmission occurring primarily through unprotected sexual intercourse and from mother to child during pregnancy, labor, and breastfeeding. The prevention of parent-to-child transmission (PTCT) is a key public health goal, and antiretroviral therapy (ART) is a widely adopted intervention. However, the impact of ART on pregnancy outcomes, such as stillbirth, preterm delivery, and low birth weight, remains inconclusive. The objective is to assess the prevalence of HIV in antenatal mothers delivering at North Bengal Medical College & Hospital (NBMC&H) and analyze maternal outcomes associated with HIV during pregnancy. **Materials and Methods:** This prospective observational study was conducted at NBMC&H from March 2021 to February 2022. A total of 30 HIV-positive antenatal mothers were included in the study. These mothers were identified through universal opt-out HIV screening in antenatal care clinics, emergency labor room admissions, and third-trimester screening for high-risk cases. HIV-positive mothers were followed up for maternal outcomes, including mode of delivery, ART initiation, complications, and neonatal outcomes. Data collection was performed using a semi-structured questionnaire and HIV screening tests. Statistical analysis was conducted using appropriate methods. **Result:** The incidence of HIV-positive mothers at NBMC&H between March 2021 and February 2022 was 0.27%. Most HIV-positive mothers (66.7%) were aged 21-30 years. ART was initiated in 40% of cases by 1-12 weeks of gestation, and 13.3% of mothers initiated ART before pregnancy. The majority of deliveries were via emergency cesarean section (56.7%), with a higher incidence of complications such as anemia, wound infections, and respiratory tract infections. Neonatal outcomes showed a significant difference in birth weight, with a mean weight of 3.02 kg for babies born at 37-42 weeks, compared to 2.26 kg at 24-32 weeks of gestation. APGAR scores improved with later gestational age, with a higher percentage of neonates achieving scores >7 at 37-42 weeks. **Conclusion:** HIV infection during pregnancy increases the risk of low birth weight and preterm birth, highlighting the importance of timely ART initiation and proper antenatal care. While ART significantly improves maternal health, early screening, preconception counseling, and targeted interventions are essential to reduce adverse pregnancy outcomes. The continued monitoring of HIV-positive pregnant women and the adaptation of preventive strategies is critical for improving maternal and neonatal health in resource-limited settings.

INTRODUCTION

Since 1980, in developing countries prevalence of HIV has increased and it has led to plenty of economic demographic, and social significances.[1] The human immunodeficiency virus (HIV) is an enveloped retrovirus that contains 2 copies of a single-stranded RNA genome. It causes the acquired immunodeficiency syndrome (AIDS) that is the last stage of HIV disease. Two to four weeks after HIV enters the body, the patient may complain of symptoms of primary infection.[2] After that, a long chronic HIV infection occurs, which can last for decades.[3]

HIV during pregnancy holds great significance because many women are first diagnosed with HIV during pregnancy. Similarly, it is equally important in cases where one or both partners are HIV positive and wish to conceive.[4]

As of 2021, a total of just over 11.7 thousand pregnant women in India were positive with HIV infections. This indicates decrease from 2018 to 2020, where nearly above 15 thousand women were tested positive for HIV infections.[5]

Primary way to transmission of HIV among adults is chiefly by insecure sexual intercourse. A large incidence of vertical transmissions observed from pregnant woman to her new-born during pregnancy antenatally (in utero), intrapartum (during labour and delivery) or postpartum through breast feeding.[6] New-born babies are solely infected due to transmission from mother, here considering the parental investment by the male partner, who transmit the infection to his partner. In India this phenomenon is aptly termed as parent-to-child transmission (PTCT).[7] 70 to 75 % HIV transmission occurs in the time of labour and delivery, while 25 to 30 % of transmission of infection occurs in the late stage of pregnancy or antenatally.[8] The third largest HIV infected population; approximately 2.39 million are living in India.[9] India has estimated 145,000 children < 15 years of age who are infected by HIV/AIDS.[10] Children account for 7% of all the new HIV infections.[11]

