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SELECTED ASPECTS OF HERPES VIRUS INFECTIONS IN THE IRKUTSK REGION

This study examined the incidence of the main herpesvirus infections (HVI) in the Irkutsk Region for 2014-2024 with the results of monitoring for herpes zoster since 2019. In the structure of HVI, the largest share is occupied by chickenpox (88.8%) and the smallest - cytomegalovirus infection with a share of less than one percent (0.4%). The dynamics of HVI incidence rates is unstable, with some upward trend in recent years. Children predominate among those affected, excluding shingles. Risk groups among the child population for the studied HVIs have been identified, which indicates the importance of preventive measures and monitoring of morbidity, primarily for these population groups. According to the forecast, an increase in the incidence of chickenpox and cytomegalovirus infection is expected, therefore, the importance of educational work to inform parents about the risks and symptoms of HVI, the role of vaccination in the fight against chickenpox increases. Effective management and prevention of these infections can significantly reduce infectious diseases and improve the overall health of the region's population.

Keywords: epidemiology, morbidity, herpesvirus infections, prognosis.

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Introduction. Herpesvirus infections (HVI) are becoming increasingly important in the structure of infectious pathology. The ongoing spread of the human immunodeficiency virus and SARS-CoV-2 contribute to the reactivation of herpesviruses and an increase in the number of registered forms of HVI [4, 5, 9].

HVI is a widespread group of infections. It is believed that by the age of 18-20, more than 90% of people are infected with one or more of the 8 known types of human herpes viruses. This article discusses four key infections caused by viruses of the *Herpesviridae* family: chickenpox, shingles, cytomegalovirus infection, and infectious mononucleosis [7].

Among the HVIs, one of the most frequently registered is chickenpox. This nosology is characterized by a high level of morbidity, uncontrollability of the epidemic process and often the development of severe complications [1, 11].

A chronic recurrent form of chickenpox is herpes zoster (HZ), which, in turn, is characterized by widespread distribution and prevalence among elderly patients; in children and adolescents it is rare and is associated with metabolic and tumor disorders. The disease manifests itself in various clinical stages with variable manifestations, some of which increase the risk of complications [7].

Unlike the previous diseases, cytomegalovirus infections are latent and opportunistic. In most cases, the infection is asymptomatic or the symptoms are mild. However, in vulnerable groups (immunocompromised patients and newborns), the virus can replicate to high levels and cause serious disease of target organs [3, 10].

As for infections caused by the Epstein-Barr virus (EBV), in childhood they are usually mild or asymptomatic; in adolescents and adults, primary EBV infections are usually characterized by infectious mononucleosis (IM) [6, 12].

The aim of the study is to study the trends in the epidemic process of key herpesvirus infections in the Irkutsk region for 2014-2023.

Materials and methods of the study. A retrospective epidemiological analysis of the incidence of the main herpesvirus infections was carried out according to the reporting forms of the Office of Rospotrebnadzor No. 2: chickenpox, cytomegalovirus infection, infectious mononucleosis for 2014-2024 and herpes zoster for a 6-year period, since the registration of cases of this

Table 1

Incidence of the total population of HVI in the Irkutsk region for 2014-2024 and forecast for 2025 (per 100 thousand, 95% CI)

HVI	average long-term indicator	average annual growth/ decrease rate (%)	forecast indicator for 2025
chicken pox	598,3 [588,5÷608,0]	-1,5	762,5 [629,4÷895,6]
herpes zoster*	33,9 [31,6÷36,3]	+19,4	42,8 [36,9÷48,7]
infectious mononucleosis	18,8 [17,0÷20,5]	+5,2	16,8 [11,9÷21,7]
cytomegalovirus infection	2,3 [1,7÷2,9]	+0,7	5,0 [3,4÷6,6]
Σ HVI *	597,3 [587,5÷607,1]	+3,9	-

* 2019-2024, the forecast is approximate due to the short dynamic series

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nosology began in 2019. The structure of HVI was calculated based on the sum of four nosological forms for 2019-2024; the forecast for 2025 was calculated based on statistical analysis of dynamic series of indicators (regression equation, standard regression error and forecast interval $P \pm m_R$) using a polynomial trend of the second and higher orders. The material was processed using mathematical and statistical methods using Windows applications (Microsoft Excel).

Results and discussion. The incidence of HVI in the total population of the Irkutsk region for the period under study is characterized by very unstable dynamics with different values of average annual growth rates (Table 1) and a tendency to increase in recent years (Fig. 1).

Forecast calculations indicate a continuing increase in the incidence of cytomegalovirus infection and chickenpox in the total population of the Irkutsk region (Fig. 1), although the latter has an average annual decline rate of 1.5%.

