Journal of Cardiovascular Disease Research

ISSN: 0975-3583, 0976-2833 VOL14, ISSUE8, 2023

ORIGINAL RESEARCH ARTICLE

# THE PREVALENCE OF HIV INFECTION AMONG INFANTS BORN TO HIV POSITIVE MOTHERS IN BUNDELKHAND REGION OF MADHYA PRADESH: A RETROSPECTIVE OBSERVATIONAL STUDY

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**ABSTRACT**

**Background:**

HIV is a major public health problem worldwide. In 2022, approximately, 1.5 million children 0-14 years globally were HIV infected, with 0.13 million children being newly infected with HIV. One of the main sources of HIV infection in children is the transmission from mother to child which may occur during pregnancy, delivery or breastfeeding. The rate of mother to child transmission is 15-45% in the absence of any intervention. There is significant reduction with the usage of Anti-Retroviral Therapy (ART). Hence, we aimed to assess the prevalence of HIV positive infants born to HIV positive mothers in Bundelkhand region of Madhya Pradesh.

**Methods:**

A facility based retrospective cross-sectional observational study was conducted amongst the HIV exposed infants born to HIV positive mothers, from November 2018 to Feb 2022 at the ART centre, Government Bundelkhand Medical College, Sagar, Madhya Pradesh, India. Data regarding the HIV positive mothers and the infants born to HIV positive mothers was collected from the ART centre in a predesigned proforma(n=148). The collected data was compiled and analyzed by SPSS 21.0 software.

**Results:**

In the study, 112 samples were valid and considered in analysis. The prevalence of HIV positive infants born to HIV positive mothers was 1.8%. Most mothers were in the range of 19 to 47 years, whereas 56.3% of the HIV positive mothers had age below 25 years. Of the HIV positive mothers, 50% were primigravida and 36.6% were second gravida. 90.2% were from rural background. 50.9% of the mothers had received secondary education. Most HIV positive mothers (83.1%) were delivered at either Government Bundelkhand Medical College & Hospital (28.6%) or nearby Government Hospital (54.5%). 78.5% of the delivered neonates had birth weight ≥2.5 kg. Of the HIV exposed infants 40.2 % were males and 59.8%

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were females. Most mothers had good adherence to ART (n=96, 85.7%).

**Conclusion:**

The prevalence of HIV positive infants born to HIV positive mothers in Bundelkhand region of Madhya Pradesh was found to be 1.8% using the multi/triple drug regime of Anti-Retroviral Therapy. The prevalence is lower than previously reported maternal to child transmission of HIV. Effective screening of antenatal women for HIV positive status and ensuring good adherence and compliance to ART can be instrumental in reducing parent to child transmission of HIV.

**Keywords:** HIV transmission**,** HIV infection among infants, HIV positive mothers/antenatal women, Prevention of Mother to child transmission (PMTCT).

## 1. INTRODUCTION

Human Immunodeficiency Virus, HIV, is a virus that lives in and attacks the human immune cells and affects their functions. HIV is a major global public health problem claiming millions of lives so far. Globally, at the end of 2022, approximately 39.0 million people were living with HIV, with 1.3 million people becoming newly infected with HIV in 2022. Approximately, 1.5 million children aged 0-14 years were globally HIV infected. Out of them 0.13 million children were newly infected with HIV in 2022[1].

Globally, 1.2 million women and girls living with HIV become pregnant each year [1]. The burden of mother to child transmission of HIV in absence of any intervention is 15-45% [2]. Globally, 82% of the women had assess to antiretroviral therapy in 2022. Since the global shift to Highly effective, simplified interventions based on lifelong Anti-retroviral therapy, ART for pregnant women living with HIV, virtual elimination of mother to child transmission, MTCT, to lesser than 2%, has been shown to be feasible [3].

According to recent data, India harbors the third largest burden of HIV infected population in the world [4]. India has 2.401 million people living with HIV/AIDS, about 0.07 million are children living with HIV/AIDS, of which the new HIV infections were 62.97 thousand [5]. Children account for 7% of all new HIV infections. [6].

One of the main sources of HIV infection in children is the transmission from mother to child which may occur during pregnancy, delivery or breastfeeding. The mother to child transmission, MTCT rate of HIV was 24.25% in 2021[5]. In India, the mother to child transmission of HIV is 3.49% to 29.41% with a pooled MTCT of HIV prevalence to be 8.76%, as reported in various studies, although without ART they have 30% chance of being infected [7]. HIV seropositivity among the children perinatally exposed to HIV is reported to be 3.6-14%. The risk of morbidity and mortality in HIV infected children are still major health challenges.

