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Prevalence of Human Immunodeficiency Virus 1 Infection and its Associated Factors Among Exposed Infants at Shegaw Motta General Hospital, Ethiopia

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Abstract

Background: Human Immunodeficiency Virus (HIV) is a leading cause of death and a significant burden of disease. The primary route through which HIV infects children worldwide is vertical transmission. Morbidity and mortality among infants exposed to HIV remain major health issues in Ethiopia. Therefore, the aim of this study was to assess the prevalence of HIV-1 infection and its associated factors among exposed infants at Shegaw Motta General Hospital in Ethiopia.

Methods: A hospital-based cross-sectional study was conducted on exposed newborns at Shegaw Motta General Hospital from September 1, 2022, to July 30, 2023. The study participants were selected using the sequential convenience sampling technique. Whole blood samples were collected from both the mothers and babies. Laboratory testing was carried out using standard operating procedures such as viral load, cluster of differentiation 4 counts, and early newborn diagnosis, were used to conduct laboratory testing. The data were entered EpiData version 3.1 and analyzed using SPSS version 23. Bivariate and multivariate logistic regressions were then performed to identify associated factors ($P < 0.05$).

Results: Out of 155 newborns, approximately 79 (50.9%) were females, and 87 (56.1%) lived in urban areas. The majority of babies 88 (56.8%) were born to mothers who were illiterate with maternal ages ranging from 25 to 34 years (138, or 89.0%). The overall prevalence of HIV 1 infection among exposed infants was 6 (3.87%) with at 95% CI fell between 2.9% to 8.2%. Factors associated to HIV 1 infection among exposed infants included pregnant women who did not receive antenatal care (AOR = 7.281, P = 0.001), delivered at home (AOR = 3.239, P = 0.001), did not receive antiretroviral prophylaxis (AOR = 9.213, P = 0.001), did not provide nevirapine prophylaxis to their infants (AOR = 2.560, P = 0.007), and had a high maternal viral load (AOR = 5.120, P = 0.004).

Conclusion: The risk of HIV-1 infection among exposed infants remains high (3.87%) particularly among pregnant women who did not receive antenatal care follow-up, delivered at home, had a high maternal viral load, did not receive antiretroviral prophylaxis, and did not provide nevirapine prophylaxis to their infants. To prevent HIV infection among exposed infants, health facilities should enhance Prevention of Mother–to-Child Transmission (PMTCT) services by providing maternal antiretroviral prophylaxis, promoting antenatal care services, early screening of maternal viral load, and increasing skilled delivery.

Keywords: HIV Infection, Associated Factors, Exposed Infants Ethiopia

Background

One of the leading causes of mortality and disease burden is human immunodeficiency virus (HIV)/acquired immunodeficiency syndrome (AIDS) [1]. The main source of HIV infection in children is vertical transmission, with an estimated 2000 vertically acquired HIV infections occurring daily worldwide, mainly in Eastern Europe and Central Asia [2]. However, in 2011, around 330,000 children worldwide were diagnosed with HIV, with over 90% of these infections occurring in sub-Saharan Africa accounting through mother-to-child transmission [3].

Ethiopia is one of the priority nations facing the challenge of HIV transmission from mother to child, where three out of every five children born to HIV-positive women still contract the virus [4,5]. HIV-1 infection in babies is primarily transmitted through mother to child transmission (MTCT) [6]. There are three main ways in which MTCT of HIV 1 can occur: intrauterine (IU), intrapartum during labor and delivery, and postpartum through breastfeeding, are the three ways in which MTCT of HIV-1 can occur [7,8].

To prevent MTCT of HIV 1, public health measures should be implemented. These measures include preventing nipple lesions, mastitis, and infant thrush, reducing the duration of breastfeeding for all HIV-1-infected mothers, avoiding breastfeeding entirely for high-risk individuals, and preventing HIV-1 transmission to nursing mothers. Additionally, prenatal antiretroviral treatments should be administered [9].

The presence of integrated viral deoxyribonucleic acid (DNA) in mothers' milk cells is associated with HIV-1 infection in breastfed children born to infected mothers. Breast milk containing IgM and IgA anti-HIV-1 agents may provide some protection against the virus's postnatal spread [10]. However, current international guidelines recommend that HIV-infected mothers to avoid breast feeding when safe, economical, sustainable, and acceptable replacement feeding options are accessible [11].