The largest number of registered cases of HVI are varicella pox (VP), which accounts for 88.8% of the total number of cases. Children predominate in the structure of cases - 94.3%. The epidemiological manifestations of VP in the region were previously presented [2]: an increase in incidence in 2021-2022 with a risk group of children under 6 years of age, and an increase in the volume of vaccination, against which the epidemiological effectiveness of this measure is not observed. The situation remains unfavorable in 2024 (Fig. 2); the highest incidence of morbidity is recorded among children aged 3-6 years.

Herpes zoster accounted for 7.0% of the total number of herpes zoster cases. A clearly expressed upward trend was also observed in the dynamics of herpes zoster incidence: over the 6-year observation period, the incidence rate increased more than 2-fold. The average long-term incidence rate (ALI) of the total population was 33.9 per 100 thousand [31.6 ÷ 36.3]. The ALI of adult incidence was statistically significantly 2.3 times higher than that of children under 17: 39.2 [36.4 ÷ 42.1] and 17.2 [13.8 ÷ 20.6] per 100 thousand, respectively. The incidence rates varied among adults within the range of 22.1–57.2 per 100 thousand, and among children 13.6–25.6 per 100 thousand. Adults predominated in the structure of cases – 87.8%. However, cases of herpes zoster were also observed in children, with the highest proportion in the 7-14 age group – 63.0%. Age-specific incidence rates

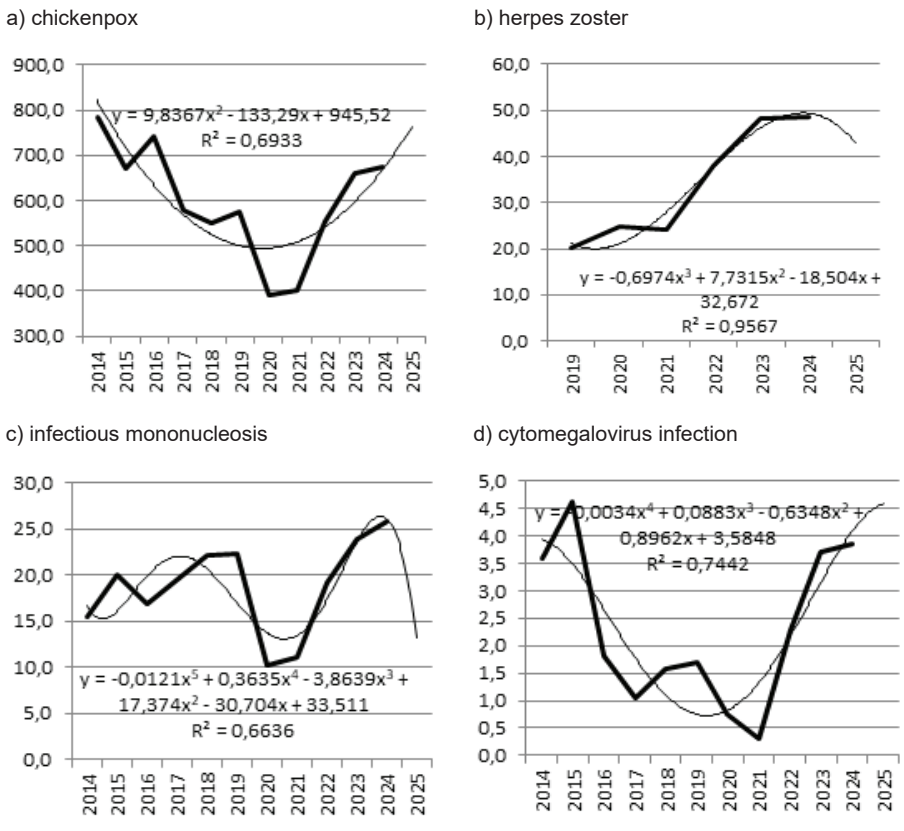

Fig. 1. Incidence of the total population of the Irkutsk region with HVI with a forecast for 2025 (per 100 thousand)

