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**FEATURES OF VERTICAL TRANSMISSION OF HIV INFECTION FROM MOTHER
TO CHILD (LITERATURE REVIEW)**

Atabekov N.S., Yunusov M.M., Atakhazhiyev M.S., Atakhazhiyeva Yo.N.

Committee for Sanitary and Epidemiological Welfare and Public Health under the Ministry of
Health of the Republic of Uzbekistan
Andijan Branch of Kokand University

Annotation: This article describes the origin, transmission routes, and spread of HIV infection among the global population, as well as its occurrence among pregnant women and the peculiarities of the antenatal period. It also includes comparative and analytical data based on statistics provided by the World Health Organization (WHO). Additionally, the role of breast milk in the vertical transmission of HIV infection, the use of artificial formula, and the results of scientific studies conducted by global researchers are presented. It has been proven by various sources that breastfeeding by mothers infected with HIV significantly increases the risk of transmitting the infection to the infant through breast milk.

Keywords: HIV infection, pregnant women, newborns, breastfeeding, vertical transmission, mothers, children, breast milk

**ОСОБЕННОСТИ ВЕРТИКАЛЬНОЙ ПЕРЕДАЧИ ВИЧ-ИНФЕКЦИИ ОТ МАТЕРИ
К РЕБЕНКУ (ОБЗОР ЛИТЕРАТУРЫ)**

Аннотация: В статье рассматриваются вопросы возникновения и распространения ВИЧ-инфекции в мире, основные пути передачи вируса, а также особенности эпидемиологической ситуации среди беременных женщин. Особое внимание уделено антенатальному периоду у ВИЧ-инфицированных матерей. Проведён анализ статистических данных Всемирной организации здравоохранения, отражающих актуальные тенденции по ВИЧ. Освещено значение грудного вскармливания как одного из факторов вертикальной передачи ВИЧ-инфекции, а также эффективность использования искусственных молочных смесей. Представлены результаты научных исследований, подтверждающих высокий риск передачи ВИЧ новорождённым при кормлении грудным молоком от инфицированных матерей.

Ключевые слова: ВИЧ-инфекция, беременные женщины, новорождённые, грудное вскармливание, вертикальная передача

INTRODUCTION

The Human Immunodeficiency Virus (HIV) has encompassed all regions of the world and currently stands as one of the primary challenges facing the World Health Organization (WHO) and the United Nations (UN) [1,5,8]. Looking back at the history of HIV infection, it appeared in human life in the 1980s. The problem of its spread remains relevant today, representing one of the most serious threats to human life expectancy and safety. This, in turn, makes HIV infection one of the most critical and pressing public health issues [8,9,14].



According to WHO data, "...to date, more than 85.6 million people worldwide have been infected with HIV, of whom 1.7 million are children. 40.3 million people have died from the consequences of the disease. Currently, more than 39 million people are living with HIV, and 29.8 million of them are leading full lives thanks to antiretroviral therapy (ART)..." [5].

It is also noted that "...HIV infection today is classified as a chronic, manageable condition, allowing infected individuals to live long and quality lives..." [1,12]. The ongoing HIV/AIDS epidemic remains not only a threat to human health but also a factor negatively impacting social development and progress. The infection has spread across all strata of the population. It should be noted that the characteristics of the epidemic spread of HIV infection are determined by geographical, social, economic, and cultural factors, causing the epidemiological situation in different countries to change over time. In particular, cases of mother-to-child transmission of HIV are increasingly recorded among young people, which has a serious impact on children's health [3,6,7,15].

It is known that the main source of HIV infection is a person infected with HIV. Transmission of the virus is possible at all stages of the disease through both natural and artificial means [1,10]. It should be emphasized that natural routes include:

1) Unprotected sexual contact (homo- and heterosexual);

2) Vertical transmission path:

- Antenatally — intrauterine infection of the fetus;

- Intranatally — during childbirth;

- Postnatally — during breastfeeding of the child by an HIV-infected mother.

