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Research Paper

Epidemiological trend and laboratory diagnostics of acquired immunodeficiency syndrome in the Republic of Uzbekistan

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ABSTRACT

Background: Human immunodeficiency virus (HIV) causes acute acquired immunodeficiency syndrome (AIDS) people. HIV is currently assigned to the Retroviridae family and the Lentivirinae subfamily.
Objective: A characteristic feature of retroviruses is the presence of the reverse transcriptase (RTE) enzyme, which is unique in the composition of their genome.
Results: DNA polymerase (revertase), which refers to RTE or RNA, has the property that the genomic bundle in the genome is directed back to the data.
Conclusions: normally genetic information is transferred from DNA to RNA.

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1. INTRODUCTION

It is known that only a significant part of the diseases that cause death and disability worldwide corresponds to the proportion of infectious diseases. Among them, the acquired immunodeficiency syndrome (AIDS) is a disease that causes severe cases, negatively affecting all organs and systems of the human body [1], [2], [3]. The initial data on AIDS recorded during the 1981 USA has been an urgent problem for many years with uneven prevalence among different segments of the population and various complications of the disease in patients. HIV can be transmitted to the body during sexual intercourse, parenteral treatment (the use of nosteryl needles, syringes and other instruments) and vertically - from mother to child (during pregnancy (prenatal period), during childbirth (intranatal period) and breastfeeding (postpartum period)). The use of blood and replacement drugs is transmitted during organ and tissue transplantation (transplantation). The majority of HIV-infected people are homo- and bisexuals (those who have sex with their own sex and others), prostitutes, drug addicts (addicts).

The target cells for HIV to enter my body are basically cells that hold CD4 molecules in their membrane. The basis of these cells are T helper cells. In addition to monocytes, macrophages, and nerve cell membranes, such CD4 receptors are also less common. HIV masterfully protects itself from the body's defense system, because with the help of the RTE enzyme in the cell, the viral RNA molecule is converted into DNA and becomes integrated (penetrating) into the cellular genome. In addition, due to errors in the work of the RTE enzyme, many structural changes occur in the viral genome. This leads to a constant change in viral antigens. Consequently, antibodies formed against the viral antigen are not able to destroy viruses. The mechanism of rapid depletion of T helper cells in the body is largely based on the pathogenic effect of the virus on the cell (PEC).

The HIV virus activates cellular apoptosis (programmed cell death), autoimmune reactions, produces syncytial cells (multicellular cells) and damages lymphoid anterior cells. Based on the above reasons, the number of T helper cells (CD4) decreases significantly, causing a state of deep secondary immunodeficiency in the body. The body becomes defenseless, as a result of which conditionally pathogenic microorganisms (which do not cause diseases with a normal immune system) they can cause the disease and activate the formation of tumors (Kaposi's sarcoma, skin carcinoma, B-cell lymphoma). In addition, HIV spreads throughout the body in the presence of macrophages, and also damages the central nervous system (CNS). This leads to the development of various diseases in the body, leading to the development of AIDS [4], [5], [6], [7]. Although antiretroviral treatment (ART) has led to a reduction in AIDS mortality, the use of this method in treatment is not universal, and the prospects for total treatment and effective vaccination are still unclear. Prevention and awareness-raising programs, which were considered a viable approach due to the high prevalence of HIV and limited access to antiretroviral therapy among the main population groups, have not been implemented. Social factors play an important role in the spread of HIV, although many factors have their own influence [8], [9], [10], [11].

- **The Main Part:** AIDS, such as cardiovascular, oncological and other diseases, is also a common pathology among the population around the world. According to the Jackson Health Organization (WHO), about 40 million people on the entire planet Earth suffer from HIV infection. On average, 1.5 million people get the disease every year, and more than 600,000 die from it. Globally, the number of people infected with HIV in 2021 will be 38.4 million (33.9 million–43.8 million). In 2021, the new number of people infected with HIV was 1.5 million (1.1 million–2.0 million). The number of deaths associated with this disease in 2021 was 650,000 (510,000-860,000). In 2021, 28.7 million people received anti-terrorism therapy. Of those infected, 36.7 million (32.3 million – 41.9 million) were adults (aged 15 years and older). 1.7 million (1.3 million - 2.1 million) children (aged 0-14 years). Women accounted for 54% of those infected with HIV [12], [13], [14], [15].