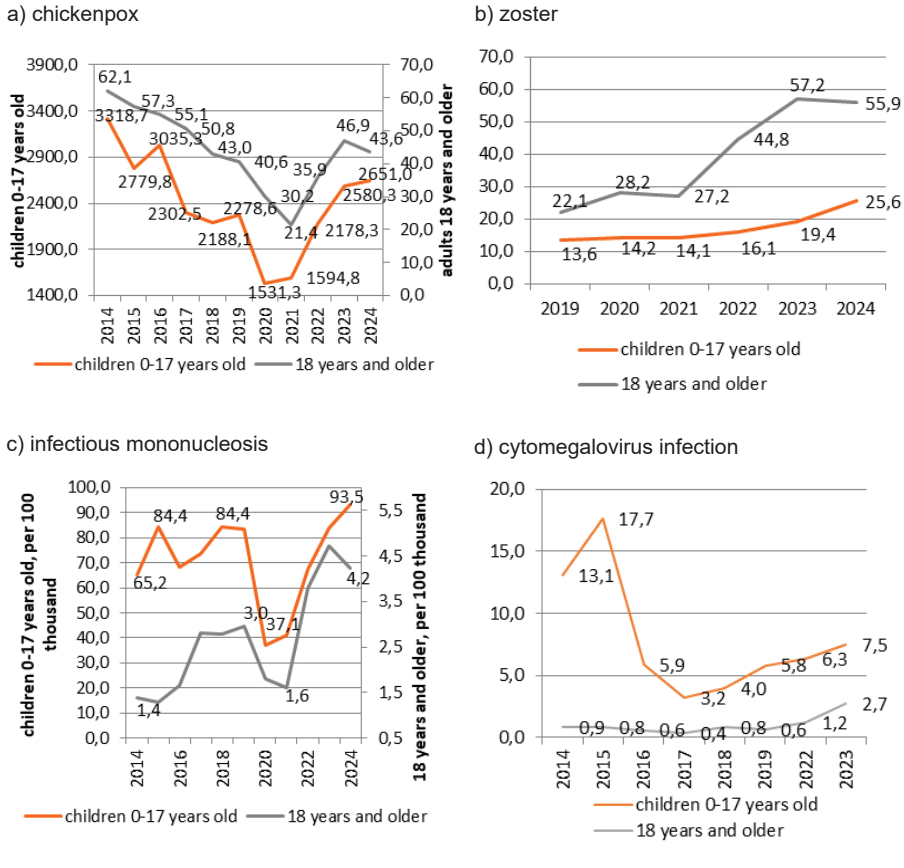

Fig. 2. Dynamics of incidence rates of HVI among children and adults in the Irkutsk region for 2014-2024 (per 100 thousand)

Table 2

Average long-term indicators and average annual growth rates of HVI among children of different age groups in the Irkutsk region for 2014-2024 (per 100 thousand, 95% CI; %)

HVI	long-term average, 95% CI / average annual growth/decrease rate, %				
	up to 1 year	1-2 years	3-6 years	7-14 years	15-17 years
chicken pox	1181.9 [1061.0÷1302.9] / -0.5	2829.3 [2701.7÷2956.9] / +2.4	5840.8 [5716.8÷5964.8] / -1.9	1176.7 [1134.5÷1218.8] / -0.2	490.7 [442.0÷539.3] / -1.9
herpes zoster*	36.3 [15.0÷57.6] / +14.4	165.9 [134.6÷197.2] / +2.6	114.7 [96.8÷132.6] / +3.5	38.1 [30.5÷45.8] / +8.2	35.5 [22.4÷48.6] / +12.2
infectious mononucleosis	43.7 [20.3÷67.1] / +8.2	19.0 [8.4÷29.6] / -4.3	5.1 [1.3÷8.9] / -6.4	1.2 [0.0÷2.6] / -21.9	0.6 [0.0÷2.4] / -
cytomegalovirus infection	2.6 [0.0÷8.7] / -	5.9 [0.0÷12.2] / +51.6	10.3 [4.8÷15.7] / +13.7	22.8 [17.1÷28.5] / +9.0	22.3 [12.2÷32.5] / +15.7

* 2019-2024

among children were unevenly distributed: risk groups are children aged 7-14 and 15-17: 22.8 [17.1÷28.5] and 22.3 [12.2÷32.5] per 100 thousand, respectively – Table 2.

Infectious mononucleosis (IM) accounts for 3.8% of the total number of HVIs. The incidence of IM during the observation period was without a clearly defined trend; the rates varied from a minimum in 2020 - 10.3 [9.0 ÷ 11.6] to a maximum in 2024 of 25.8 per 100 thousand [23.7 ÷ 27.8]; the average incidence rate of the total population is 18.8 per 100 thousand [17.0 ÷ 20.5]. Adults and children are involved in the epidemic process of IM in a ratio of 1: 8.4. The group of children aged 3-6 years prevailed in the structure of cases (39.0% of the total number of children or 34.8% of the total number of cases). The incidence rates of infectious mononucleosis (per 100 thousand) were: in children - 71.2 [64.2 ÷ 78.1]; in adults - 2.6 [1.9 ÷ 3.4]. The period of epidemiological unfavorability for this infection was 2024, when the highest level of MI incidence was observed.

Cytomegalovirus infection (CMV) accounts for only 0.4% of the total number of HCV infections. The average long-term incidence rate of CMV in the Irkutsk region was 2.3 [1.7 ÷ 2.9] per 100 thousand people. The incidence rate varied significantly by year, the minimum incidence rates were recorded from 2020 to 2021. Children prevailed in the structure, among whom children under 2 years of age predominated. The average incidence rate of children was 6.8 [4.6 ÷ 9.0], adults - 1.0 [0.6 ÷ 1.5] per 100 thousand people.

