






Formation of HIV-infected models based on epidemiological monitoring data

Formación de modelos infectados por el VIH basado en datos de seguimiento epidemiológico

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Abstract

HIV infection epidemiological monitoring, taking into account gender, age, infection routes, social features of patients, plays a key role in the formation of prevention programs. Epidemiological monitoring data make it possible to form a model of a person with a risk of infection higher than the average for the population. To identify this group, the authors proposed the term “Potential HIV-Infected”. In this study, based on the data of the epidemiological history of medical records (form No. 357/U) of the AIDS Center of the Republic of Tatarstan, the HIV infection monitoring information and analytical system “Aidsnet”, the Federal HIV Infection Register, we carried out a retrospective analysis of data obtained from the epidemiological monitoring of HIV infection cases in the Republic of Tatarstan for 2015 - 2019; we assessed the structure of patients with an established diagnosis of HIV infection, including by transmission routes, studied gender structure, risk groups, foreign and domestic literature sources on this infectious disease, as well as analyzed the alleged epidemiological risks. The data obtained indicate the involvement of the general population in the epidemic process of HIV infection in recent years, the need to strengthen preventive work, using effective communication tools with various groups of people included both in the “Potential HIV-Infected” risk group and the general population.

Key words: HIV infection, epidemiology, infectious diseases, epidemic monitoring, prevention, retrospective analysis.

Resumen

El monitoreo epidemiológico de la infección por VIH, teniendo en cuenta el género, la edad, las vías de infección, las características sociales de los pacientes, juega un papel clave en la formación de los programas de prevención. Los datos de seguimiento epidemiológico permiten formar un modelo de persona con riesgo de contagio superior a la media de la población. Para identificar este grupo, los autores propusieron el término “Potencial infectado por el VIH”. En este estudio, con base en los datos de la historia epidemiológica de las historias clínicas (formulario No. 357 / U) del Centro de SIDA de la República de Tartaristán, el sistema de información y análisis de seguimiento de la infección por el VIH “Aidsnet”, el Registro Federal de Infección por el VIH, realizamos un análisis retrospectivo de los datos obtenidos del seguimiento epidemiológico de los casos de infección por el VIH en la República de Tartaristán para 2015 - 2019; evaluamos la estructura de pacientes con diagnóstico establecido de infección por VIH, incluyendo por vías de transmisión, estructura de género establecida, grupos de riesgo, fuentes de literatura extranjera y nacional sobre esta enfermedad infecciosa, así como analizaron los presuntos riesgos epidemiológicos. Los datos obtenidos indican la participación de la población en general En el proceso epidémico de infección por VIH de los últimos años, la necesidad de fortalecer la labor preventiva, utilizando herramientas de comunicación eficaces con diversos g Grupos de personas incluidos tanto en el grupo de riesgo de “posibles infectados por el VIH” como en la población general.

Palabras clave: Infección por VIH, epidemiología, enfermedades infecciosas, seguimiento de epidemias, prevención, análisis retrospectivo.

Introduction

The study of HIV infection began in 1981, when cases of pneumocystis pneumonia in combination with Kaposi's sarcoma were diagnosed in Los Angeles in 5 previously healthy homosexual men. According to UNAIDS, there were approximately 37.9 million people living with HIV worldwide in 2018, 1.7 million of which - new infections. Over the course of epidemic, a maximum of 3.7 million new infections were reported in 1997, followed by a decline in new infections and AIDS deaths throughout the 2000s.

However, the incidence of HIV infection increased by more than 25% in the regions of Eastern Europe and Central Asia for 2001-2011¹.

Thus, according to the Federal Scientific and Methodological Center for the AIDS Prevention and Control, the cumulative number of registered HIV infection cases amounted to about 1.4 million people among citizens of the Russian Federation by June 30, 2019, while it was reported about 47,971 new cases of infection according to preliminary data in the first half of 2019.

There is a predominance of HIV infection in the working-age cohort in the Russian Federation. At the end of 2019, there is the highest level of prevalence of the population with this infection in the age group of 30-39 years old and an increase in the role of the sexual transmission route in the Russian Federation. This circumstance requires a more detailed analysis and, probably, indicates ignorance about the ways of HIV transmission or ignorance about their HIV status².

