

ABSTRACT

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THE IMPACT OF THE PANDEMIC CAUSED BY COVID-19 ON THE EPIDEMIOLOGICAL STATE OF HIV INFECTION IN UKRAINE

HIV infection is a human disease with progressive dysfunction of the body's immune system and a long asymptomatic course.

In 2021, there were 42 million HIV-positive people in the world. Today, 341,084 infected people are officially registered in Ukraine. One in one hundred citizens aged 15 to 50 is a carrier of retrovirus. In 2019, the World Health Organization (WHO) confirmed the beginning of a pandemic of a new infectious disease caused by the SARS-CoV-2 virus.

The report of the Global Fund to Fight AIDS and the data of International Charitable Foundation "Public Health Alliance" («Альянс громадського здоров'я») state that COVID-19 can seriously disrupt the health care system as well as medical services providing to HIV-infected people in many countries.

Objective. To study the impact of the COVID-19 pandemic on the current HIV epidemic and case registration in Ukraine.

Materials and methods. To complete the tasks, the statistical and epidemiological data of the WHO and the Ministry of Health of Ukraine on the current epidemiological state of HIV infection during 2017–2021 and COVID-19 during 2020–2021 were used.

The results of epidemiological studies were processed with the help of the method of variation statistics using computer programs Microsoft Office Excel 2010, SPSS Statistics and online calculator (<http://medstatistic/calculators/calchit.html>).

Results and discussion. The epidemiological data provided by the WHO, the Ministry of Health of Ukraine and the International Charitable Foundation "Public Health Alliance" on the epidemiological status of HIV infection in 2017–2021 and COVID-19 during 2020–2021 were analyzed.

The COVID-19 pandemic has negatively affected the provision of diagnostic, preventive and curative services to HIV-infected people. This is confirmed by a decrease in the number of rapid tests for retrovirus in 2020 by 4.1 times compared to 2019. The reduction in the number of new cases of HIV, AIDS and mortality from terminal disease in 2020–2021 occurred by an average of 1.5–2.4 times compared to the period before the pandemic caused by coronavirus. These data simultaneously correlated with an increase in COVID-19 cases, the number of rapid tests for coronavirus, and were inversely proportional.

The COVID-19 pandemic will significantly increase the incidence of

HIV in Ukraine and raise the number of new AIDS cases and deaths.

Conclusions. The pandemic caused by COVID-19 affected the provision of diagnostic, prophylactic and treatment services to HIV-infected people. There is an inversely proportional trend between the number of confirmed cases of HIV infection and cases of COVID-19. The increase in the incidence of COVID-19 occurred in the autumn–winter period, which corresponded to the period of declining levels of HIV diagnosis.

Keywords: HIV infection, epidemiology, pandemic, COVID-19, diagnosis, coinfection.

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ВПЛИВ ПАНДЕМІЇ СПРИЧИНЕНОЇ COVID-19 НА ЕПІДЕМІОЛОГІЧНИЙ СТАН ВІЛ-ІНФЕКЦІЇ В УКРАЇНІ

ВІЛ-інфекція – захворювання людини з прогресуючою дисфункцією імунної системи організму, та тривалим безсимптомним перебігом.

У 2021 році у світі налічувалося 42 млн. ВІЛ-позитивних осіб. В Україні сьогодні офіційно зареєстровано 341 084 інфікованих. Кожен сотий громадянин у віці від 15 до 50 років є носієм ретровірусу.

У 2019 році Всесвітня організація охорони здоров'я (ВООЗ) підтвердила початок пандемії нового інфекційного захворювання яке спричинене вірусом SARS-CoV-2.

У доповіді Глобального фонду боротьби зі СНІДом, та за даними Міжнародного благодійного фонду «Альянс громадського здоров'я» зазначено, що COVID-19 може серйозно порушити систему охорони здоров'я і надання медичних послуг ВІЛ-інфікованим, у багатьох країнах світу.