An analysis of the incidence rates of HVI infection in individual age groups of children showed (Table 2) that the risk group for CMV infection are children under 1 year of age, and for infectious mononucleosis, children aged 1–2 years. A short-term forecast was calculated for these age groups, according to which, most likely, in 2025 for children aged 1 to 2 years, the incidence rate of infectious mononucleosis is expected to be almost the same as in 2024: 207.5±43.1 per 100 thousand, i.e. in the range from 164.4 to 250.7; and for cytomegalovirus infection, the incidence rate of children under 1 year will continue to increase - up to 95.8±27.6; i.e. the indicator will be in the range from 68.2 to 123.5 per 100 thousand (Fig. 3).

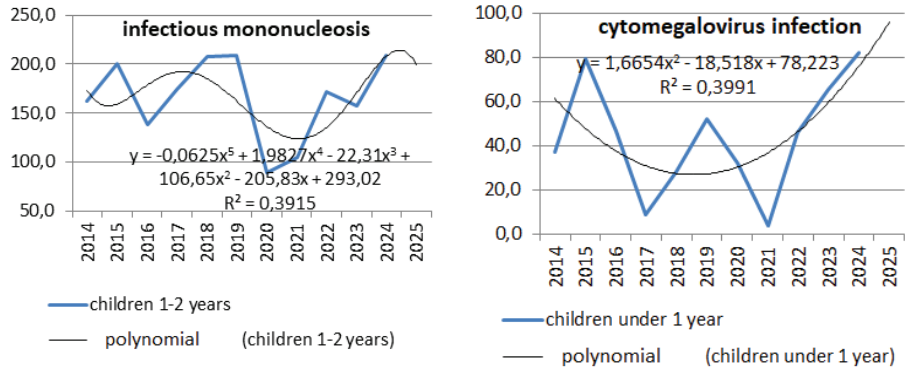

Fig. 3. Forecast of incidence rates of infectious mononucleosis and cytomegalovirus infection ir risk groups of children in the Irkutsk region for 2025 (per 100 thousand)

No clear cyclical pattern was observed in the long-term dynamics of incidence in the HVI group during the analyzed observation period. The sharp decline in rates in 2020-2021 was associated with the implementation of anti-epidemic measures against the novel coronavirus infection COVID-19 [8]. For certain HVIs (shingles, infectious mononucleosis), the incidence rate in 2023-2024 significantly exceeded the previous period in the compared groups – by 1.5-2 times, respectively.

The intra-annual dynamics of incidence for the studied infections in the region did not differ significantly from published data [7]. For example, chickenpox was characterized by a pronounced winter-spring seasonality. Cases of shingles and infectious mononucleosis were evenly distributed throughout the calendar period, with the highest number of registered cases in the fall-winter period. Isolated cases of CMV were recorded throughout the year without a pronounced seasonal increase.

Conclusion. According to the results of the analysis, the incidence of HVI in the total population of the Irkutsk region from 2014 to 2024 demonstrates unstable dynamics with an upward trend in recent years, which raises serious concerns in the field of public health. Children predominate in the structure of cases of all studied HVIs, excluding herpes zoster, which is more often registered in adults. Chickenpox remains the most common infection, accounting for a significant proportion of cases (89%), especially among children (94%). Each age group of children is a risk group with the highest average long-term rates for one of the HVIs: children under 1 year old – for CMV; 1-2 years – for infectious mononucleosis; 3-6

years – for chickenpox, 7-14 and 15-17 years – for herpes zoster. Projections for 2025 indicate a further increase in the incidence of chickenpox and cytomegalovirus infection (including in the risk group of children under 1 year of age), which emphasizes the need for active preventive measures and monitoring to protect vulnerable population groups.

Full-scale epidemiological surveillance of HVIs (including recording the absolute number of cases and incidence rates, identifying risk factors and groups, and implementing anti-epidemic and preventive measures) is only implemented for officially registered HVIs. For HVIs not subject to official registration and reporting, anti-epidemic measures are limited. Despite the availability of vaccines against chickenpox and shingles, these infections are considered "uncontrollable" by immunoprophylaxis.

Given the high prevalence of varicella-zoster virus infections and the limitations of specific preventive measures, it is important to focus efforts on early detection, isolation, and laboratory testing of all patients with symptoms of herpes infections. At the regional level, there is an objective need to change the chickenpox vaccination strategy from selective to routine, with a gradual expansion of the cohorts eligible for vaccination.

Effective management and prevention of these infections can significantly reduce the incidence and improve the overall health of the region's population.

The authors declare no conflict of interest.

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