Early infant diagnosis (EID) and the provision of appropriate care and treatment could have prevented the majority of HIV-related fatalities in children. The risk of transmission to newborns has been reduced by 40-50% due to interventions such as the use of antiretroviral (ART) medications by infected pregnant women, safe delivery procedures, and safe infant feeding [12]. Antibody tests are unreliable for detecting HIV in newborns or toddlers younger than 18 months because of passively transmitted maternal HIV-1 antibodies, which may remain in the child's circulation until that time [12,13]. Instead, polymerase chain reaction (PCR), like EID, offers a practical way to evaluate PMTCT programs and detect HIV-infected infants early [14]. Due to its high sensitivity and specificity, PCR has been extensively used for HIV diagnosis in exposed infants and for identifying infection from birth [15].

The average mother-to-child transmission (MTCT) rate of HIV in Ethiopia is 18%, ranging it among the top ten nations in the world with the highest burden of HIV-1 infection in children [16,17]. As a result, the primary health concern in Ethiopia remains to be child morbidity and mortality among infants exposed to HIV [18]. However, further research is necessary on HIV-1 and its related variables in children born to women with HIV. Therefore, this study aimed to assess the prevalence of HIV-1 and its associated factors in infants born to HIV-positive mothers at Shegaw Motta General Hospital in Ethiopia.

Materials and Methods

Study Area, Design, and Period

Shegaw Motta General Hospital (SMGH), located in the East Gojjam zone of the Amhara regional state in Ethiopia, was the site of a hospital-based cross-sectional study. SMGH is situated 370 kilometers from Addis Ababa, Ethiopia's capital city, and 120 kilometers from Bahir Dar. Over 1.5 million people have benefited from SMGH services. This study was conducted between September 1, 2022, and July 30, 2023.

Study Population and Participants

This study included all infants under 12 months of age born to mothers with HIV. The participants were HIV-exposed infants who attended the PMTCT clinic at Shegaw Motta General Hospital and provided blood samples during the designated study period.

Sample Size and Sampling Technique

Using the single population proportion calculation, the sample size was determined by considering the 11.4% pooled prevalence of HIV-positive newborns born to HIV-positive mothers in Ethiopia [19]. This calculation assumed a 95%

confidence interval (Z = Zα/2 = 1.96) and a margin of error (d = 5% = 0.05). The sample size was then calculated as follows:

$$N = (Z_{\alpha/2})^2 p (1-p)/ d^2 = 155$$

Therefore, a successive convenience sampling procedure was used to select a minimum of 155 study participants.

Eligibility Criteria

This study included all infants born to HIV-positive mothers who were enrolled in the PMTCT clinic at Shegaw Motta General Hospital. However, it did not include infants who were exposed to HIV but were in severe condition and whose parents refused to give consent.

Data Collection and Processing

The lead investigator and a trained midwife were responsible for collecting the data. They used a semi structured, pretested Amharic version of the questionnaire to gather sociodemographic and related data through in-person interviews with the parents of the study participants, once consent was obtained. Before conducting the interviews, parents were thoroughly informed about study`s purpose at each data collection site.

Blood Sample Collection, Transportation and Storage

A minimum of 100 µl of whole blood sample was collected via an ethylene diamine tetraacetate (EDTA) test tube according to the manufacturer's instructions at the heel or toe site of infants born to HIV-positive mothers [20]. The collected whole blood was immediately transported from the PMTCT clinic to the microbiology laboratory of Shegaw Motta General Hospital for examination. Due to Cepheid being busy and unable to perform the GeneXpert MTB/RIF tests immediately, the samples were stored at temperature of 2–8°C, 15–30°C, and 31–35°C for up to 72, 24, and 8 hours, respectively [21].

Additionally, 5 mL of whole blood was collected from the mother using an EDTA K3 plasma separating tube (PPT). The tube was incubated for 4-12 hours and then centrifuged at 3000 rpm for 3 minutes to separate the 1-2 mL of plasma from red blood cells. The separated plasma was stored at 2-8°C for one week since it was not tested immediately. The sample was then transported to Debre Markos Comprehensive Specialized Hospital (DMCSH), Molecular Biology Laboratory at 2-8°C using a triple packaging system to determine the maternal viral load.