Recently, there has been a shift in the detection of new HIV infection cases in older age groups. In 2010, according to the UK Health Protection Agency, older people (aged 50 years and over) were diagnosed with HIV significantly more often than young people in the United Kingdom (62% vs. 38%). This year, people over 50 years old accounted for 14% of new HIV infections in the United States of America.

A similar trend is observed on the territory of the Russian Federation: if 87% of HIV-infected people were diagnosed at 15-29 years old in 2001, 82% were first diagnosed at the age of over 30 years old in 2018, of which 70% of patients were 30-50 years old. An increase in the proportion of newly diagnosed cases was also observed in older age groups, including those over the age of 70 years old.³

Recently, there has been a worldwide shift in the detection of new HIV infection cases in the groups aged 51 years or more. 5,113 new infections were registered in the Republic of Tatarstan for 2015-2019. 545 people among them belong to the 50+ age group, which is about 10%. The share of women in the morbidity structure is increasing, especially in the older age group, which indicates an increased risk of heterosexual transmission. HIV infection in patients over 50 years old is a serious problem, since the disease is usually diagnosed at later stages (III, IV) in this age group compared to younger patients.

Analysis of the literature, goals and objectives identified by the World Health Organization in the global health sector strategy to eliminate HIV 2016-2021 convincingly proves the need and practical significance of the study in order to predict the epidemic process of HIV infection in the Republic of Tatarstan, which will allow carrying out preventive measures against HIV more closely and effectively, as well as deliver or adapt these interventions to reach more people who need them⁴.

The study is aimed at analyzing the data of epidemiological monitoring of HIV infection cases for 2015-2019 and developing proposals to improve the effectiveness of preventive measures.

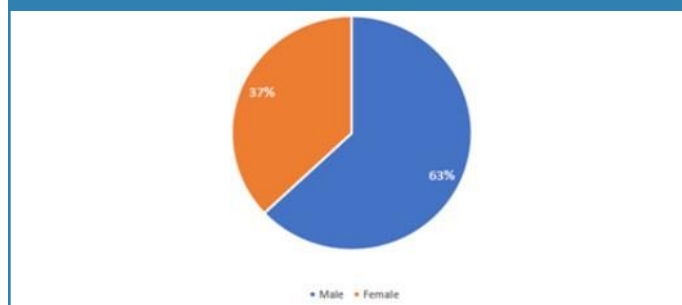
Methods

The study used data from the epidemiological history of medical records (form No. 357/U) of the AIDS Center of the Republic of Tatarstan, the HIV infection monitoring information and analytical system "Aidsnet", the Federal HIV Infection Register. To process the data we used medical statistics, including calculation of various indicators and rates, graphical methods.

Results

This study analyzes data from the epidemiological monitoring of new HIV infections for 2015-2019. Cumulatively, there is a predominance of the epidemic process of HIV infection among the male population in the sex structure (Fig. 1).

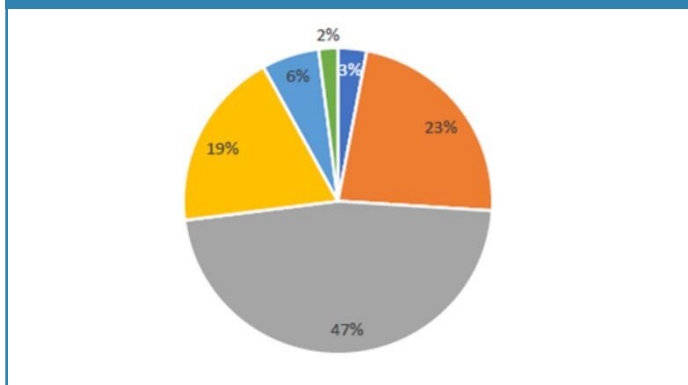
Fig. 1. Sex structure of new HIV infections for 2015 - 2019 (%).