Мета. Встановити вплив пандемії COVID-19 на сучасний епідемічний стан ВІЛ-інфекції та рівень реєстрації випадків в Україні.

Матеріали і методи. Для вирішення завдань було проведено опрацювання статистичних та епідеміологічних даних ВООЗ та МОЗ України, МБФ «Альянс громадського здоров'я», щодо сучасного епідеміологічного стану ВІЛ-інфекції протягом 2017–2021 років та COVID-19 протягом 2020–2021 років включно.

Результати епідеміологічних досліджень були опрацьовані методом варіаційної статистики з використанням комп'ютерних програм Microsoft Office Excel 2010, SPSS Statistics і онлайн калькулятора (<http://medstatistic/calculators/calchit.html>).

Результати та обговорення. Проаналізовано епідеміологічні дані надані ВООЗ, МОЗ України та Міжнародного благодійного фонду «Альянс громадського здоров'я» щодо епідеміологічного стану ВІЛ-інфекції 2017–2021 років та COVID-19 протягом 2020–2021 років включно.

Пандемія спричинена COVID-19 негативно вплинула на надання діагностичних, профілактичних та лікувальних послуг ВІЛ-інфікованим. Це підтверджується зниженням кількості проведених експрес-тестів до ретровірусу за 2020 рік у 4,1 рази у порівнянні з 2019 роком. Зменшення кількості нових випадків

ВІЛ-інфекції, СНІДУ та смертності від термінальної стадії хвороби за 2020–2021 роки у середньому у 1,5–2,4 рази у порівнянні з періодом до початку пандемії викликаной коронавірусом. Ці дані одночасно корелюють із збільшенням кількості випадків підтвердження захворювання на COVID-19, кількості проведених швидких тестів до коронавірусу, та мають обернено-пропорційну залежність.

Висновки. Пандемія спричинена COVID-19 вплинула на надання діагностичних, профілактичних та лікувальних послуг ВІЛ-інфікованим. Спостерігається обернено пропорційна динаміка між кількістю підтверджених випадків ВІЛ-інфекції та випадків COVID-19. Підвищення захворюваності на COVID-19 припадає на осінньо-зимовий період, що відповідає періоду зниження рівня діагностики ВІЛ-інфекції.

Ключові слова: ВІЛ-інфекція, епідеміологія, пандемія, COVID-19, діагностика, коінфекція.

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INTRODUCTION/ВСТУП

HIV infection is a lentivirus anthroponotic disease with a high epidemic process level, which is becoming more widespread in all countries. The disease is characterized by the body's immune system disorders [1], long asymptomatic course and opportunistic damage of many organs and systems of the body [2–4].

In 2021, there were 42 million HIV-positive people in the world. Today Ukraine is one of the first countries in the European region in the number of HIV-infected [5]. 341,084 patients are officially registered in our country, the epidemic of HIV infection at the present stage is characterized by a predominant number of people of working age, one in one hundred citizens of the country aged 15 to 49 is infected with HIV [6].

In 2019, the planet was hit by a new disease – COVID-19, which was accompanied by severe respiratory syndrome caused by SARS-CoV-2. In 2020, almost a year after the dangerous virus emerged, the World Health Organization (WHO) reported that more than 76 million people were diagnosed with COVID-19, and about 1 million 700 thousand patients died from this disease [7–9, 16].

Between 2019 and 2021, more than 6 million people worldwide were infected with SARS-CoV-

2. Tough anti-epidemic measures have been introduced in many countries around the world. The COVID-19 pandemic has had a negative impact on the people with HIV. According to the WHO in July 2021, people with severe immunodeficiency who do not receive antiretroviral therapy (ART) have a particularly high susceptibility to infection and severe COVID-19 with fatal consequences [5, 10].

The Global Fund to Fight AIDS, Tuberculosis and Malaria report states that COVID-19 has severely disrupted the health care system and medical services provision in the fight against HIV in low- and middle-income countries in 2020 [11].