Laboratory Testing

Early Infant Diagnosis (EID) Via the GeneXpert HIV-1 Qual Assay

In the newly updated algorithm, samples that are nonreactive or indeterminate in the differentiation assay are tested with an HIV-1 nucleic acid amplification (NAAT) test for resolution. The Xpert HIV-1 Qual assay is a new NAAT assay approved for the identification of HIV infection in whole blood [21]. GeneXpert HIV-1Qual assays were conducted according to the manufacturer's recommendations. Early infant diagnosis (EID) can be performed using the GeneXpert HIV-1 Qual Assay on the GeneXpert system machine (Cepheid) by trained laboratory personnel during the study period. The GeneXpert® HIV-1 Qual is a molecular cartridge-based assay that detects total nucleic acid (DNA and RNA) and provides a qualitative result (HIV detectable or undetectable) [22,23].

The GeneXpert HIV Qual cartridge was labeled with the identification of the collected blood sample. After opening 750 µl of sample reagent was transferred using the provided pipette in the kit. The whole blood was mixed well by inverting the EDTA tube containing the blood at least seven times. Approximately 100 µl of whole blood was then transferred immediately using the provided pipette in the kit or a calibrated automatic pipette into the same sample chamber of the GeneXpert HIV Qual cartridge, and the lid was firmly closed. The prepared GeneXpert HIV Qual cartridge was run by starting the test on the GeneXpert machine, and the resulting output was interpreted and recorded as "HIV-1 detected" or "HIV-1 not detected," which was displayed on the computer connected to the GeneXpert system machine (Cepheid) after 90 minutes [24].

Cluster of Differentiation 4 (CD4) Counts

Maternal CD4 counts were determined using the FACS Presto Machine. One drop (40 µl) of the collected 5 ml of maternal blood was incubated with the viral load samples on the CD4 cartridge for 18 minutes. The resulting CD4 count was recorded and then analyzed for its correlation with HIV infection among exposed infants.

Maternal Viral Load Determination

Five milliliters of whole blood were collected from the mother using an EDTA-K3 plasma separating tube (PPT). The sample was then incubated for 4-12 hours and centrifuged at 3000 rpm for 3 minutes to separate 1-2 ml of plasma from red blood cells. The separated plasma was stored at 2–8°C for a week due to delay testing.

The plasma was later transported to Debre Markos Comprehensive Specialized Hospital, Molecular Biology Laboratory, at 2-8°C using a triple packaging system. This was done to determine the maternal viral load. The viral load was determined using PCR (Roche Diagnostics GmbH, Mannheim, Germany). The result, whether high or low, were recorded

and assessed for their association with HIV infection in infants.

Quality Control

To ensure consistency in word meanings, the structured questionnaires were initially written in English, then translated into Amharic, and finally back into English. A BSc midwifery was trained to collect clinical and sociodemographic data, with approximately eight (5%) of the questionnaires being pretested at the Motta Health Center. The expiration date of the GeneXpert HIV-1Qual cartridges was monitored, and the Cepheid system machine was calibrated annually.

Following the activation of the FACS Presto CD4 Machine, quality control for CD4 T cells was conducted daily, comparing results to standard reference ranges. Precision was assessed by comparing control sample results to the manufacturer's recommended range. Quality control for viral load determination involved analyzing a sample, typically commercial, with a predetermined high value before routine the laboratory procedures.

Data Processing and Analysis

EpiData 3.1 was utilized for data entry, the data, and SPSS 20 (Statistical Package for Social Sciences) was employed data analysis. Descriptive statistics were used to determine the prevalence of HIV-1. To identify factors associated with HIV-1 infection among exposed newborns, a multivariable logistic regression analysis was conducted including variables with $p < 0.25$ from the bivariable logistic regression. A P value < 0.05 was considered indicative of a statistically significant association.

Ethical Considerations

The administrative office of Shegaw Motta General Hospital provided ethical clearance and approval letter with reference number SMGH 534/94/72. In accordance with the Declaration of Helsinki, written consent was obtained from the parents or legal guardians of the study participants. Additionally, all participants were recruited voluntarily by their parents or legal guardians, and their identities were coded for confidentiality. Finally, all newborns with HIV were referred to the hospital's ART clinic for further care.