From 2016 approximately 21 thousand ICTCs are available to offer free services to pregnant women, across India and most are attached with government aided healthcare facilities.[12,13] Objective of this PPTCT facilities is to prevent the perinatal transmission from a pregnant woman with HIV to her new-born. Programme involves counselling and testing of pregnant women. NACO in India, adopted the WHO recommendations 'Option B' for pregnant women, changing from a dose of Nevirapine to multi-antiretroviral drug prophylaxis strategy.[14]

The benefits of ART for PPTCT are well known; however, the effect of antiretroviral drugs on pregnancy outcomes is not fully known. There is inconclusive evidence on the occurrence of adverse pregnancy outcomes such as stillbirth, preterm delivery, low birth weight or small-for-gestational-age deliveries among women on ART.[12]

Objective: Assess the prevalence of HIV in antenatal mothers, delivering in NBMC & H, and their maternal outcomes.

MATERIALS AND METHODS

Study Type: Prospective observational study.
Study Design: Prospective Observational and Analytical design.
Study Setting: Hospital based study in North Bengal Medical College & Hospital among Antenatal Mothers attending ANC Clinic, ICTC Centre & those Unbooked / Referred cases attending labour room for delivery and Post Natal Ward in Department of G & O NBMC & H.
Period of Study: March 1st 2021 to Feb 28th 2022.
Study Population:

- Antenatal mothers attending ANC Clinic advised for universal 'opt out' screening for HIV as early as possible in pregnancy.
- Referred / unbooked/ undocumented mothers in Labour and admitted in Labour Room through Emergency undergoing rapid HIV testing by kits (HIV Ab testing kits)
- All ICTC negative mothers including those having high risk bchaviour and living in areas of high incidence of HIV/AIDS for repeat screening at 3rd trimester.

Sample Size: All Antenatal mothers getting admitted to LR from March 1st 2021 Feb 28th 2022; testing positive for HIV, undergoing either vaginal or operative delivery (LUCS) will be followed up for Maternal outcome at Post Natal Ward. As per last 3 years' record average number of mothers with HIV delivering at NBMC & H is 35. So my sample size will vary from 30 – 50.
Sampling technique: Total Enumeration method. As per last 3 years' record average number of mothers with HIV delivering at NBMC & H is 35.Total no. of HIV Positive mothers delivered between March 2021 till February 2022 was 30, so my sample size is 30.
Inclusion Criteria

- All Antenatal mothers who underwent voluntary universal screening either by Conventional or Rapid kit Test method; and then tested positive by confirmatory test for HIV, underwent delivery will be included in the study.

Exclusion Criteria:

- All the mothers testing negative for HIV by either Conventional or Rapid kit test method would be excluded from the study.

Tools And Techniques:

- Semistructured Questionnaire.
- Screening tests for HIV:

At ICTC Clinic: Sequential tests as follows as confirmatory test:

- COMB test HIV 1 and HIV 2 Immunodot test,
- Meriscreen HIV1 and HIV2 Whole blood finger prick test(WBFPT). It specifically identifies HIV1 or 2,

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- TREDRO HIV1-2 Antibody Test: Rapid Test for Differential Detection of Antibodies to HIV 1 and HIV 2 in human serum or plasma.

At Labour room:Screening test: Meriscreen HIV1 and HIV2 Whole blood finger prick test (WBFPT). It specifically identifies HIV1 or 2 . If screening test is positive, 5ml sample of venous blood sent to Stand alone ICTC centre at ANC clinic. Sequential testing is done as:

1.COMB test HIV 1 and 2 immunodottest: If negative; test is repeated after 3 months.Report given as "Indeterminate". If positive; 2. Meriscreen Whole Blood finger prick test is done. If report comes as positive; 3. TREDRO HIV 1- 2 Antibody test is done. HIV is confirmed if all the 3 tests are positive.

Data Collection & Interpretation: Data regarding HIV status whether positive or negative collected at time of admission in LR through interviews past ICTC report using pretested & predesigned schedule &proforma (proforma to be designed after literature review).

