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Maternal and Perinatal Outcomes of Pregnancies Managed Under the PPTCT Programme: A Retrospective Observational Study

Vidhi Singh[*,1], Priyanka kanwaria[2], Ayushi Aggrawal[3]

Abstract

Background: Human immunodeficiency virus (HIV) infection during pregnancy remains a significant public health concern due to its impact on maternal and perinatal outcomes. The Prevention of Parent-to-Child Transmission (PPTCT) programme aims to reduce vertical transmission and improve pregnancy outcomes through early diagnosis and comprehensive antenatal care.

Objectives: To evaluate maternal and perinatal outcomes of pregnancies managed under the PPTCT programme over a five-year period and to identify factors associated with adverse perinatal outcomes.

Methods: A retrospective observational study was conducted among **460 HIV-positive antenatal women** registered under the PPTCT programme over a five-year period. Sociodemographic characteristics, obstetric profile, antiretroviral therapy (ART) status, and pregnancy outcomes were retrieved from medical records. Maternal and perinatal outcomes were analysed using descriptive statistics. Factors associated with adverse perinatal outcomes were assessed using univariate and multivariate logistic regression analysis.

Results: Anaemia was the most common maternal morbidity (41.0%). The majority of women delivered vaginally (74.3%), and no maternal deaths were recorded. Low birth weight (25.2%) and preterm birth (18.9%) were the most frequent adverse perinatal outcomes. On multivariate analysis, third-trimester antenatal registration, fewer than four antenatal visits, maternal anaemia, and preterm labour were identified as independent predictors of adverse perinatal outcomes.

Conclusion: Pregnancies managed under the PPTCT programme demonstrated acceptable maternal and perinatal outcomes. Early antenatal registration, adequate antenatal visits, and effective management of maternal anaemia and preterm labour are crucial for improving perinatal outcomes among HIV-positive women.

Keywords: PPTCT programme; HIV in pregnancy; Maternal outcome; Perinatal outcome; Retrospective study.

Introduction

HIV infection during pregnancy continues to be a major public health concern due to its implications for maternal health and perinatal outcomes. In the absence of appropriate interventions, mother-to-child transmission (MTCT) of HIV can occur during pregnancy, labour, delivery, or breastfeeding, with transmission rates ranging from 15–45% [1]. In addition to the risk of vertical transmission, HIV-positive pregnant women are at increased risk of anaemia, preterm birth, low birth weight, and other obstetric complications [2]. The

Affiliation:

Department of Obstetrics and Gynaecology, Govt Medical College Datia, India

***Corresponding author:**
Vidhi Singh, Department of Obstetrics and Gynaecology, Govt Medical College Datia, India.

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introduction of antiretroviral therapy (ART) and structured antenatal interventions has significantly reduced MTCT rates worldwide. In India, the Prevention of Parent-to-Child Transmission (PPTCT) programme was launched under the National AIDS Control Programme to ensure universal HIV screening in pregnancy, early initiation of ART, safe obstetric practices, and appropriate infant feeding counselling [3]. With the scale-up of PPTCT services, MTCT rates in programme settings have declined to below 5% in many regions [4]. Despite improved programme coverage, variations in maternal and perinatal outcomes persist across different healthcare settings. Several Indian studies have reported that adverse outcomes such as anaemia, prematurity, and low birth weight continue to occur among HIV-positive pregnant women, particularly in cases of late antenatal registration and inadequate antenatal care [5,6]. Evaluating real-world programme outcomes is therefore essential to identify gaps in service delivery and strengthen existing interventions. The present study was undertaken to evaluate maternal and perinatal outcomes of pregnancies managed under the PPTCT programme over a five-year period at a tertiary care centre.

Materials and Methods

Study Design and Setting

This was a retrospective observational study conducted at a tertiary care teaching hospital with an integrated PPTCT centre.

Study Period

Five years.

Study Population

HIV-positive antenatal women registered under the PPTCT programme and who delivered at the study centre during the study period.

Sample Size

A total of 460 eligible antenatal women were included in the study.

Inclusion Criteria

- HIV-positive pregnant women registered under the PPTCT programme
- Women who delivered at the study institution
- Availability of complete maternal and perinatal outcome records

Exclusion Criteria

- Women lost to follow-up before delivery
- Incomplete or missing medical records

Data Collection

Data were collected retrospectively from PPTCT registers, antenatal records, labour ward registers, and neonatal records. Information obtained included sociodemographic profile, obstetric history, timing of antenatal registration, ART status, and pregnancy outcomes.