The biggest challenge for HIV-positive patients during a pandemic is to establish continuous ART.

In accordance with the International Charitable Foundation "Public Health Alliance" («Альянс громадського здоров'я»), the COVID-19 pandemic was the social problems reason that volunteers faced during the first lockdown in the spring of 2020. It was difficult for people with HIV to obtain the necessary drugs due to restrictive quarantine measures [12, 13].

The only conditions for HIV-positive people to feel safe during a pandemic are timely ART, regular laboratory tests and medical consultation in

full compliance with anti-epidemic measures [12, 14].

Objective. To study the impact of the COVID-19 pandemic on the current HIV epidemic and level of case registration in Ukraine.

Materials and methods. To complete the tasks, the statistical and epidemiological data of the WHO, the Ministry of Health of Ukraine and International charitable foundation "Alliance for Public Health" on the current epidemiological state of HIV infection during 2017-2021 [5, 6, 13, 15] and Covid-19 during 2020-2021 [6, 7, 15] were used. For this purpose the basic complex epidemiological method including receptions of epidemiological supervision was used. Methods of comparison, statistical and logical analysis were applied to the obtained data to understand and further predict the epidemiological situation.

Statistical processing of the obtained results: all data were entered into the "Electronic research map". The following algorithms were performed: record of the fields lists for calculated data annually and/or monthly, filling in these fields, calculation, charts construction. The results of epidemiological studies were processed using the method of variation statistics using computer programs Microsoft Office Excel 2010, SPSS Statistics and online calculator (<http://medstatistic/calculators/calchit.html>).

Results and discussion. The epidemiological data of the WHO, Ministry of Health of Ukraine and International charitable foundation "Alliance

for Public Health" on the epidemiological state of HIV infection in 2017–2021 and COVID-19 during 2020–2021 were analyzed [4, 7, 8, 10–12].

According to the Ministry of Health, as of November 1, 2021, there were 231,000 HIV-positive people in Ukraine. According to official statistics, 58 people were diagnosed with HIV every day [6], during 2017–2021 in Ukraine 82,214 new cases were diagnosed.

During 2017, 18,214 people were diagnosed with HIV (42.8 cases per 100,000 population), 9,241 cases of disease progression to the terminal IV clinical stage (21.7 cases per 100,000 population). During January-March, April-June, July-September and October-December 2017, new cases of HIV infection were registered: 4728, 4164, 4385, 4937, respectively. The cases of AIDS during the above periods of the same year were: 2469, 2155, 2108, 2509, respectively.

In 2018, 18,099 cases of HIV infection were detected for the first time (42.7 per 100,000 population) and 8,838 cases of AIDS (20.8 per 100,000 population of Ukraine). For the periods January-March, April-June, July-September and October-December 2018, retroviral disease was diagnosed in 4358, 4458, 4598, 4685 people, respectively. During identical periods, the progression of the disease to the terminal stage was detected in 2238, 2199, 2167, 2234 people, respectively.