Parenteral infection through non-sterile medical instruments, transfusion of blood and its components without proper HIV screening. Injection drug use, tattooing using non-sterile equipment [7,9,16].

According to a number of authors, the sexual route remains the most common mode of HIV transmission. In several developed countries, infection through unprotected heterosexual contact leads to approximately equal infection rates among men and women [11,16].

It is important to note that HIV infection continues to prevent people from leading full lives. From the moment of its discovery until 2024, it is estimated that 42.3 million people [range: 35.7 to 51.1 million] have died from AIDS [3,9,13]. At the same time, HIV-related mortality rates have decreased by 56% among women and girls and by 47% among men and boys since 2010.

A most alarming fact: according to 2024 statistics, one person dies from the consequences of HIV infection every minute worldwide.

The average prevalence of HIV among the adult population (aged 15–49 years) is 0.8%; however, due to marginalization, discrimination, and in some cases criminalization, this figure is significantly higher in specific groups.

Average HIV prevalence rates by key populations are: Among girls and young women (15–24 years) in Eastern and Southern Africa — 2.3%; Among men who have sex with men — 7.7%; Among sex workers — 3%; Among people who inject drugs — 5%; Among transgender people — 9.2%; Among prisoners — 1.3% [3,9,13].

As a result of scientific research conducted in the field of medicine, clinical guidelines for the treatment and prevention of HIV infection have been developed and implemented in practice.

By the end of 2024, 30.7 million people [range: 27 to 31.9 million] had access to antiretroviral therapy (ART), whereas in 2010 this figure was 7.7 million [6.7–8 million]. Thus, in 2024, 77% [61–89%] of all infected individuals were receiving ART. Specifically: 77% [62–90%] among



HIV-infected individuals aged 15 and older; 57% [41–75%] among HIV-infected children under the age of 14.

Significant measures have also been implemented within the framework of preventing vertical transmission of HIV: in 2024, 84% [72–98%] of pregnant women with HIV received antiretroviral therapy [3,5,14].

Scientific studies conducted worldwide regarding vertical transmission of HIV and newborn nutrition have also shown positive results [7,11].

Despite all efforts aimed at preventing mother-to-child transmission of HIV, in 2024, 44% of new HIV infection cases globally occurred in women and girls of all ages. In sub-Saharan Africa, women and girls accounted for 62% of all new cases. In other regions of the world, more than 73% of new HIV cases were recorded among men and boys. Furthermore, in 2024, approximately 4,000 girls and young women aged 15–24 were infected with HIV every week, with 3,100 of these cases occurring in sub-Saharan Africa [3,5,7,9,16].

Pregnancy in women infected with HIV is associated with specific pathological changes in the antenatal period, which increases risks for both the mother and the child. Vertical transmission of HIV from mother to child can occur at various stages of the perinatal period: Antenatally — through the placenta during pregnancy; Intranatally — through contact with vaginal secretions or maternal blood during childbirth; Early neonatal period — through breastfeeding in the first days of the child's life [6,7,9].

It has been confirmed that breastfeeding children born to HIV-infected mothers increases the risk of HIV transmission. On the other hand, breastfeeding plays an important role in the formation of the immune system in infants and helps prevent many childhood diseases at an early age. Today, about 40% of infants worldwide are exclusively breastfed up to 6 months. Nevertheless, due to a lack of nutrition in various countries around the world, approximately 2.7 million children die annually [2,4,8].

Due to the high risk of HIV transmission through breast milk, it is recognized as crucial to provide newborns born to HIV-infected mothers with free artificial formulas. Improving this system remains one of the pressing problems [6,7,9,12,14].

Scientific research in the fields of pediatrics and infectious diseases raises a problem: the transition to artificial feeding to prevent HIV transmission through milk may be accompanied by difficulties, particularly in ensuring the full physical development of the child [3,7,13].