Outcome Measures

- **Maternal outcomes:** anaemia, hypertensive disorders, preterm labour, mode of delivery, postpartum complications
- **Perinatal outcomes:** birth weight, gestational age at delivery, NICU admission, stillbirth, neonatal mortality

Statistical Analysis

Data were entered into Microsoft Excel and analysed using statistical software. Categorical variables were expressed as frequencies and percentages. Associations were assessed using Chi-square or Fisher's exact test as appropriate. A p-value <0.05 was considered statistically significant.

Result

Sociodemographic and Obstetric Characteristics

A total of 460 HIV-positive antenatal women were included in the study. The majority of women belonged to the 20–30-year age group (77.4%), while 22.4% were older than 30 years and only 0.2% were below 20 years of age. With respect to parity, 60.4% of the women were multigravida, whereas 39.5% were primigravida. Regarding the timing of antenatal registration, 50.4% of women registered during the second trimester, followed by 26.9% in the first trimester and 22.6% in the third trimester. A majority of the study participants (68.5%) had four or more antenatal visits, while 31.5% had fewer than four visits. Assessment of socioeconomic status revealed that most women belonged to the low socioeconomic group (61.5%), followed by the middle socioeconomic group (32.6%), with only 5.8% belonging to the high socioeconomic group.

Maternal Clinical Characteristics and Outcomes

Among the **460 HIV-positive antenatal women**, **36.3%** were already receiving antiretroviral therapy (ART) before pregnancy, while **63.6%** were initiated on ART during pregnancy. Anaemia was the most common maternal morbidity, observed in **41.0%** of women, followed by **preterm labour (16.5%)**, **hypertensive disorders (12.8%)**, and **opportunistic infections (9.7%)**. With respect to the mode of delivery, **74.3%** of women delivered vaginally, whereas **25.6%** underwent caesarean section. **Postpartum complications** were documented in **7.8%** of cases. **No maternal deaths** were recorded during the study period.

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Table 1: Sociodemographic and Obstetric Characteristics of Study Participants (n = 460)

Variable	Number (n)	Percentage (%)
Age (years)		
< 20	1	0.2
20–30	356	77.4
> 30	103	22.4
Parity		
Primigravida	182	39.5
Multigravida	278	60.4
Gestational age at registration		
First trimester	124	26.9
Second trimester	232	50.4
Third trimester	104	22.6
Number of antenatal visits		
< 4 visits	145	31.5
≥ 4 visits	315	68.5
Socioeconomic status		
Low	283	61.5
Middle	150	32.6
High	27	5.8

Table 2: Maternal Clinical Characteristics and Outcomes

Maternal Variable	Number (n)	Percentage (%)
ART status during pregnancy		
On ART before pregnancy	167	36.3
Initiated ART during pregnancy	293	63.6
Maternal morbidities		
Anaemia	189	41
Hypertensive disorders	59	12.8
Preterm labour	76	16.5
Opportunistic infections	45	9.7
Mode of delivery		
Vaginal delivery	342	74.3
Caesarean section	118	25.6
Postpartum complications		
Yes	36	7.8
No	424	92.1
Maternal mortality	0	0

Perinatal Outcomes

Of the **460 deliveries**, **25.2%** of neonates had a birth weight of **less than 2.5 kg**, while **74.7%** weighed **2.5 kg or more** at birth. **Preterm births** accounted for **18.9%** of deliveries, with the remaining **81.0%** occurring at term.

An **APGAR score below 7 at 5 minutes** was noted in **10.0%** of neonates, whereas **90.0%** had a score of **7 or above**. **NICU admission** was required for **20.8%** of neonates. The **stillbirth rate** was **1.7%**, and **neonatal mortality** was recorded in **0.2%** of cases.

Table 3: Perinatal outcomes

Perinatal Outcome	Number (n)	Percentage (%)
Birth weight		
< 2.5 kg (LBW)	116	25.2
≥ 2.5 kg	344	74.7
Gestational age at delivery		
Preterm (<37 weeks)	87	18.9
Term	373	81
APGAR score at 5 minutes		
< 7	46	10
≥ 7	414	90
NICU admission		
Yes	96	20.8
No	364	79.1
Stillbirth	8	1.7
Neonatal mortality	1	0.2

Table 4: Univariate Analysis of Factors Demonstrating Association with Adverse Perinatal Outcomes (n = 460)

Variable	Adverse Outcome n (%)	No Adverse Outcome n (%)	χ^2	p-value
Gestational age at registration				
First trimester	32 (25.8)	92 (74.2)	9.86	**0.007**
Second trimester	86 (37.0)	146 (63.0)		
Third trimester	58 (55.8)	46 (44.2)		
Antenatal visits				
< 4 visits	86 (59.3)	59 (40.7)	18.42	**<0.001**
≥ 4 visits	90 (28.6)	225 (71.4)		
Maternal anaemia				
Present	104 (55.0)	85 (45.0)	22.36	**<0.001**
Absent	72 (26.6)	199 (73.4)		
Preterm labour				
Present	62 (81.6)	14 (18.4)	44.51	**<0.001**
Absent	114 (29.6)	270 (70.4)		
Hypertensive disorders				
Present	38 (64.4)	21 (35.6)	10.92	**0.001**
Absent	138 (34.5)	263 (65.5)		