It has been established that a prevalence of the epidemic process in the male cohort is noted in the sex structure of HIV infection for a given time period. Thus, there was an increase (+ 3.3%) of HIV infection in the sex structure in the male cohort by 2019 (64.6%), compared to 2015 (61.3%).

When analyzing the age structure of HIV-infected people in the Republic of Tatarstan, there is a prevalence of the epidemic process of this disease in the age cohort of 21-30 and 31-40 years old (Fig. 2).

Fig. 2. Age structure of new HIV infections for 2015 - 2019 (%).



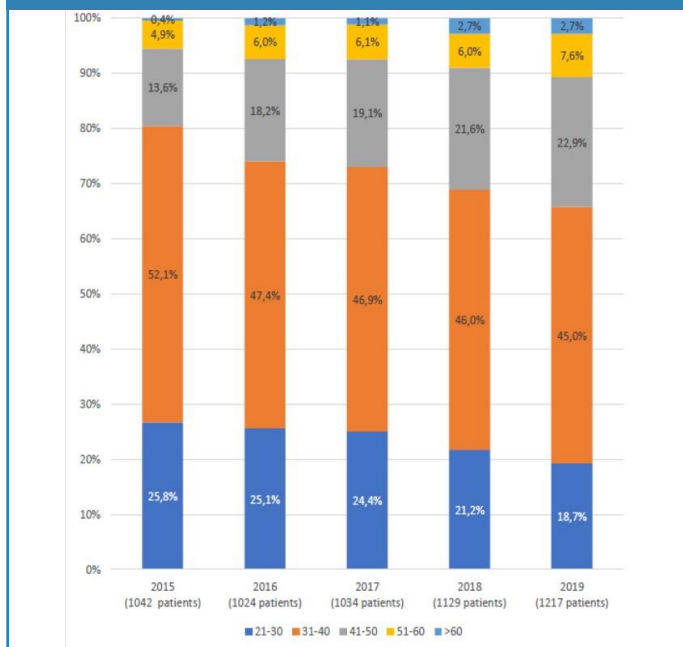
Moreover, there has been a shift in HIV infection to age groups over 30 years old for 2015-2019 (2015 - 72%, 2019 - 78.3%), while there is a downward trend in the number of newly diagnosed HIV cases among patients aged from 31 to 40 years old. Thus, 547 new cases of infection were registered in 2019, which is 196 cases less than in 2015. The share of men decreased by 24.44% (from 528 to 399 cases), while the share of women - by 25.97% (from 258 to 191 cases).

From 01.01.15 to 01.01.20, 3,371 people aged 31 to 40 years old were registered at the Republican AIDS Center, 2,243 (66.54%) of which were men, 1,128 (33.46%) - women.

The share of women in this age group is 14.95% higher than among patients 31-40 years old and only 3.18% less than the number of infected men in their age group. Moreover, the number of women is 33.08% less than that of men among patients from 30 to 39 years old.

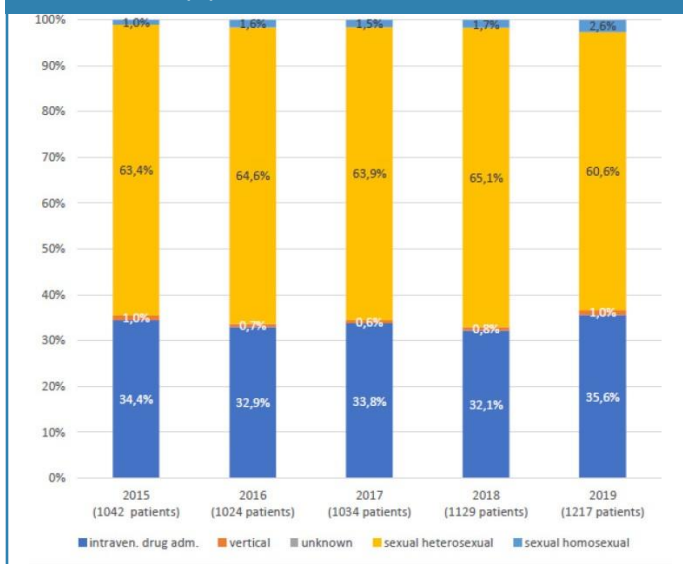
There is a statistically significant increase in HIV-infected among people aged 41-50 years old by 1.9 times ($p < 0.05$), 1.8 times - 51-60 years old ($p < 0.05$), by 8.25 times - over 60 years old ($p < 0.05$) (Fig. 3). Thus, the number of detected HIV infection cases among patients aged 50 years old and more amounted to 168 people in 2019, which is 62 cases more than in 2015. In total, 754 new cases of HIV infection were registered in the age group of 50 years old and more for 2014 to 2019, 389 (51.59%) of which were men, 365 (48.41%) - women. New infections among men increased by 146.37%. And this indicator increased by 181.08% for women. Based on these data, it can be concluded that an increase in the share of women among PLHIV aged 50 years old and more is associated with the greater role of heterosexual infection transmission in this category of patients.