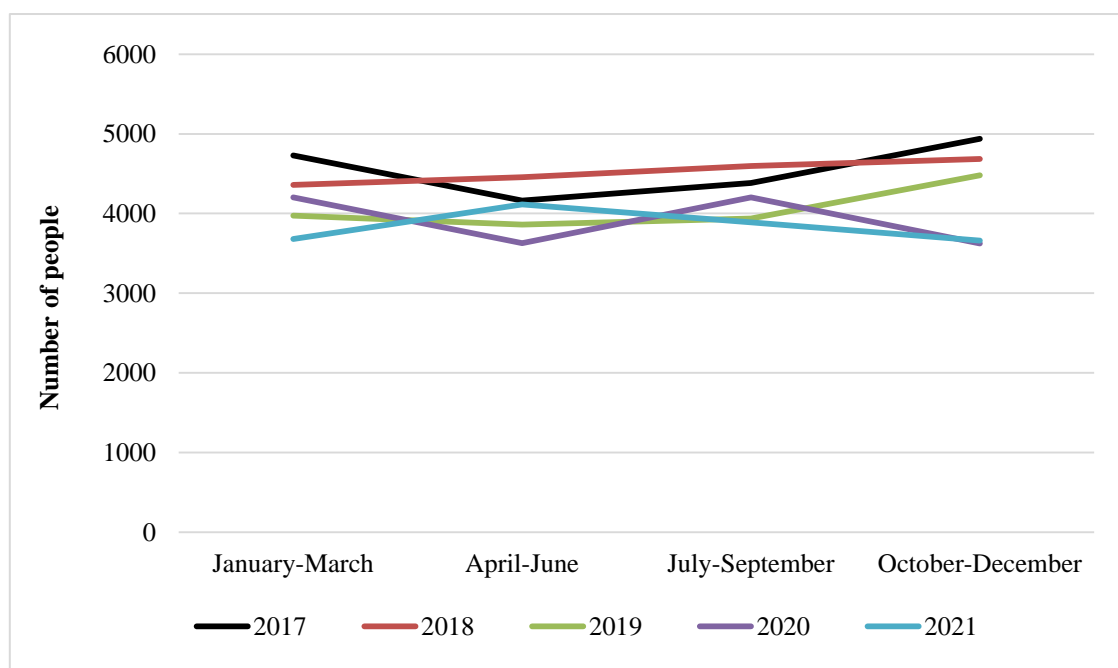


Figure 1 – The number of newly diagnosed people diagnosed with HIV during 2017–2021

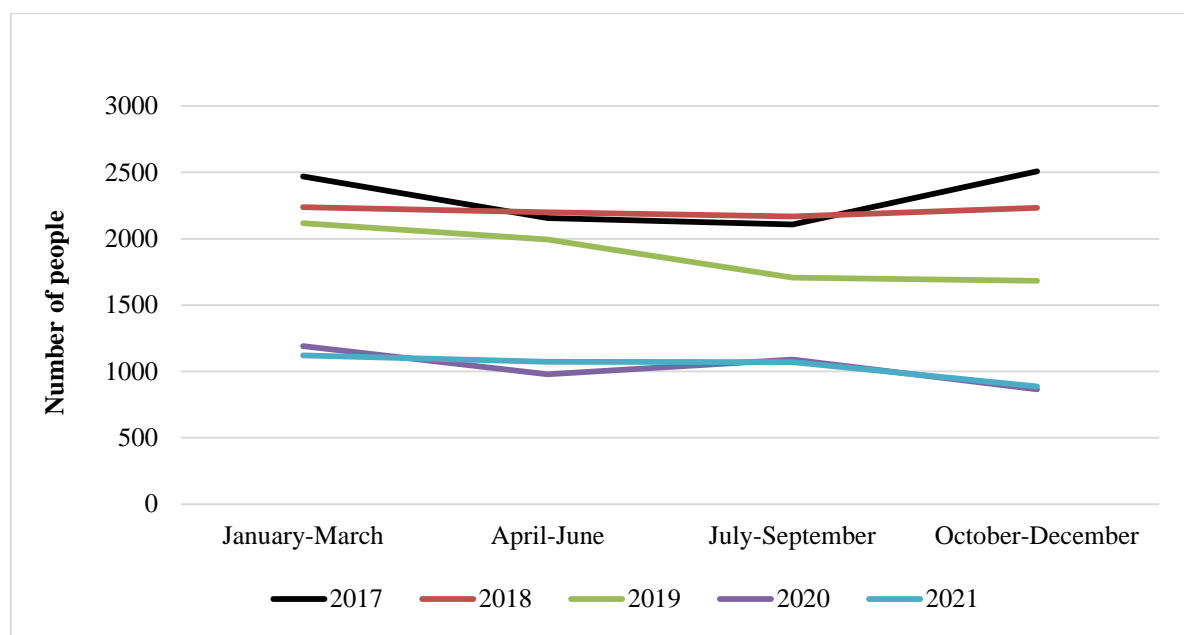


Figure 2 – The number of newly diagnosed people diagnosed with AIDS during 2017–2021