(Adverse perinatal outcome defined as presence of ≥1 of the following: low birth weight, preterm birth, NICU admission, stillbirth, or neonatal mortality)

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Table 5: Multivariate Logistic Regression Analysis of Factors Associated with Adverse Perinatal Outcome

Predictor Variable	Adjusted OR	95% CI	p-value
Third trimester registration	2.14	1.28–3.58	**0.004**
< 4 antenatal visits	2.63	1.71–4.03	**<0.001**
Maternal anaemia	2.48	1.64–3.75	**<0.001**
Preterm labour	5.92	3.01–11.63	**<0.001**
Hypertensive disorders	1.41	0.82–2.44	0.214

Discussion

This retrospective observational study evaluated maternal and perinatal outcomes among HIV-positive pregnant women managed under the PPTCT programme over a five-year period and identified factors associated with adverse perinatal outcomes. The findings demonstrate that **late antenatal registration, inadequate antenatal visits, maternal anaemia, and preterm labour** were independent predictors of adverse perinatal outcomes, highlighting key areas for targeted intervention within the PPTCT framework. In the present study, **maternal anaemia** was the most common morbidity, affecting 41.0% of women, and emerged as an independent predictor of adverse perinatal outcomes. This finding is consistent with several Indian studies that have reported a high prevalence of anaemia among HIV-positive pregnant women and its association with low birth weight and preterm birth [5,6]. Anaemia in this population is multifactorial, resulting from nutritional deficiencies, chronic infection, and socioeconomic deprivation, and remains an important modifiable risk factor. **Late antenatal registration**, particularly during the third trimester, was significantly associated with adverse perinatal outcomes. Similar observations have been reported in Indian programme-based evaluations, where delayed registration limits opportunities for early ART initiation, nutritional supplementation, and timely detection of obstetric complications [3,7]. These findings reinforce the importance of early engagement with antenatal and PPTCT services to optimise pregnancy outcomes.

The number of antenatal visits was another significant determinant of perinatal outcomes. Women with **fewer than four antenatal visits** had a significantly higher risk of adverse outcomes, even after adjustment for confounding factors. This observation is in agreement with previous Indian studies demonstrating that inadequate antenatal care is associated with increased risks of prematurity, low birth weight, and neonatal morbidity among HIV-positive women [6,8]. Adequate antenatal visits provide opportunities for monitoring maternal health, ensuring ART adherence, and implementing preventive interventions. **Preterm labour** emerged as the strongest independent predictor of adverse perinatal outcomes in the present study. This finding aligns with existing literature, where preterm labour is closely linked to prematurity, NICU admission, and neonatal morbidity, irrespective of maternal HIV status [9,10]. The association underscores the need for early identification and management of risk factors for preterm labour within the PPTCT programme. Although **hypertensive disorders of pregnancy** were significantly associated with adverse perinatal outcomes on univariate analysis, this association did not persist on multivariate analysis, suggesting that their effect may be mediated through other factors such as prematurity and maternal anaemia. Similar findings have been reported in other Indian studies evaluating high-risk pregnancies, including those affected by HIV [7,9].

The overall maternal and perinatal outcomes observed in this study were acceptable and comparable to those reported in national and regional PPTCT programme evaluations [3,4]. The absence of maternal mortality and the low rates of stillbirth and neonatal mortality reflect the benefits of institutional delivery, improved ART coverage, and coordinated obstetric–neonatal care. The strengths of this study include its large sample size, extended duration, and comprehensive evaluation of outcomes in a real-world programme setting. However, the retrospective design and reliance on record-based data limited the assessment of ART adherence, viral load trends, and long-term infant outcomes. Despite these limitations, the findings provide valuable insights into programmatic and clinical factors influencing perinatal outcomes among HIV-positive women.

Conclusion

This retrospective observational study demonstrates that pregnancies managed under the PPTCT programme have **acceptable maternal and perinatal outcomes** in a tertiary care setting. The findings highlight that **late antenatal registration, inadequate antenatal visits, maternal anaemia, and preterm labour** are key independent predictors of adverse perinatal outcomes among HIV-positive pregnant women. Early antenatal registration, adequate utilization of antenatal services, and timely identification and management of maternal anaemia and preterm labour are crucial for improving perinatal outcomes. Strengthening these components within the PPTCT framework can further enhance maternal and neonatal health and contribute to the continued reduction of HIV-related adverse pregnancy outcomes.

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