First contact of study participants for data collection made immediately after admission.

- If undocumented HIV status noted, rapid kit tests performed at LR.
- If positive sent to ICTC clinic for confirmatory test.
- Rescreening for all mothers previously tested negative in first trimester and those with high risk Behaviour & coming from high incidence areas to be done.
- Labour event followed for pre-term labour.
- Mode of delivery noted-Vaginal: spontaneous/or/instrumental delivery.
- LUCS- Either elective or emergency caesarean section for obstetric reasons

Follow up of mother post delivery till discharge for-Part partum fever

- Endometritis
- UTI
- Respiratory tract infections
- Other maternal morbidily including healing of episiotomy wound or LUCS wound.

Data will be verified, missing information collected from Ante Natal records if available.

Data compilation and tabulation done using a relevant application software tools.

Statistical analysis plan: Data analysed by appropriate statistical tests & methods, appropriate tables & graphs used for data representation.

RESULTS

Out of these 10720 cases, 30HIV positive mothers were admitted and delivered during this period. The incidence of HIV positive mothers being delivered at NBMC and H between March 2021 to February 2022 is 0.27%. [Table 1]

Most of the HIV positive mother belong to 21-30 years of age group i.e. 20(66.7%), followed by 31-40 years of age group i.e. 7(23.3%), and 3(10.0%) HIV positive mothers were 18-20 years of age group respectively. [Table 2]

ART was initiated in 12(40%) cases at 1-12 & 13-26 weeks of gestational age. The mean gestational age was 6.00±0.95 & 17.33±1.72, 2(6.7%). ART was startedat>27 weeks of gestational agein 2 cases; the mean gestational age was 37.50±0.70.In 4(13.3%) cases, ART was initiated before the present pregnancy. [Table 3]

Serological investigation suggested that HbsAg& HCV co infection with HIV was found in none of the cases. Only one case (3.3%) was VDRL reactive. [Table 4]

At the time of ART initiation Mean & SD value of Hb% was 11.40±46.16 and CD4 Count was 349.36±46.16. [Table 5]

At the time of delivery we have found the mean and SD value was 9.94±1.48, and CD4 count was 372.30 ±64.44 respectively. [Table 6]

Out of 12 vaginal deliveries2 cases were between 24 - ≤32 weeks of gestational age, 4 cases were >32 - ≤37weeksof gestational age, and 6 cases belonged to >37 - 42 weeks of gestational age.

Out of 17 Emergency LSCS,1 case was between24 - ≤32 weeks of gestational age, 2 cases were >32 - ≤37 weeks of gestational age, and 14 cases belonged to >37 - 42 weeks of gestational age.

Only one Instrumental Vaginal delivery (Forceps) was performed mother >32 - ≤37 weeksof gestational age. [Table 7]

All LSCS performed wereEmergency in nature and no Elective caesarean section was done in HIV positive mothers.

We have found that amongst Indication of LUCS, 4(13.3%) cases wereprepared due to Meconium stained liquor with foetal distress, 8 (26.7%) cases were Post C/S in labour, and PIH with big baby (CPD), Breech in labour, Primi with CPD, Non progress of labour, and Induction failure were found 1 case each i.e. 3.3% respectively. [Table 8]

Mean Hb-9.66 gm% was found in24 - ≤32 weeks of gestational age group cases.Hb-9.47 gm% found in >32 - ≤37 weeks of gestational age group, and Hb-10.15 gm% found in >37 - 42 weeks of gestational age group. Statistically not significant, p value was 0.565.

On the other hand, CD4 count 283.33(cell/mm^3) found in 24 - ≤32 weeks of gestational age group, CD4 count 327.57 (cell/mm^3) found in >32 - ≤37 weeks of gestational age group, CD4 Count 401.30 (cell/mm^3) found in >37 - 42 weeks of gestational age group respectively. We have found significant difference in between the groups. P value was <0.0001. This is suggestive of improved perinatal outcomes due to continuation of pregnancy till term in HIV Positive mothers with increased CD4 count. [Table 9]

Mean Baby weight -2.26±0.15 kg was found in 24 - ≤32 weeks of gestational age group. Mean Baby weight -2.37±0.25 kg was found in >32 - ≤37 weeks of gestational age group, and Mean Baby weight - 3.02±0.19 kg found in >37 - 42 weeks of gestational

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age group. It was statistically significant, p value was <0.0001. [Table 10]

Table 1: Distribution of All mothers according to Modes of delivery: Total no. of cases delivered during the period : March 2021 to February -2022: N=10720.