The number of new infections in Kazakhstan has increased by 88% since 2010. At the same time, the number of deaths from AIDS decreased by 32 percent and amounted to one third at a time. According to available data, 35 thousand people with AIDS live in Kazakhstan today. Of these, the annual number of new cases among 21,000 men, 13,000 women and persons under the age of 14 is estimated at 3,500. About 100 of them inform children, as well as about 80% of patients about their diagnosis. In other words,

approximately 35 thousand to 7 thousand infected people do not know that there is a virus in the body. About 22 thousand patients undergo regular therapy. In 2021, 3,478 new cases of HIV infection were registered, which is 4.2 percent more during this period and 13.5 percent more over the past 5 years. If in the 90s the transmission of diseases (by injection) by drug addicts prevailed in the country, today 70.3% of patients were found to be sexually infected with HIV [16].

The number of new cases of HIV infection in the Kyrgyz Republic is decreasing compared to the latest data: over the past decade, they have been registered from 500 to 800 annually. However, by mid-November 2021, 665 viral infections were detected, and the total number of HIV-infected people in the republic was 11,066. As of mid-November 2021, it was revealed that 937% of the HIV-infected population of Kyrgyzstan are children and adolescents under the age of 19. This is 9% of the total number of HIV-infected people in the republic. Some of them are patients who were publicly infected at the Naukat District Hospital in 2007. Some became infected with the virus either at birth or through breast milk, when the algorithm for preventing HIV transmission from mother to child in medical institutions in Kyrgyzstan has not yet worked. However, one way or another, 36% of all people infected with HIV in Kyrgyzstan are young people under the age of 30. As of November 1, 2021, 737 of the total number of infected patients have already entered the AIDS stage [17].

According to the data provided by the state institution "Republican Center for the Prevention and Control of HIV Diseases" of the Ministry of Health and Social Protection of the Republic of Tajikistan, from 1991 to June 30, 2022, the total number of people infected with HIV was 14,540, of which 9,264 were men and 5,276 women. At this stage, 305 children born to HIV-positive mothers are under the supervision of a specialist under the age of 18 months. Children make up 1803 people out of the total number of infected [18]. A number of scientific studies are being conducted all over the world to study the epidemiology, clinic, diagnosis, treatment and prevention of HIV infection. In this regard, of particular importance are such as comparing clinical and laboratory methods for diagnosing opportunistic diseases developing at different stages of HIV infection, and identifying prognostic signs, choosing optimal treatment methods, optimizing disease prevention tactics taking into account transmission routes, increasing the effectiveness of measures aimed at the first link of the epidemic process to prevent infection [19], [20], [21], [22].