Operational Definitions

- **GeneXpert HIV-1 Qual Assays:** The GeneXpert® Instrument System is a qualitative in vitro diagnostic test designed to detect human immunodeficiency virus type 1 (HIV-1) total nucleic acids via human venous whole blood and capillaries from individuals suspected of having HIV-1 infection in infants.
- **Infants:** Infants or babies who are less than 12 months of age and cannot produce their own serological detectable antibodies against HIV.
- **HIV-1-Exposed Infants:** Infants born to HIV-positive mothers or women.

Results

Sociodemographic Characteristics of the Study Participants

A total of 155 infants were recruited for the current study. Approximately more than half, 79 (50.9%), were female, with the remaining infants being male. Additionally, the majority of infants 87 (56.1%), 87 (56.1%), 123 (79.4%), 138 (89.0%), and 148 (95.5%) were born to mothers who could not read and write, urban residents, self-employed, aged 25-34 years old, and married mothers, respectively. Approximately 90 (58.1%) infants were less than 6 months old, while the remaining 65 (41.9%) were between 6-12 months old in the current study (Table 1).

Variable	Categories	Frequency	Percent (%)
Gender of infant	Male Female	76 79	49.1 50.9
Residence	Urban Rural	87 68	56.1 43.9
Maternal education	Unable to read and write Primary & above	87 68	56.1 43.9
Maternal age (in years)	< 25 25–34 ≥35	6 138 11	3.9 89.0 7.1
Maternal marital status	Not married Married	7 148	4.5 95.5
Maternal occupation	Housewife Government employee Self-employed	24 8 123	15.4 5.2 79.4
Infant age (in months)	<6 months 6- 12months	90 65	58.1 41.9

Table 1: Sociodemographic Characteristics of the Study Participants at Shegaw Motta General Hospital from September 1, 2022, to July 30, 2023

Prevalence of HIV-1 Among Exposed Infants

The GenXpert HIV-1 Qual assay (EID) was used to test for HIV infection in 155 infants who had been exposed to HIV. According to the current study, the total prevalence of HIV-1 infection among exposed infants was 6 (3.87%), with a 95% confidence interval of 2.9--8.2 (Figure 1).

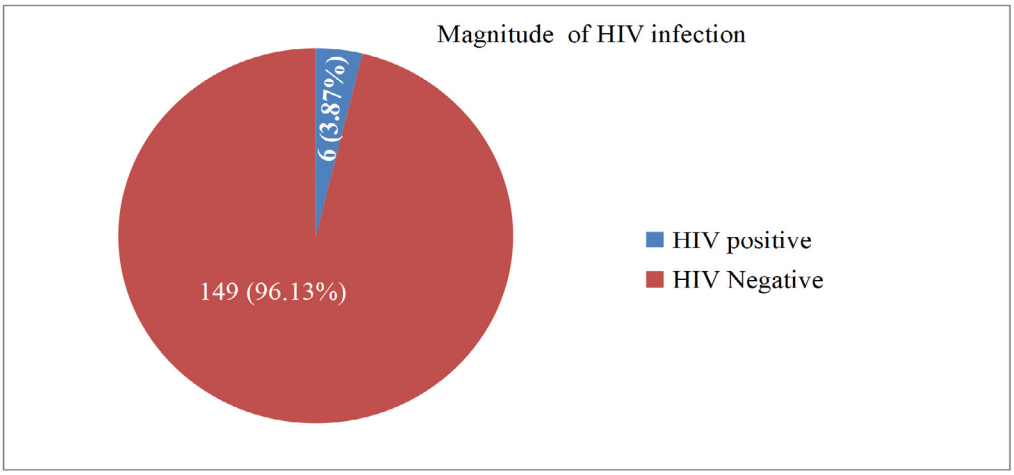

Figure 1: EID Positivity and Negativity for HIV-1 Among Exposed Infants at Shegaw Motta General Hospital