Mode of Delivery	No of Cases	Percentage
LSCS	5176	48.3
Vaginal Delivery	5084	47.4
Instrumental Vaginal delivery	460	4.3
Total	10720	100

Table 2: Age distribution among HIV positive mother (n=30)

Age in Year	No of Cases	Percentage
18 – 20	03	10.0
21 – 30	20	66.7
31 – 40	07	23.3
Total	30	100

Table 3: Distribution of Time of cART Initiation in HIV Positive mothers (n=30)

Time of cART Initiation	No of Cases	Percentage	Mean & SD Gestational period
Before Pregnancy	04	13.3	0.0
1-12 weeks of gestationalage	12	40.0	6.00±0.95
13-26 weeks of gestational age	12	40.0	17.33±1.72
>27 weeks of gestational age	02	6.7	37.50±0.70
Total	30	100	11.83±9.63

Table 4: Serological status of HIV Positive mothers (n=30)

Serological investigations		No of Cases	Percentage
HbsAg	Positive	00	0.0
	Negative	30	100.0
HCV	Positive	00	0.0
	Negative	30	100.0
VDRL	Reactive	01	3.3
	Non-reactive	29	96.7

Table 5: Blood Investigation recordat the time of ART initiation(n=30).

Blood Investigation	Mean	SD
Hb(%)	11.40	±46.16
CD4 Count (cell/mm^3)	349.36	±46.16

Table 6: Blood Investigation at the time of delivery (n=30)

Blood Investigation	Mean	SD
Hb(gm%)	9.94	±1.48
CD4 Count (cell/mm^3)	372.30	±64.44

Table 7: Distribution of HIV Positive mothers according to Mode of Delivery (n=30)

Mode of Delivery	No of Cases (%)	Gestational age		
		24 - ≤32 weeks(n=03)	>32 - ≤37 weeks(n=7)	>37 - 42 weeks(n=20)
Vaginal Delivery	12 (40%)	2 (66.7%)	4 (57.1%)	6 (30%)
Emergency LSCS	17 (56.7%)	1 (33.3)	2 (28.6%)	14 (70%)
Instrumental vaginal delivery (Forceps)	01 (3.3%)	0	1 (14.3%)	0
Total	30(100%)	3(100%)	7(100%)	20(100%)
Statistical Inferences	Chi-square- 6.7240 p Value-0.15			

Table 8: Distribution of Emergency LSCS done in HIV Positive mothers based on their Indications (n=17)

Indication of LSCS in HIV Positive mothers	No of Cases	Percentage
Meconium stained liquor with foetal distress	04	13.3
Post C/S in labour	08	26.7
PIH with big baby (CPD)	01	3.3
Breech in labour	01	3.3
Primi with CPD	01	3.3
Non progress of labour	01	3.3
Induction failure	01	3.3

Table 9: Distribution of Blood investigation Reports according to period of gestation in HIV Positive mothers (n=30)

Blood Investigation	Gestational age			p Value
	24 - ≤32 weeks (n=3)	>32 - ≤37 weeks (n=7)	>37 - 42 weeks (n=20)	
Hb (gm%)	9.66±0.20	9.47±1.43	10.15±1.60	0.565
CD4 Count (cell/mm^3)	283.33±30.55	327.57±49.88	401.30±50.81	<0.0001

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Table 10: Distribution of Baby weight according to period of gestation in HIV Positive mothers (n=30)

Baby Weight (Kg)	Gestational age			p Value
	24 - ≤32 weeks (n=03)	>32 - ≤37 weeks (n=7)	>37 - 42 weeks (n=20)	
	2.26±0.15	2.37±0.25	3.02±0.19	<0.0001