Pregnant women with HIV often experience opportunistic infections, which in turn affects the condition of newborns in the early neonatal and postnatal periods. This manifests as delays in psychomotor and physical development. According to literature data, experts from WHO, BHIVA/CHIVA, CDC, and the American Academy of Pediatrics recommend against breastfeeding for children born to HIV-infected mothers under any circumstances (in settings where safe alternatives exist). It has been established that 78.5% of such children have uneven physical development, with body weight lagging behind growth norms in 56.9% [4,8].

Taking into account the importance of breastfeeding for the full development of healthy infants, it becomes obvious that for children born to HIV-positive mothers, a systemic organization of artificial feeding is necessary, especially at the early stage of life [6,9].

According to research data, in the USA, preventive measures among pregnant women have reduced the risk of vertical HIV transmission to 15–30%, and in African countries to 40–50%. Despite recommendations to use artificial nutrition for newborns of mothers with HIV, the financial aspects of this issue often remain without proper attention and study (E.B. Yastrebova et al., 2019).



Scientists from New York, led by Dr. Rebecca Powell, discovered a special type of white blood cell in the breast milk of HIV-infected mothers. These cells are capable of engulfing and destroying the virus coated with HIV antibodies. This mechanism is called antibody-dependent cellular phagocytosis (Poseryaeva T., 2023).

The physical and psycho-emotional development of children infected with HIV is subject to the influence of numerous factors that negatively affect their growth and development (Deryabina A., 2020; Coffee M., Lurie M.N. et al., 2018).

In the USA, due to the high risk of HIV infection, breastfeeding for children born to infected mothers is categorically prohibited. However, in most developing countries where there are no safe alternatives to breastfeeding, artificial nutrition is not used (G. Libman, H.J. Makadon, 2018).

In CIS countries, including Russia, it has been proven that prescribing antiretroviral therapy from the early stages of pregnancy to women infected with HIV significantly reduces the risk of vertical transmission of infection in the perinatal period. At the same time, a high level of complications is noted in such patients after operative delivery (A.F. Zavalko et al., 2016).

The implementation of three-stage ART prophylaxis (during pregnancy, childbirth, and the early postnatal period) and the exclusion of breastfeeding has proven its effectiveness in preventing vertical HIV transmission. However, given the lack of a cure for HIV, prevention continues to remain the primary method of combating the infection (D.Z. Buzueva et al., 2021).

Among HIV-infected children, the following are often observed: delayed weight gain, decreased appetite, impaired nutrient absorption in the intestine, and frequent infectious diseases (Bazykina E.A., Blinov D.S. et al., 2017).

In Uzbekistan, it has been scientifically confirmed that the transmission of HIV from mother to child, the features of the clinical course of the disease, as well as the effectiveness of new medications in treating such cases, can be controlled (Atabekov N.S. et al., 2018; Tuychiev L.N. et al., 2019).

Despite existing data on preventing vertical HIV transmission, including antenatal and delivery measures as well as the refusal of breastfeeding, questions regarding replacing breast milk with artificial formulas and their financial provision remain insufficiently covered. Forming the lifestyle and nutrition regimen of HIV-infected children, especially starting from infancy, organizing systematic and safe artificial feeding, and assessing their physical development through anthropometric indicators to improve quality and longevity of life are among the most urgent practical tasks of modern medicine.

CONCLUSION OF THE LITERATURE REVIEW

In a number of countries worldwide, breastfeeding of children born to HIV-infected mothers is strictly prohibited. However, in most developing nations, despite the existence of alternatives to breastfeeding, the transition to artificial nutrition is often not realized. At the same time, many specialists make exceptions, recommending breastfeeding during the first 4–6 months, especially in the absence of safe substitutes.

In Asian and African countries, where the rate of child morbidity and mortality due to diarrhea, pneumonia, and malnutrition remains high, breastfeeding is maintained as a measure to save the child's life, even if the mother is infected with HIV. Although this approach is not supported by national healthcare systems in some contexts, it continues to be applied in practice.

Despite the implementation of HIV transmission prevention programs, including antiretroviral therapy (ART) and antiretroviral prophylaxis, the spread of HIV among pregnant women and,



consequently, the vertical transmission of the virus to children remains a pressing problem in global practice.

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