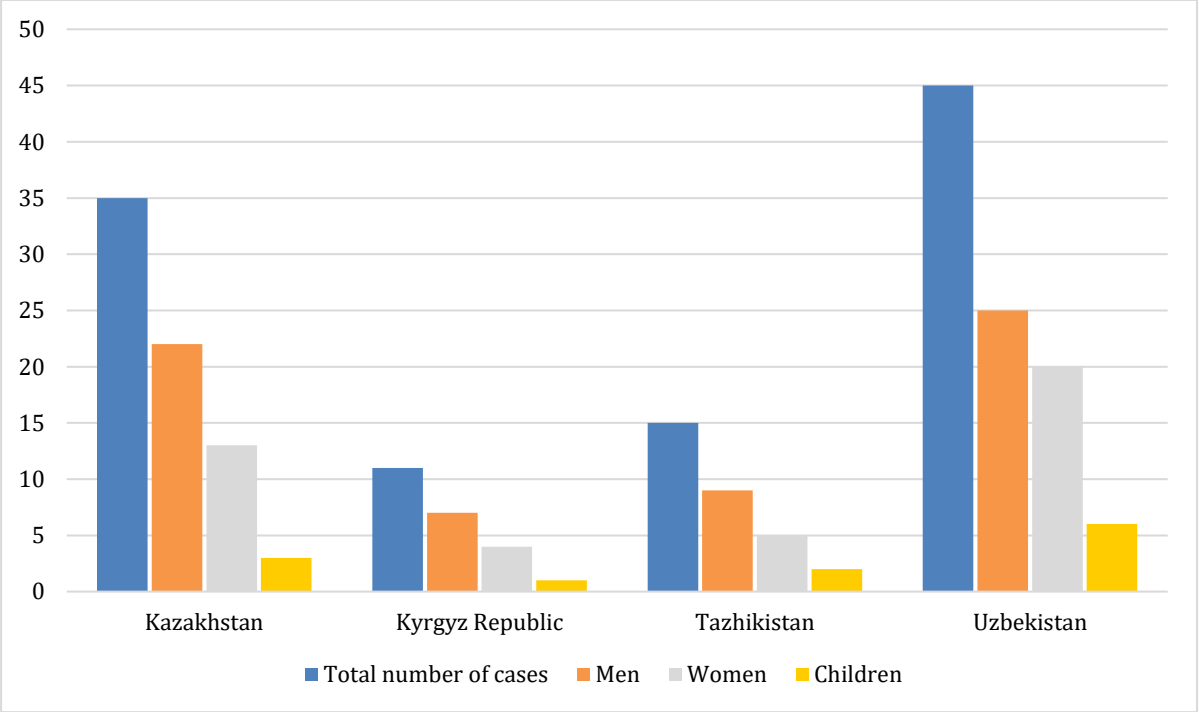


Figure 1. Dynamics of HIV Incidence in Neighbouring Countries, Taking into Account 2021

According to the latest data, more than 45,000 people living with AIDS have been registered in Uzbekistan to date, 55% of whom are men, 45% women and 14% children. In one year, this figure has grown to 1,483, which is much less than in the previous year. It was reported that in 2017 there were 4,025 compared to 4,100 in 2018, an average of 4,000 in 2019 compared to 3,983 in 2020 [23].