According to NFHS-5, the women aged 15-49 years, who had comprehensive knowledge of HIV/AIDS was 21.6% in India and 18.7% in Madhya Pradesh [8]. The maternal HIV positivity detection provides the unique opportunity and modality in preventing HIV infection in children by preventing the perinatal transmission from pregnant woman with HIV to her newborn. Hence, we aimed to assess the prevalence of HIV positive infants born to HIV positive mothers in Bundelkhand region of Madhya Pradesh, at Sagar, India.

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## 2. METHODS

A facility based retrospective cross-sectional observational study was conducted for the period from November 2018 to Feb 2022 at the ART centre, Government Bundelkhand Medical College, Sagar, Madhya Pradesh, based on the records of the HIV exposed infants born to HIV positive mothers.

Data regarding the HIV positive mothers and the infants born to HIV positive mothers was collected from the ART centre in a predesigned proforma. Data of 148 samples was collected, but only 112 samples were valid. The rest were missing a few variables, hence excluded from the analysis. All infants who tested HIV DNA Test (done as DBS, dried blood spot] positive at 6 weeks and 6 months and whole blood for antibody testing positive at 18 months were considered confirmed to be HIV positive infants. All infants exposed to HIV who did not have confirmatory HIV test until end of data collection were excluded from the study.

The collected data was compiled and analyzed by SPSS21.0 software. Proportion and percentage were calculated for qualitative data. Mean and median were calculated for quantitative data. The Institutional Ethical Committee approval and clearance was taken before performing the study.

## 3. RESULTS

In the study, out of the 148 enrolled participants, 112 samples were valid and considered in the analysis.

**TABLE 1: PREVALENCE OF HIV POSITIVE INFANTS BORN TO HIV POSITIVE MOTHERS**

| HIV STATUS | FREQUENCY(N) | PERCENT (%) |
|---|---|---|
| Negative | 110 | 98.2% |
| Positive | 2 | 1.8% |
| Total | 112 | 100% |

The prevalence of HIV positive infants born to HIV positive mothers was 1.8%.

**TABLE 2: DISTRIBUTION ACCORDING TO MATERNAL AGE**

| MATERNAL AGE GROUP | FREQUENCY(N) | PERCENT (%) |
|---|---|---|
| Less than 25 years | 63 | 56.3 |
| 25 yrs and above | 49 | 43.8 |
| Total | 112 | 100 |

Most mothers were in the range of 19 to 47 years. 56.3% of the HIV positive mothers had age below 25 years while the rest 43.8% were above 25 years.

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**TABLE 3: DISTRIBUTION OF OBSTETRIC HISTORY**

| GRAVIDA | FREQUENCY(N) | PERCENT (%) |
|---|---|---|
| 1 | 56 | 50 |
| 2 | 41 | 36.6 |
| 3 | 12 | 10.7 |
| 4 | 3 | 2.7 |
| Total | 112 | 100 |

Of the HIV positive mothers, 50% were primigravida and 36.6% were second gravida,10.7% were third gravida and 2.7% were fourth gravida.

**TABLE 4: DISTRIBUTION ACCORDING TO RESIDENCE**

| LOCALITY | FREQUENCY(N) | PERCENT (%) |
|---|---|---|
| Rural | 101 | 90.2 |
| Urban | 11 | 9.8 |
| Total | 112 | 100 |

90.2% HIV positive mothers were from rural background.

**TABLE 5: DISTRIBUTION OF MATERNAL EDUCATION**

| MATERNAL EDUCATION | FREQUENCY (N) | PERCENT (%) |
|---|---|---|
| Graduate | 13 | 11.6 |
| +12 | 6 | 5.4 |
| +10 | 7 | 6.3 |
| Secondary | 31 | 27.7 |
| Primary | 55 | 49.1 |
| Total | 112 | 100.0 |

50.9% of the mothers had received secondary education, whereas 49.1% were primary educated.

**TABLE 6: DISTRIBUTION ACCORDING TO ANTENATAL FOLLOW UP DURING PREGNANCY**

| ANTENATAL FOLLOWUP | FREQUENCY(N) | PERCENT (%) |
|---|---|---|
| <16 weeks | 55 | 49.1 |
| >16 weeks | 57 | 50.9 |
| Total | 112 | 100 |

Nearly half of the HIV positive mothers (49.1%) had antenatal visits before 16 weeks of period of gestation, whereas rest half (50.9%) had antenatal visits after 16 weeks period of gestation.