Factors Associated with HIV-1 Infection Among Exposed Infants

In relation to bivariable logistic regression analysis, the following variables were entered into multivariable logistic regression analysis: residence, maternal education level, antenatal care (ANC) follow-up, maternal antiretroviral therapy (ART) enrollment, place of delivery, infant age at enrollment, attending delivery, maternal antiretroviral (ARV) prophylaxis, infant nevirapine (NVP) prophylaxis, maternal CD4+ (cell/mm³), and maternal viral load (p value < 0.2). Accordingly, multivariable logistic regression analysis revealed that high maternal viral load (>1000 copies) (AOR = 5.120, 95% CI: 2.75--11.18, P = 0.004), home delivery (AOR = 3.239, 95% CI: 1.75--9.19, P = 0.001), not receiving ARV prophylaxis (AOR = 9.213, 95% CI: 2.95--10.11, P = 0.001), and not consuming NVP prophylaxis (AOR = 2.560, 95% CI: 1.98--10.24, P = 0.007) were significantly associated with HIV infection among infants born to HIV-positive mothers.

Consequently, the odds of HIV infection were 7.281, 3.239, 9.213, 2.560, and 5.120 times greater for infants born to HIV-positive mothers who did not receive ANC follow-up, home delivery, or ARV prophylaxis, respectively; the infant did not receive NVP prophylaxis, and the maternal high viral load (>1000 copies) was greater in this study (Table 2).

Variables	**Categories**	**HIV1**		**COR(95%CI)** *P value*	**AOR(95%CI)**	*P value*
		Positive N (%)	Negative N(%)			
Gender of infant	Male Female	2(2.6) 4(5.4)	74(97.4) 71(94.6)	1 2.324(0.69-5.61)0.720		
Infant age (in months)	<6 months 6- 12months	6 (6.7) 0(0)	84 (93.3) 65 (100)	1.653(0.812-7.921)0.431 1		
Residence	Urban Rural	4(3.4) 2(2.9)	83(96.6) 66(97.1)	1 3.12 (1.45-5.11)0.102*	1 2.51(0.69-4.67)	 0.145
Maternal education	Unable read and write Primary & above	3(3.4) 3(4.5)	85(96.6) 64(95.5)	1.78(2.14-4.76)0.019* 1	3.16(0.43-5.89) 1	0.205
Maternal age (in years)	< 25 25–34 ≥ 35	0 (0) 4 (3.0) 2 (18.2)	6 (100) 131 (97.0) 9 (81.8)	1 0.729(0.31-1.73)0.473 1.545(0.47-5.12)0.478		
Maternal marital status	Not married Married	1(14.3) 5 (3.4)	6(85.7) 143(96.6)	1 1.714(0.72-4.11)0.427		
Maternal occupation	Housewife Self-employed Government employee	2(8.3) 3 (2.5) 1(12.5)	22 (91.7) 120 (97.5) 7(87.5)	0.857(0.31-2.43) 0.367 1.6490.418-3.24) 0.771 1		
ANC follow up	Yes No	2 (2.7) 4 (5.0)	73 (97.3) 76 (95.0)	1 10.615(4.40-25.61)0.001*	1 7.281(2.53-20.96)	 0.001**

Maternal ART enrollment	Enrolled Not enrolled	2 (1.5) 4 (23.3)	135 (98.5) 14 (77.7)	1 16.179(4.58-57.22)0.001*	1 6.985(0.61-28.91)	0.195
Place of delivery	Home Health facility	2(3.9) 4 (3.8)	49 (96.1) 100(96.2)	4.681(1.78-12.29) 0.002* 1	3.239(1.75-9.19) 1	0.001**
Infant Feeding pattern	EBF ERF MF	0(0) 2(3.8) 4(5.0)	23(100) 50(96.2) 76(95.0)	1 2.857(0.91-4.43) 0.367 1.649(0.518-8.24) 0.571		
Infant's age at enrollment	≤ 6 weeks >6 weeks	2(2.0) 4 (7.6)	100(98.0) 49 (92.4)	1 4.681(1.78-12.29) 0.002*	1 5.219(0.65-14.29)	0.327
Maternal ARV intervention	Before delivery During/after delivery No	1(2.6) 2(2.2) 3 (11.1)	38(97.4) 87(97.8) 24(88.9	1 1.857 (0.31-6.43) 0.367 4.649(0.418-7.24) 0.771		
Attendant of delivery	TBA Skilled delivery	3(2.9) 3 (5.7)	99(97.1) 50 (94.3)	4.381(1.68-11.29) 0.001* 1	4.239(0.75-9.19) 1	0.512
Maternal ARV prophylaxis	Not Received Received	4(11.1) 2(1.7)	32(88.9) 117 (98.3)	5.418(2.37-12.41) 0.001* 1	9.213(2.95-10.11) 1	0.001**
Infant NVP prophylaxis	Yes No	2(2.2) 4(6.4)	90(97.8) 59(93.6)	1 4.681(1.78-12.29) 0.002*	1 2.560(1.98-10.24)	0.007**
Maternal CD4+ (cell/mm3)	< 200 ≥ 200	5(31.2) 1(0.7)	11(68.8) 138 (99.3)	1 5.418(2.37-12.41) 0.001*	1 9.213(0.95-10.11)	0.354
Maternal viral load	<1000copies (Low) ≥ 1000 copies) (High)	2(1.4) 4 (28.6)	139(98.6) 10(71.4)	1 4.681(1.78-12.29) 0.002*	5.120(2.75-11.18)	0.004**