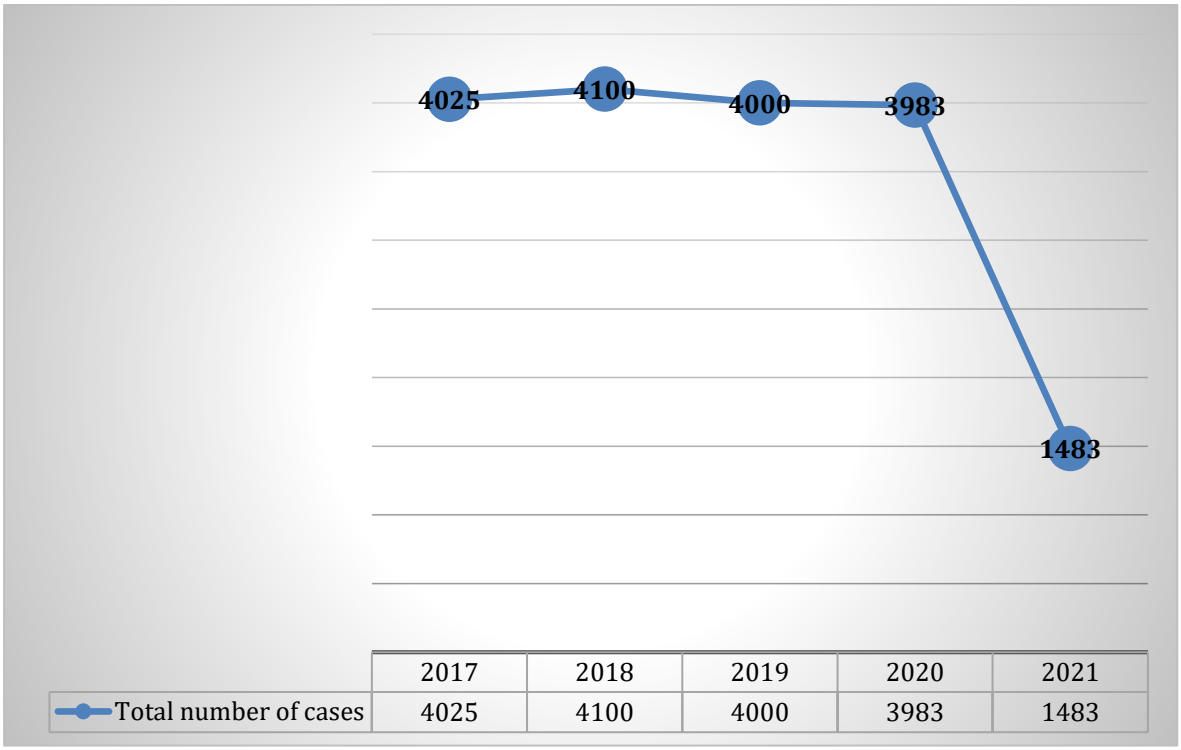


Figure 2. Dynamics of AIDS incidence in Uzbekistan in 2017-2021

It is reported that more than 28,000 patients received ARV therapy. HIV infection in the country is mainly common among dangerous Gurukhs - 29%, as well as among migrant workers – 28%. The main age of infected people is 30-49 years. More than 70% of all infected people have received antiretroviral therapy. At the same time, according to data analysis, infection occurs in more than 75% of cases among people aged 25-49 years. In addition, the rate of sexual transmission of HIV has been increasing worldwide in recent years. "Unfortunately, this situation is also observed in our country. For example, 74.3 percent of patients registered last year had a suspicion of a sexually transmitted disease," the Republican AIDS Center notes.

The first case of HIV infection was registered in Uzbekistan in 1987. Since the first detection of HIV infection, about 71,000 cases have been registered to date, and the number of deaths among people with HIV is about 26,000. However, thanks to preventive measures, HIV transmission by injection decreased from 76.6% to 15.4%. Thanks to full-fledged preventive work, the level of infection of children from the mother has decreased. If in 2013 the rate of transmission of HIV infection from mother to child was 2.3%, then in 2021 it was only 0.7%. It was also reported that from 2011 to 2021, the incidence among children under the age of 18 decreased threefold. To date, all HIV-infected children under the age of majority receive monthly State benefits. Parents of children with HIV have the right to stay in a medical institution with children in inpatient conditions, being temporarily released from work and receiving temporary disability benefits.