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**TABLE 7: DISTRIBUTION ACCORDING TO PLACE OF DELIVERY**

| PLACE OF DELIVERY | FREQUENCY(N) | PERCENT (%) |
|---|---|---|
| BMC | 32 | 28.6 |
| Other government Hospital | 61 | 54.5 |
| Home | 12 | 10.7 |
| Private hospital | 7 | 6.3 |
| Total | 112 | 100 |

Most women had delivered at nearby government hospital (n=61,54.5%), followed by Government Bundelkhand Medical College, Sagar (n=32,28.6%). Lesser number(n=12,10.7%) delivered at home, whereas a few(n=7,6.3%) delivered at private hospitals.

**TABLE 8: DISTRIBUTION ACCORDING TO TYPE OF DELIVERY**

| TYPE OF DELIVERY | FREQUENCY(N) | PERCENT (%) |
|---|---|---|
| Caesarean Section | 19 | 17 |
| Normal vaginal | 93 | 83 |
| Total | 112 | 100 |

Most HIV positive mothers (n=93, 83%) had normal vaginal delivery. 17%(n=19) had delivered by caesarean section.

**TABLE 9: DISTRIBUTION ACCORDING TO BIRTH WEIGHT**

| BIRTH WEIGHT | FREQUENCY(N) | PERCENT (%) |
|---|---|---|
| <2.5 Kg | 24 | 21.4 |
| ≥2.5 kg | 88 | 78.5 |
| All | 112 | 99.9 |

78.5% of the neonates born to HIV positive mothers had birth weight ≥2.5 kg whereas 21.4% had low birth weight.

**TABLE 10: DISTRIBUTION ACCORDING TO GENDER**

| GENDER | FREQUENCY(N) | PERCENT (%) |
|---|---|---|
| Female | 67 | 59.8 |
| Male | 45 | 40.2 |
| Total | 112 | 100 |

Of total HIV exposed infants, 45(40.2%) were males and 67(59.8%) were females. Of the HIV exposed infants 40.2 % were males and 59.8% were females.

**TABLE 11: DISTRIBUTION ACCORDING TO TIMING OF INITIATION OF ART**

| TIME OF ART INITIATION | FREQUENCY(N) | PERCENT (%) |
|---|---|---|
| Trimester 1 | 21 | 18.8 |
| Trimester 2 | 26 | 23.2 |
| Trimester 3 | 32 | 28.6 |
| Preconceptional | 33 | 29.5 |
| Total | 112 | 100 |

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ART was started preconceptionally in 29.5%, during first trimester in 18.8%, during second trimester in 23.2% and during third trimester in 28.6%.

**TABLE 12: DISTRIBUTION ACCORDING TO ADHERANCE TO ART**

| ADHERANCE | FREQUENCY(N) | PERCENT (%) |
|---|---|---|
| Good>95% | 96 | 85.7 |
| Average 80%-95% | 3 | 2.7 |
| Poor <80% | 13 | 11.6 |
| Total | 112 | 100 |

Most mothers had good adherence to ART (n=96, 85.7%).
Adherence was poor in 11.6% of the HIV positive mothers.

## 4. DISCUSSION

The prevention of mother to child transmission is a challenge among infants of HIV positive mothers. During the study period, the prevalence of HIV positive infants born to HIV positive mothers and the transmission of HIV from mother to infant was 1.8%. This prevalence is one of the lowest among most studies. Although, there are reports of studies with low prevalence of HIV through MTCT in Dessi Town (3.8%) of Ethiopia [9], China (3.9%) [10], Ethiopia (5.5%) [11], Eastern & South Africa (6 % in 2015, from 18% in 2010) [12]. Recently, WHO has entitled Botswana with the so-called "silver-tier status" for reducing the mother-to-child HIV transmission rate to less than 5%, providing antenatal care and antiretroviral therapy (ART) to over 90% of pregnant women, and attaining a HIV case rate of less than 500 cases per 100 000 livebirths [13]. The low prevalence could be due to implementation of similar PPTCT/PMTCT programme. The current study used the modified WHO guideline (option B+) and combined multi/triple drug ART drug regime in health facility and had very good compliance and adherence of the ART regime by HIV positive mothers.

The pooled prevalence of HIV transmission from mother to child has been reported as high as 8.76% (95% CI; 5.76,12.31) [7]. This level of MTCT was corroborating with the NACO report on prevalence of HIV by MTCT in India [14]. The MTCT has come down to 8%, whereas earlier nearly 30% of children born to HIV-positive mothers were HIV seropositive in India, as per figures by the health secretary Prasada Rao [15]. An Ethiopian study showed HIV prevalence by MTCT as 9.93% closer to the pooled prevalence of India [16].

A study in South Africa reports higher prevalence of Parent to child transmission of HIV, 14% in children less than 6 weeks and 24% among babies aged 3-6 months [17]. A Ukranian study reports the MTCT rate of 10% in 2002, decreased from 30% in 2000 [18]. Studies have shown that over a quarter of all cases of mother-to-child transmission (MTCT) of HIV in the world happen in Nigeria (UNAIDS 2017; UNAIDS 2018) [19].