Keywords:* = variables entered into multivariate regression (P value < 0.2),** = statistically significant association; ANC: antenatal care; AOR: adjusted odds ratio; ART: antiretroviral therapy; ARV: anti-retroviral; CD4- cluster of differentiation -4; CI: confidence interval; COR: crude odds ratio: EBF: exclusive breast feeding; HIV: human immunodeficiency; MF: mixed feeding; NVP: nevirapine; TBA: traditional birth attendant

Table 2: Bivariable and Multivariable Logistic Regression Analysis of Factors Associated with HIV-1 Infection Among Exposed Infants at Shegaw Motta General Hospital Town, Ethiopia, from September 1, 2022, to July 30, 2023

Discussion

In the present study, 3.87% of the children born to HIV-positive mothers had HIV-1 infection. This result was consistent with research carried out in various regions of Ethiopia, including Dessie Town Public Health Facilities (3.8% [25]), Pastoralist Health Facilities, South Omo Zone (5.3% [26]), East and West Gojjam Zone (5.9% [27]), University of Gondar Specialized Hospital (5.5% [28]), East Africa (7.68% [29]), and Kenya (3.3% [30]).

The HIV-1 infection rate in our study was lower than the pooled prevalence of 11.4% reported in Ethiopia [19], 9% reported in Sidama [31], 10.1% reported in the Amhara Region [32], and 9.9% reported at public health facilities in Bahir Dar city [33]. This discrepancy might result from differences in ART and PMCT follow-up, HIV knowledge, HIV control and prevention policies and programs, methodologies, and sample sizes. In contrast, it was marginally higher than 1.5%, 1.6%, 2.7%, and 2.1%, compared with studies in France [34], Ukraine [35], Rwanda [36], and the Tigray regional state, Northern Ethiopia [37], respectively. This discrepancy might result from the great coverage of PMTCT interventions in industrialized nations and the low quality of services, lack of awareness, and restricted access in developing nations such as Ethiopia.

According to the current study's multivariable logistic regression analysis, mothers who did not receive ANC follow-up had a significantly greater MTCT of HIV-1 (AOR = 7.281, 95% CI: 2.53 – 20.96, P = 0.001). In contrast, mothers who skipped ANC follow-up had a 7.281-fold greater risk of infecting their babies with the virus than mothers did. Studies carried out in Rwanda [38], Ethiopia [39], Gondar city health institutions, Northwest Ethiopia [40], and Dessie town public health facilities [41] all concurred with this conclusion.

Similarly, home delivery was a significant factor linked to MTCT of HIV-1 infection (AOR = 3.239, 95% CI: 1.75 – 9.19: P = 0.001)). As a result, babies born at home were 3.239 times more likely to have the virus than babies born in hospitals

were. This result was consistent with studies in East Africa [42], rural Uganda [43], southwestern Ethiopia [44], Dire Dawa [45], southern Ethiopia [46], Northwest Ethiopia [47], Gondar city health institutions [40], the South Gondar zone [48], and the Bahir Dar administration [49]. This could be because mothers with unknown HIV status who gave birth at a medical institution were tested for the virus, and if the results were positive, mothers and their babies received ARV treatment right away. This strong correlation may also be supported by mothers' prenatal care along with safe delivery techniques and proper postpartum care in medical facilities.