During 2019, 16,257 new cases of HIV infection were diagnosed (38.7 per 100,000 population); 7502 cases of AIDS (17.8 per 100,000). During January-March, April-June, July-September and October-December 2019, the first identified cases of HIV infection were: 3974, 3862, 3939, 4482 diseases, respectively. During the identical periods of the same year: 2117, 1995, 1706, 1684 cases of progression to the stage of AIDS, respectively.

The data obtained for 2020 showed 15,659 newly diagnosed cases of HIV infection and 4,129 of AIDS. The figures per 100,000 population were 37.3 and 9.8 cases, respectively. During January-March, April-June, July-September, October-December, the number of diagnosed cases of retroviral infection was: 4203, 3628, 4202, 3626, respectively. During the same periods of the same year, 1190, 979, 1094, 866 cases of AIDS were diagnosed, respectively.

During 2021, the number of newly diagnosed people diagnosed with HIV was 15,346 cases. 4129 people were diagnosed with terminal AIDS. The figures per 100,000 population were 36.8 and 9.9 cases, respectively. According to the above periods, retroviral infection affected: 3682, 4113, 3891, 3660 people, respectively. The AIDS stage was confirmed for 1190, 979, 1094, 866 cases, for the periods January-March, April-June, July-September, October-December, respectively (Fig. 1, 2).

During 2019–2020, 275,081 rapid tests for retroviral infection were conducted under the project of the International Charitable Foundation "Public Health Alliance". The rate per 100,000 population

was 656,3 tests for antibodies to human immunodeficiency virus.

221332 tests were conducted during 2019 only, with an indicator for 525 surveys per 100 thousand Ukrainians. For the periods of January-March, April-June, July-September, and October-December 65,479, 70,945, 58,020, 26,888 diagnostics were performed, respectively.

In 2020, the Public Health Alliance in Ukraine conducted 53,749 rapid tests. The figure was 128.2 tests per 100,000 citizens. The data obtained for the above periods were 16,127, 12,469, 15,841, 9,312 diagnostics, respectively (Fig. 3).

During 2017–2021 period, the largest number of people with the newly diagnosed HIV and AIDS was registered in 2017 – 18,214 and 9,241 cases, respectively. The lowest number of patients with retroviral infection and progression to the terminal stage of the disease was recorded in 2021 and amounted to 15,346 and 4,129 cases, respectively. Data for 2018 were compared to 2017 and there were no significant differences between them. A slight decrease in indicators was observed during 2019 compared to previous years.

In 2020, the number of new cases of HIV infection was 15,659 people, and was less than in 2017, 2018, 2019 by 1.2 times ($\chi^2 = 4.682$; χ^2 at $p < 0.05$ is 3.751), 1.15 times ($\chi^2 = 5.301$; χ^2 at $p < 0.05$ is 3.831), and 1.05 times ($\chi^2 = 6.111$; χ^2 at $p < 0.05$ is 3.701), respectively. The number of AIDS in the same year was 4129 cases and was less than in 2017, 2018, 2019 by 2.2 times ($\chi^2 = 4.282$; χ^2 at $p < 0.05$ is

3.661), 2.1 times ($\chi^2 = 9.169$; χ^2 at $p < 0.05$ is 3.970), and 1.8 times ($\chi^2 = 7.990$; χ^2 at $p < 0.05$ is 3.719), respectively.