Fig. 3. Dynamics of the age structure of new cases of HIV infection for the period 2015 - 2019 (%).



The heterosexual sexual route is in the lead among the transmission routes for 2015-2019 (2015 - 63.4%, 2019 - 60.6%). The second way, which contributes to the spread of HIV infection among the population of the Republic of Tatarstan, is injection (2015 - 34.4%, 2019 - 35.6%). The perinatal transmission route was 1% in 2019 (2015 - 1%). The share of homosexual route in the spread of HIV infection increased from 1% in 2015 to 2.6% in 2019 (Fig. 4).

Fig. 4. The dynamics of the structure of HIV transmission routes for 2015 - 2019 (%).



For 2015-2019, the prevailing transmission routes of HIV infection include gender heterosexual (63.5%) and injection (33.8%). Smaller shares are in perinatal (0.8%), sexual homosexual (1.7%) and others (0.2%). Other routes include cases where the transmission route has not been established.

The role of heterosexual transmission of infection is higher among people aged 50 years old and more, and is 87.36% vs. 56.39% in patients 31-40 years old, while infection due to intravenous drug use is higher by 29.54% in this age category (41.32% vs. 11.78%). The share of homosexual transmission of infection among people aged 50 years and more is 0.72%, which is 1.39% lower than in the age group from 31 to 40 years old (2.11%).

This circumstance requires a detailed epidemiological analysis, since the current sanitary and epidemiological rules establish the need for voluntary HIV testing only for people aged 18-60 years old. The introduction of mandatory HIV screening in this population and increased awareness of the transmission routes and risks of infection will allow detecting a disease at an early stage and reducing the number of new infections. In addition, timely diagnosis of HIV infection will help to achieve a faster immune response to drug therapy, which is extremely important for PLHIV aged 50 years old and more due to age-related changes in their immune profile. In turn, a quick selection of an effective and safe ARVT regimen will significantly reduce the economic costs for treatment and preserve the patient's quality of life.

Summary

The main trends in the development of HIV infection remain the same: the prevalence of infection at the age of 31-50 years old - 67.9% (2015 - 65.7%) (Russian Federation - 71%), an increase in the share of the age category over 50 years old to 10.3% (2015 - 5.3%), and infection in the socially adapted segments of the population - 51.2% (2015 - 50.2%). The results obtained testify to the positive results of the implementation of prevention programs among young people, but they require the development of HIV infection prevention methods among the population over 30 years old. Sexual heterosexual - 66.5% (2018 - 67.4%) (Russian Federation - 62.7%) and injection transmission routes (33.5%, 2018 - 32.6%, Russian Federation - 37.3%) prevail. The data obtained indicate the need to strengthen preventive work within the framework of hygienic education with a focus on the problems of sexual behavior patterns, as well as with injecting drug users, because the injection HIV transmission route makes a significant contribution to the spread of this socially significant disease in the territory of the Republic of Tatarstan.

The epidemiological monitoring data serve as a basis for the development and implementation of new approaches to the implementation of preventive measures aimed at HIV-negative people who are especially vulnerable to HIV infection due to increased exposure to the risk of HIV infection and/or because of their inability to avoid risks or take effective HIV prevention measures.

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