Table 11: Distribution of APGAR score at 1minute, of babies born to HIV Positive mothers according to period of gestation (n=30)

APGAR score at 1minute	Gestational age		
	24 - ≤32 weeks (n=03)	>32 - ≤37 weeks (n=7)	>37 - 42 weeks (n=20)
<4	2(66.7%)	2(28.6%)	0(0.0%)
4 – 7	1(33.3%)	4(57.1%)	5(25.0%)
>7	0(0.0%)	1(14.3%)	15(75.0%)
Total	3(100%)	7(100%)	20(100%)
Statistical inferances	Chi- square- 17.2544 p Value-0.001		

Table 12: Distribution of APGAR score at 5 minutes, of babies born to HIV Positive mothers according to period of gestation (n=30)

APGAR score at 5 minutes	Gestational age		
	24 - ≤32 weeks (n=03)	>32 - ≤37 weeks (n=7)	>37 - 42 weeks (n=20)
<7	2(66.7%)	3(42.8%)	1(5.0%)
>7 or 7	1(33.3%)	4(57.2%)	19(95.0%)
Total	3(100%)	7(100%)	20(100%)
Statistical inferances	Chi- square- 9.1815 p Value-0.01		

Table 13: Distribution of HIV Positive mothers according to requirement of Blood transfusion (n=30)

Blood transfusion	Gestational age		
	24 - ≤32 weeks (n=03)	>32 - ≤37 weeks (n=7)	>37 - 42 weeks (n=20)
Required	0(0.0%)	1(14.3%)	2(10.0%)
Not required	3(100.0%)	6(85.7%)	18(90.0%)
Total	3(100%)	7(100%)	20(100%)
Statistical inferances	Chi- Square- 0.4761 p Value- 0.788		

3 HIV positive mothers required blood transfusion. 1 case belonged to>32 to ≤37 weeks of gestation age group and remaining 2 cases had a gestational age >37 to 42 weeks.

Table 14: Complications after delivery

Type of Compilation	LSCS (n=17)	Vaginal delivery (n=12)
LUCS Wound site infection requiring secondary suture	02(6.7%)	NA
LRTI	02(6.7%)	Nil
Episiotomy wound infection	NA	01(3.3%)

Out of 17 LSCS cases, Lower tract respiratory infection and Wound site infection necessitating subsequent secondary suture were each observed in 2 (6.7%) patients. However, just one case of episiotomy wound infection was noted amongst the 12 vaginal deliveries conducted in HIV Positive mothers.

DISCUSSION

In the present study, most of the patients were in the age groups of 20-30 years, i.e. 20(66.7%), similar to study by Devneni and Sodumu,[13] where 73% of patients were in this age group. Study by Pandya and Patel (2015),[14] reported that 64% referred cases belonged to age group of 21-30 years, which is also comparable to our study. Gupta et al,[15] (2016) reported that 86.98% of referred cases were in this age group, much higher than our study, because maximum pregnancy occurs between 21-30 years of age group in our country, due to trend of early marriages, we get maximum referral cases in this group.

In the present study at the time of ART initiation, Mean & SD value of Hb% was 11.40±46.16 and CD4 Count was 349.36±46.[16] At the time of delivery we have found the mean and SD value was 9.94±1.48, and CD4 count was 372.30 ±64.44 respectively.

This is consistent with similar studies of Li N et al, &Takuva S et al suggest ART helps toreverse clinical anaemia among HIV positive patients. Although our study attributes the resolution of anaemia to ART use, we did not determine whether the presence of anaemia was due to pregnancy related haemodilution or due to iron deficiency. As such, we could not rule out the possibility of the positive effect of haematinic supplementation contributing to the resolution of anaemia among HIV positive pregnant women.[16,17] Another study of Methazia J et al,[18] reported At end-line (after seven months of treatment), the number of women with moderate/severe anaemia decreased significantly from 56 at baseline to 23. In addition, the number of HIV positive women with anaemia decreased from 87 at baseline to 62 seven months after starting treatment. Furthermore, the average CD4 count of women with moderate/severe anaemia increased from 124.1 to 287.3. However, across the three groups (non-anaemic, anaemia and

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moderate/severe anaemia) there was no statistically significant difference in CD4 count.