HIV infection, for the first time detected in 2021, amounted to 15,346 people, which was less than in 2017, 2018, 2019, 2020 by 1.2 times ($\chi^2 = 9,700$; χ^2 at $p < 0.05$ is 3.812), 1.7 times ($\chi^2 = 10.166$; χ^2 at $p < 0.05$ is 3.812), 1.05 times ($\chi^2 = 12,066$; χ^2 at $p < 0.05$ is 3,712), and 1.02 times ($\chi^2 = 10.011$; χ^2 at $p < 0.05$ is 3.198), respectively. The AIDS values of the

same period were equal to the 2020 values (Figs. 1, 2).

The number of rapid tests for retrovirus in 2019 exceeded the survey in 2020 by 4.1 times ($\chi^2 = 8,731$; χ^2 at $p < 0.05$ is 3,811). During 2019, in January-March and April-June, the largest number of tests was conducted compared to other periods of 2019 and 2020. The lowest number of surveys was conducted in April-June and October-December 2020 compared to other periods (Fig. 3).

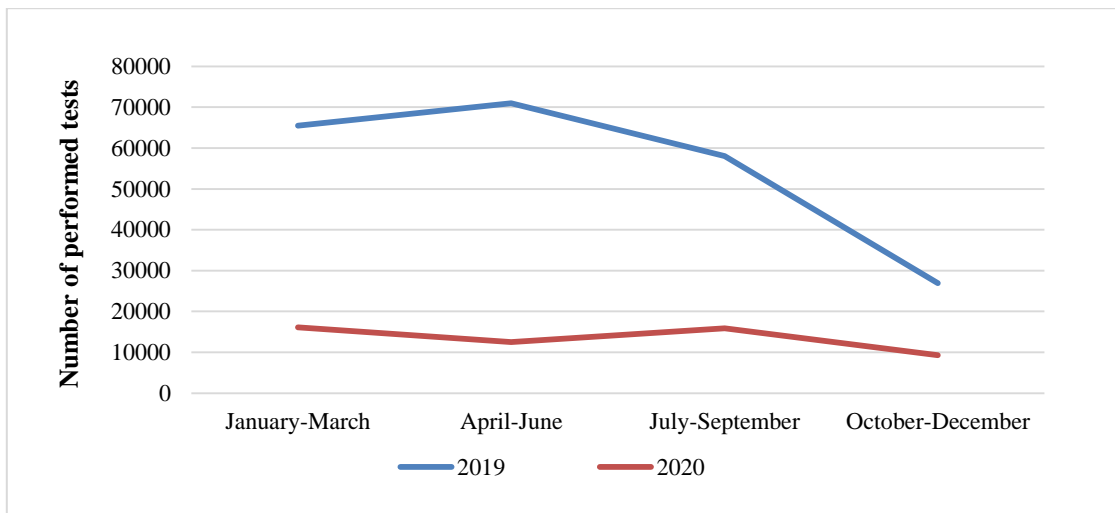


Figure 3 – The number of HIV tests during 2019–2020

In Ukraine, during March 2020 – November 2021, 3,667,649 cases of COVID-19 were diagnosed (8786 per 100,000 population) [1, 5–8], in 2020 – 1,055,047 cases of COVID-19 (2518 per 100,000 population). In January-March, April-June, July-September, October-December the number of diagnosed cases of COVID-19 was 645, 43,689, 164,625, 846,088, respectively.

In 2021, 2,612,602 cases were diagnosed with COVID-19 – (6,282 cases per 100,000 population). In January-March, April-June, July-September, October-December, the incidence of SARS-CoV-2 was 619,121, 560,928, 188,283, 1,244,270 cases, respectively (Fig. 4).