Differences in the prevalence of MTCT in developing and developed nations could be due to dissimilarities in sociodemographic, educational and economic profiles, availability of antiretroviral drugs, coverage of the health care system and acceptance of the PMTCT facilities by the population [20].

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In our study, 50.9% of the mothers had received secondary education. According to a study by Tiruneh et al, HIV transmission from mother to child is 1.36 times stronger among infants of uneducated mothers compared with those of educated mothers. This could be because as the educational status of mother rises, so does her understanding of mother-to-child HIV transmission [21].

We observed that nearly half of the HIV positive mothers (49.1%) had antenatal visits before 16 weeks of period of gestation, whereas rest half (50.9%) had antenatal visits after 16 weeks period of gestation. According to the multivariable analysis by Tiruneh et al, the factors strongly associated with HIV infection were regular antenatal care visits, place of delivery, infant feeding practice and educational status of mothers [21]. Ebuy et al reported that ANC visits allows early detection and the beginning of antiretroviral therapy for HIV positive mothers, as well as continuous counseling for institutional delivery preparation throughout follow-up [22].

Most HIV positive mothers (83.1%) were delivered at either at Government Bundelkhand Medical College & Hospital (28.6%), nearby CHC/PHC Government Hospital (54.5%), while 10.7% were home delivered. Daniels et al reported that infants born at home had a 2.24 times greater chance of contracting the virus than those born in a hospital. HIV exposed newborns would be able to receive ART prophylaxis as soon as they were born, reducing their chances of contracting the virus[23].

In our study, most (83%) HIV positive mothers had normal vaginal delivery while 17% had delivered by Caesarean section. The studies reported from Africa and Europe exhibit that a baby born through elective cesarean delivery can strongly prevent HIV transmission from the mother [16,17].

In our study, 90.2% of the HIV positive mothers were from rural background. 78.5% of the delivered neonates had birth weight ≥2.5 kg. Birth weight plays a significant role as HIV positive mothers had higher prevalence of low-birth-weight babies. As reported by Fentie et al, prevalence of LBW among HIV positive mothers is 17.7% against an overall prevalence of 13.9%. Also, they reported that rural residence, PROM during current pregnancy and gestational age <37 weeks were significantly associated with LBW [24].

There was female preponderance in the cases of deliveries, n=67, 59.8 whereas males contributed to n= 45, 40.2% cases of HIV infected neonates. Similar observations have been made in various studies although a few others report male preponderance.

ART was started preconceptionally in 29.5%, during first trimester in 18.8%, during second trimester in 23.2% and during third trimester in 28.6%. Measures to reduce the mother to child transmission of HIV include ART prescribed throughout pregnancy, suppressed viral load, and administration of ART to the newborn after birth. These reduce the chances of transmitting HIV to the newborn to less than 1% [21,25].

In our study, most mothers had good adherence to ART (n=96, 85.7%). Prabhu et al suggest that overcoming barriers to testing and adherence through the development of differentiated care models and providing psychosocial support will be key in reaching populations at high risk of presenting with advanced HIV [26]. Mother's poor adherence to ART was associated with HIV positivity of infant at 18th month antibody testing. Being rural resident, being low birth weight, and not receiving ARV prophylaxis were the factors that enhance the overall HIV positivity. Timely infant testing, counselling on feeding options and

ISSN: 0975-3583, 0976-2833 VOL14, ISSUE8, 2023

adherence should be intensified, and prevention of mother-to-child transmission in rural areas should be strengthened [23].

Infants who received mixed breastfeeding were at more than 5 times higher risk than those who received only breastfeeding. This could be due to food contamination during preparation or feeding, resulting in gastrointestinal infection and laceration, causing mucosal barrier breakage and subsequent viral entry into the bloodstream, leading to the progression of HIV infection progression. The observed mixed feeding practice that may be influenced by mothers' lack of knowledge about the sufficiency of breastfeeding to meet the nutritional demands of their (6-month) infants might contribute to the observed feeding malpractice [21].

The limitations of this study were smaller sample size and retrospective nature of the study.

## 5. CONCLUSION

The prevalence of HIV positive infants born to HIV positive mothers in Bundelkhand region of Madhya Pradesh was found to be 1.8% using the multi/triple drug regime of Anti-Retroviral Therapy. This is a lesser prevalence than previously reported maternal to child transmission of HIV. Effective screening of antenatal women for HIV positive status and ensuring good adherence and compliance to ART can be instrumental in reducing parent to child transmission of HIV.

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