Women should receive antiretroviral therapy during pregnancy according to currently accepted guidelines for adults. Plasma HIV RNA levels in pregnant women should be monitored at the first prenatal visit; 2–4 weeks after initiating (or changing) cART drug regimens; monthly until RNA levels are undetectable; and then at least every 3 months during pregnancy. Human immunodeficiency virus RNA levels also should be assessed at approximately 34 0/7 to 36 0/7 weeks of gestation to inform decisions about mode of delivery and optimal treatment of the newborn.[19] Pregnant women infected with HIV whose viral loads are more than 1,000 copies/mL at or near delivery, independent of antepartum antiretroviral therapy, or whose levels are unknown, should be counseled regarding the potential benefit of and offered scheduled pre-laborcesarean delivery at 38 0/7 weeks of gestation to reduce the risk of mother-to-child transmission. In this situation, scheduling cesarean delivery as a medically-indicated early term delivery at 38 0/7 weeks of gestation is intended to decrease the likelihood of onset of labor or rupture of membranes before delivery.[20]

In the present study, All LSCS performed were an emergency in nature and no elective caesarean section was done in HIV positive mothers. We have found that amongst Indication of LUCS, 4(13.3%) cases were due to Meconium stained liquor with foetal distress, 08 (26.7%) cases were posted as Post C/S in labour, and PIH with big baby (CPD), Breech in labour, Primi with CPD, Non progress of labour, and Induction failure were the indications in 1 case each i.e. 3.3% respectively.Studies by Mukhopadhyay P,[21] 6% by Bhalerao et al,[22] and 26% by Dubashi SS.[23] also report Fetal distress, CPD and Contracted Pelvis to be leading causes for Cesarean Section amongst HIV mothers.

In the present study the Mean Baby weight - 2.26±0.15 kg was found in 24 - ≤32 weeks of gestational age group. Mean Baby weight -2.37±0.25 kg was found in >32 - ≤37 weeks of gestational age group, and Mean Baby weight -3.02±0.19 kg found in >37 - 42 weeks of gestational age group. It was statistically significant, p value was <0.0001. Low APGAR was found in 24 - ≤32 weeks of gestational age. Other Indian studies found the incidence of LBW babies between 33% and 39%,[24] The study undertaken by Swati Mahajan in the Asia Pacific Island reported an incidence of LBW to be 19%.[25] our study find out 33.3% cases had low birth weight.

In the present study, out of 17 LSCS performed in HIV Positive mothers,Lower Respiratory Tract infection and wound site infection necessitating subsequent suture were each observed in 2 (6.7%) patients. However, just one case of episiotomy wound infection was present among the 12 vaginal deliveries. However, HIV-infected women may have an increased risk of serious post-partum complications than uninfected women, especially after CS,[26] although this was not seen in the European mode of delivery trial.[27] Maternal morbidity after CS is 5–25 times higher than after a vaginal delivery in general populations, with greatest risk associated with emergency procedures.[28]

CONCLUSION

Our findings illustrate that maternal HIV infection increases the risk of LBW, and preterm birth among HIV positive women. This necessitates due attention while providing maternal health services particularly antenatal care and delivery services primarily for women with HIV infection. Prevention strategies aimed at reducing these adverse pregnancy outcomes should be developed and implemented. Although HIV infection is not a modifiable factor, it is possible to mitigate its impact by ending new incidence of HIV infection which may reduce LBW by 32% and preterm birth by 47%. Preconceptional counselling and testing and Antenatal screening should be targeted in the prevention process of these adverse pregnancy outcomes. Finally, monitoring the effects of HIV infection on maternal and infant health should be continued and strengthened in order to evaluate and adapt the implemented preventive and therapeutic strategies.

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