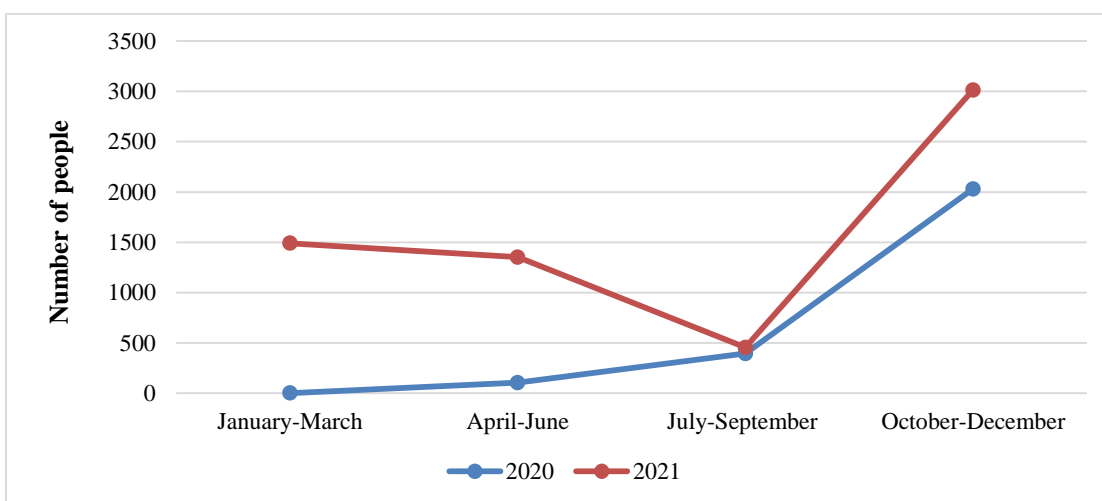


Figure 4 – The number of COVID-19 cases during 2020–2021

According to the estimates of the Ministry of Health in Ukraine, during March 2020 – November 2021 17,751,409 PCR tests for COVID-19 were performed (42,523 per 100,000 population). In 2020, the number of PCR tests was 5,525,615 (13187 cases per 100,000 population). In April-June, July-September, October-December 2020, the number of PCR tests was: 595,750, 1,622,498, 3,307,367, respectively. In 2021, 12,225,794 PCR tests were performed (29,397 per 100,000 population). During the periods January-March, April-June, July-September, October-December the

identical indicator was 2,534,487, 2,720,144, 1,989,621, 4,981,542, respectively.

In 2021, the number of COVID-19 cases increased by 2.47 times ($\chi^2 = 6,166$; χ^2 at $p < 0.05$ is 3,702) compared to 2020. The lowest number of patients in 2021 was observed during July-September (188,283), the largest – during January-March 2021 (2,612,602).

During 2021, 12,225,794 rapid tests for coronavirus infection were conducted, which is 2.2 times ($\chi^2 = 4.873$; χ^2 at $p < 0.05$ is 3.902) more than in 2020.