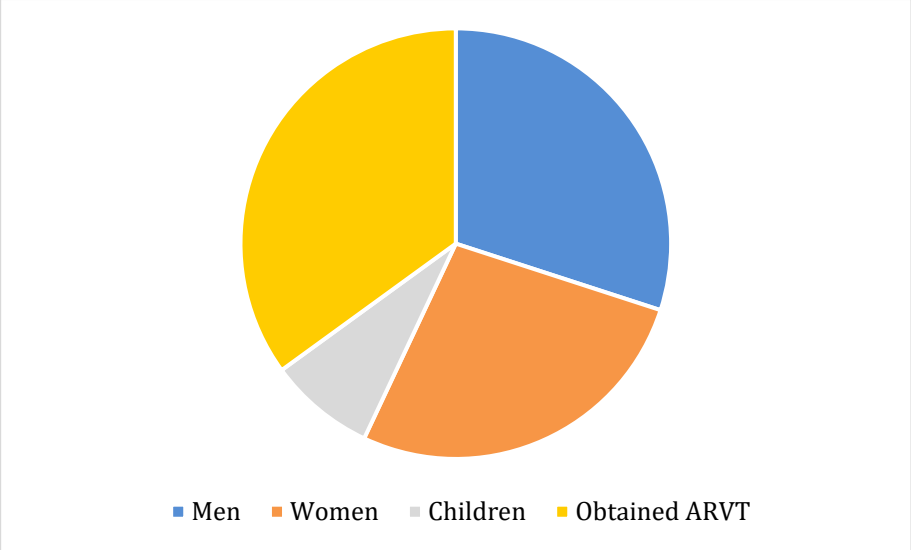


Figure 3. Dynamics of AIDS Incidence in Uzbekistan

1.1. Laboratory Diagnostics of HIV Infection

- **Enzyme Immunoassay (IFT) Detects Antibodies in Serum or Plasma:** IFT testing is used for screening of blood serum and plasma when making a diagnosis of HIV infection, for the analysis of donated blood and for epidemiological monitoring of HIV infection. But it should be remembered that IFT test systems can sometimes give "false positive" or "false negative" results. False negative results can be detected during a period known as the "serological gap". In this case, no specific antibodies are detected at the beginning of the disease. The absence of these antibodies may be associated with ham, the somatic condition of a person infected with the virus (agammaglobulinemia, seroversion, the last stage of HIV infection - AIDS). False positive results can be observed in somatic diseases accompanied by damage to the immune system (autoimmune disorders, various tumors, infectious diseases caused by viruses or bacteria) and during pregnancy.
- **Rapid Tests Detect Antibodies to HIV in Human Serum and Plasma:** The convenience of this method lies in the fact that it takes much less time to conduct it than for IFA, special measuring instruments are not required for the study, since the results are evaluated visually, so the product can also be used in unequipped laboratories.
- **The Method of Immunoblotting (Western Blotting):** It is based on the identification of antibodies specific to various HIV proteins. Its higher specificity compared to other methods is based on the separate identification of antibodies to various HIV proteins. Immunoblot is used to confirm positive screening results in the laboratory of the Republican Center for Combating AIDS.
- **The Polymerase Chain Reaction (PCR) Method:** Is a highly sensitive analysis in which application (selective increase) of a specific DNA sequence is observed.
- **Determination of the Number of SD4+ Lymphocytes:** This is a specific method that checks the immune status of the patient's body. CD4+ lymphocytes are considered a subpopulation of T–lymphocytes (T-helper cells), and in moderate amounts their number ranges from 500 to 1500 in 1 ml of blood, depending on the age of the person. A decrease in the number of T-helper cells (CD4+) serves as the main indicators of T-cell immunodeficiency in HIV infection and is detected throughout the disease, starting from the asymptomatic period of the disease. The level of CD4+ lymphocytes in the blood is determined using monoclonal antibodies [23].

2. CONCLUSION

Based on our analyses above, we can still see the dynamics of morbidity worldwide. Every year, an average of 1.5 million people are infected worldwide and more than 600,000 die from it. 35 thousand

people with AIDS live in neighboring Kazakhstan. Of these, 21,000 are men, 13,000 are women and children under the age of 14. The annual number of new cases is estimated at 3,500 patients.
However, in Kyrgyzstan, 665 patients are diagnosed with the virus every year, and the total number of people infected with HIV is 11,066.

There are more than 45,000 registered residents living with AIDS, 55% of whom are men, 45% are women and 14% are children. In one year, this figure has grown to 1,483 employees. These indicators continue to lead to an increase in the incidence of AIDS in Uzbekistan and neighboring countries. This makes the fight against this disease even more intense, requiring the adoption of timely diagnostic measures.

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Author Contributions Statement

Name of Author	C	M	So	Va	Fo	I	R	D	O	E	Vi	Su	P	Fu
Qalandarova Feruza Samandarovna	✓	✓	✓	✓	✓	✓		✓	✓	✓	✓	✓	✓	
Boymurodov Bakhodir Toshturdievich	✓		✓	✓	✓	✓	✓		✓	✓	✓	✓	✓	✓

C : **C**onceptualization
M : **M**ethodology
So : **So**ftware
Va : **Va**lidation
Fo : **Fo**rmal analysis
I : **I**nvestigation
R : **R**esources
D : **D**ata Curation
O : Writing - **O**riginal Draft
E : Writing - Review & **E**diting
Vi : **Vi**sualization
Su : **Su**pervision
P : **P**roject administration
Fu : **Fu**nding acquisition

Conflict of Interest Statement

The authors declare that there are no conflicts of interest regarding the publication of this research.

Informed Consent

All participants were informed about the purpose of the study, and their voluntary consent was obtained prior to data collection.

Ethical Approval

Not Applicable.

Data Availability

The data that support the findings of this study are available from the corresponding author upon reasonable request.

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