However, compared with mothers who received ARV prophylaxis, those who did not (AOR = 9.213, 95% CI: 2.95-10.11, P = 0.001) had a 9.213-fold greater chance of giving birth to HIV-positive infants. This result was consistent with research conducted in Vietnam [50], East Africa [42], Uganda [43], Northwest Ethiopia [47], and Ethiopia, including Mekele city [51], North Wollo Zone health facilities [52], and the Bahir Dar administration [49]. This could be because taking ARV medication lowers the mother's viral load and lowers the chance that the virus will infect her unborn child. Additionally, this study revealed that infants who did not receive NVP prophylaxis at birth had a 2.560-fold greater risk of being HIV positive (AOR = 2.560, 95% CI: 1.98–10.24, P = 0.007) than infants who did. This result was in line with other studies published in southern Ethiopia [55], Brazil [53], Uganda [54], Dire Dawa [45], and the Ethiopian Public Health Institute [56, 57]. This might be because NVP, a nonnucleoside reverse transcriptase inhibitor, suppresses viruses by binding to reverse transcriptase and preventing DNA polymerase activities that depend on RNA and DNA, including HIV replication.

Finally, among exposed infants, high maternal viral load (>1000 copies) was the factor most strongly linked to HIV infection (AOR = 5.120, 95% CI: 2.75–11.18, P = 0.004); infants born to mothers with high viral loads were 5.120 times more likely to have HIV than infants born to mothers with low viral loads were. A result was consistent with research conducted in northeastern South Africa [61], Gaza Province—Mozambique [60], Uganda (54), Rwanda [38], India [58], and Philadelphia [59]. This could be because of the high concentration of the virus, which can weaken the mother's immune system and cause HIV to be transmitted vertically to babies. One of the study's shortcomings was its limited sample size, which may have led to an underestimation of the prevalence of HIV-1 infection among exposed infants.

Conclusion

The risk of HIV-1 infection among exposed infants remains high (3.87%) particularly among pregnant women who did not receive antenatal care follow-up, delivered at home, had a high maternal viral load, did not receive antiretroviral prophylaxis, and did not provide nevirapine prophylaxis to their infants. To prevent HIV infection among exposed infants, health facilities should enhance Prevention of Mother–to-Child Transmission (PMTCT) services by providing maternal antiretroviral prophylaxis, promoting antenatal care services, early screening of maternal viral load, and increasing skilled delivery.

Abbreviations

AOR–adjusted odd ratio, ART- Antiretroviral therapy, ARV-antiretroviral, ANC-Antenatal Care, COR- Crude odd ratio, DNA- Deoxy-ribose nucleic acid, EDTA- ethylenediamine tetra acetylene, EID- early infant diagnosis, HIV- Human immunodeficiency virus, NAAT- nucleic acid amplification, NVP-nevirapine, PCR- polymerase chain reaction, PMTCT - prevention of mother-to child transmission, MTCT- mother-to-child transmission, RNA-ribose nucleic acid

Declarations

Ethics Approval and Consent to Participate

With reference number SMGH 534/94/72, the administrative office of Shegaw Motta General Hospital provided ethical clearance and an approval letter. In compliance with the Declaration of Helsinki, written consent was also acquired from the parents or legal guardians of the study participants. Additionally, all study participants were recruited voluntarily by their parents or legal guardians, and their identities were coded rather than named to maintain confidentiality. Finally, all newborns with HIV were connected to this hospital's ART clinic for additional care.

Consent of Publication

Not Applicable

Availability of Data and Materials

The data supporting the conclusion of the study are available upon the request of Destaw Kebede (correspondence author; mobile +251911594675/+251910325086, email: amaueldestaw@gmail.com)

Competing Interest

The authors declare that they have no competing interests.

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Author Contributions

DK, FG and KE wrote the main manuscript text and contributed to the conception and design, acquisition of the data, and analysis and interpretation of the data; GZ had a role in drafting the article and critically revising it for important intellectual content; AF prepared the figures and approved the final manuscript version to be published; and agreed to be accountable for all aspects of this work. All the authors reviewed this manuscript before its submission to be published.

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