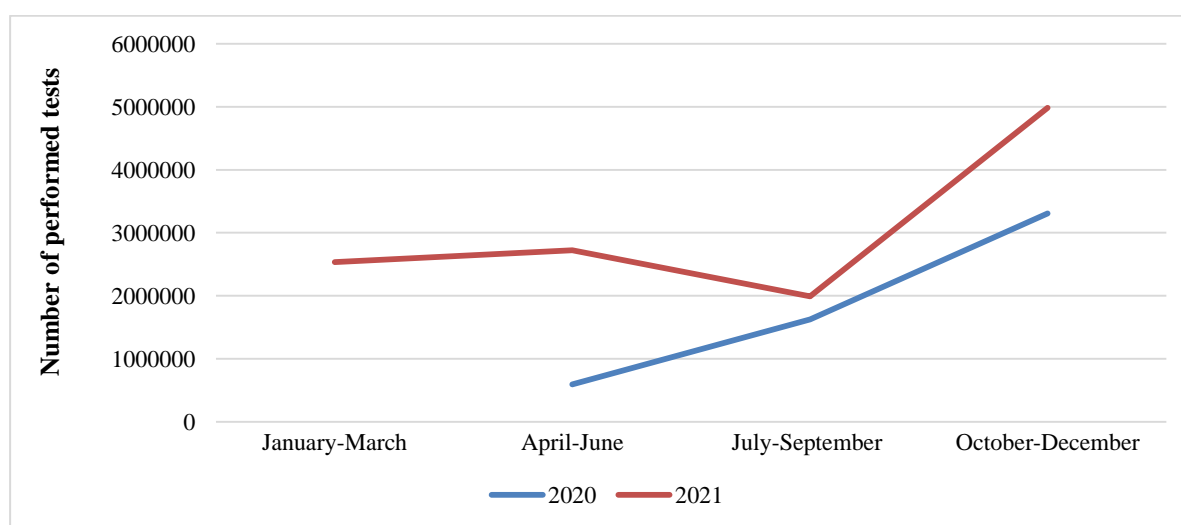


Figure 5 – The number of PCR tests for COVID-19 during 2020–2021

The fewest tests were performed during April-June 2020, the most – during November-December 2021 (Fig. 5).

In conclusion, with the increase in the number of COVID-19 diseases, the implementation of quarantine and general anti-epidemic measures and their strengthening, performance of rapid tests for

HIV reduced. This is evidenced by an increase in the incidence of COVID-19 disease, an increase in the number of rapid tests for COVID-19 and at the same time, for the same period, a decrease in HIV testing and detection of new cases of HIV and AIDS.

AIDS incidence rates for the same period were equal to 2020 data.

The number of rapid tests for retrovirus in 2019 was 221,332 and exceeded the test rate (52,749 tests) in 2020 by 4.1 times.

2. Anti-epidemic measures for COVID-19 include quarantine restrictions and regular coronavirus testing. The last ones remain consistently high and, accordingly, increase annually. In 2020 and 2021, 1,055,047 and 2,612,602 cases of COVID-19 were confirmed, respectively. In 2021, the number of cases of COVID-19 increased 2.47 times compared to 2020. In 2021, 12,225,794 rapid tests for coronavirus

CONCLUSIONS/ВИСНОВКИ

1. The potential risk of COVID-19 infection reduces the motivation of the population to be tested for HIV due to economic and psychological difficulties, especially among at-risk groups, which has led to a sharp decline in diagnostic and preventive measures against human immunodeficiency virus.

During 2020, the number of new cases of HIV infection was 1.2 times less than in 2017–2019. The number of AIDS cases for the same year was 2.1 times less than in 2017–2019 and was equal to the number in 2021. The rates of new HIV cases in 2021 were 1.24 times lower than in 2017–2020.

infection were performed, which is 2.2 times more than in 2020.

3. The pandemic caused by COVID-19 affected the provision of diagnostic, prophylactic and treatment services to HIV-infected people. There is an inversely proportional trend between the number of confirmed cases of HIV infection and cases of COVID-19. The increase in the incidence of COVID-19 occurs in the autumn-winter period,

which corresponds to the period of declining levels of HIV diagnosis.

4. The COVID-19 pandemic has reduced the number of rapid HIV tests, new HIV diagnoses, and AIDS diagnoses, which is likely to significantly increase the incidence of HIV in Ukraine in the near future and increase the number of new cases of AIDS.

PROSPECTS FOR FUTURE RESEARCH/ПЕРСПЕКТИВИ ПОДАЛЬШИХ ДОСЛІДЖЕНЬ

It is planned to develop, implement remote measures for control and treatment of HIV during emergencies in the country and modern methods of rapid and high-precision early diagnosis of retroviral disease.

CONFLICT OF INTEREST/КОНФЛІКТ ІНТЕРЕСІВ

The authors declare no conflict of interest.

FUNDING/ДЖЕРЕЛА ФІНАНСУВАННЯ

None.

AUTHOR CONTRIBUTIONS/ВКЛАД АВТОРІВ

All authors substantively contributed to the drafting of the initial and revised versions of this paper. They take full responsibility for the integrity of all aspects of the work.

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