According to the WHO, Ukraine is one of the 27 countries in the world where 85% of the incidence of tuberculosis (TB) is concentrated, and it ranks 4th in the world in terms of its prevalence.

**Objective** — to analyze the regional epidemiological characteristics of TB in the Chernivtsi region under the influence of unfavorable socio-economic factors.

**Materials and methods.** The medical records of all newly diagnosed tuberculosis cases registered at the Chernivtsi Regional Clinical Tuberculosis Dispensary from January 2021 to December 2022 were analyzed. Statistical processing of the data obtained during the research was conducted using the IBM SPSS Statistics v26.0 program.

**Results and discussion.** Tuberculosis incidence among the adult population has significantly increased. The lockdown situation caused by the COVID-19 pandemic and the conditions of martial law have had a negative impact on TB prevalence. An analysis of TB prevalence in Bukovina revealed a decrease of this indicator by 25.9% in 2020 compared to 2019, by 1.5% in 2021 compared to 2020, but there was a substantial increase of 16.1% in 2022.

**Conclusions.** In the Chernivtsi region, from 2019 to 2022, there has been a noticeable trend of a significant decrease in the incidence rate of tuberculosis, both during this period and in the conditions of martial law, aligning with the national trend. Due to the onset of the COVID-19 pandemic caused by SARS-CoV-2, the number of newly diagnosed TB cases decreased in 2020 compared to 2019, which led to the accumulation of undiagnosed and latent TB cases, which were detected more, in late stages and in more severe forms and showed an indicative probable increase in the number of active cases in 2022. The mortality rate in Bukovina was 4.7 per 100,000 population in 2021, and 4.4 per 100,000 population in 2022, i.e. it shows a downward tendency under the negative influence of socio-economic factors.

**Keywords**
Tuberculosis, morbidity, prevalence, COVID-19 pandemic, martial law.

According to the WHO, Ukraine is one of the 27 countries in the world where 85% of the incidence of tuberculosis (TB) is concentrated, and it ranks 4th in the world in terms of its prevalence. Almost 100 new cases of TB disease are registered in Ukraine every day. Despite the decrease in morbidity and mortality from TB over the past 5 years, statistical indicators remain above the epidemic threshold. In addition, the epidemic situation with tuberculosis in Ukraine is negatively affected by the increase in the number of cases of tuberculosis with multidrug resistance (MDR-TB) and extensively drug-resistant tuberculosis (XDR-TB) [2, 5, 11].
A number of scientists and physicians argue that the COVID-19 pandemic has had a potential impact on tuberculosis (TB), including through changes in the organization and provision of medical assistance, as well as a significant impact on people’s usual lifestyles and behaviours, as a result of which, according to the WHO, there was a significant global decrease of the number people diagnosed with newly diagnosed tuberculosis and officially notified in 2020 (compared to 2019). As statistical reports have shown, regression of the incidence rate has occurred in almost all countries of the world [10].

It should be noted, that the pandemic of coronavirus infection (SARS-CoV-2) negatively affected the long-term progress in the fight against TB and reducing the burden of this infection not only in Ukraine, but also in all WHO regions [6, 7].

According to WHO annual reports, there has been a significant global reduction in the number of newly diagnosed tuberculosis cases that have been registered, that is, from 2019 to 2020, the number of TB has decreased by 18 %, returning to the level of 2012. Limiting access to diagnosis and treatment of TB during the COVID-19 pandemic increased the mortality rate [12].

The armed aggression of the Russian Federation, which has been ongoing in Ukraine for more than a year, has led to a large-scale humanitarian crisis that has affected the entire population of Ukraine. Probably in the future, along with the impact of the pandemic situation on COVID-19, which has already caused an increase in the spread of TB. Moreover, in the territory of the conflict zone, as a result of the displacement of the population, the decrease in the standard of living and the deterioration of the humanitarian situation, many people are in danger of acquiring infection from contagious individuals, especially in conditions of unfit living and non-compliance with infection control requirements. In addition, migrants and refugees often do not have sufficient access to medical care, which makes the timely diagnosis and treatment of tuberculosis difficult [10]. All of the above has allowed us to formulate the goal of the fragment of our research.

Objective — to analyze the regional peculiarities of the epidemiology of tuberculosis in the Chernivtsi region under the influence of unfavorable socio-economic factors.

Materials and methods

The medical records of all newly diagnosed cases of tuberculosis that were registered at the Chernivtsi Regional Clinical Tuberculosis Dispensary from January 2021 to December 2022 (TB MANAGER electronic register of tuberculosis patients) were analyzed.
were detected at later stages and in more severe forms and demonstrated a potentially probable increase in the number of active cases in 2022 [3].

The prevalence rate of TB over the last four years has a tendency to decrease across the territory of Ukraine (Fig. 2). Thus, in 2022, the prevalence of tuberculosis infection in Ukraine decreased by 34.5 % compared to 2019, and the difference between 2019 (before the quarantine period) and 2021 is 31.5 %, between 2020 and 2021 was insignificant, as well as between 2021 and 2022 (the period of the war) [7].

The analysis of the prevalence of TB in Bukovina showed a decrease of this indicator for 2020 compared to 2019 by 25.9 %, in 2021 the rate of regression decreased to 1.5 % compared to 2020, but in the last year — 2022, a probable increase in the indicator can be observed prevalence of TB in the Chernivtsi region — by 16.1 % [1].

The analysis of the mortality rate (Fig. 3) due to tuberculosis among the entire population of Ukraine in the dynamics from 2019 to 2022 shows its decrease in the state as a whole and, in particular, in Bukovina. There was no increase in the TB death rate in the comparative dynamics between 2019—2022 in any region of Ukraine [4].

Attention is drawn to the tendency to increase the death rate from tuberculosis infection in the Chernivtsi region (see Fig. 3) compared to the similar rate in the state. At the same time, as shown in Fig. 3, the difference between the national mortality rate and in the region for 2019—2021 was probably: in 2019 — 34.1 %, in 2020 — 37.8 %, in 2021 — 37.3 %, with a lower value in Bukovina. Conversely, in 2022, we observe a trend towards the equilibrium of this indicator with some potential increase in mortality in Chernivtsi region (by 9.9 %) compared to the national level, which, in our opinion, may be due to underreporting of TB-related deaths.

The mortality rate in Bukovina under the negative influence of socio-economic factors was 4.7 per 100,000 population in 2021, and 4.4 per 100,000 population in 2022, namely it indicates a downward trend.

As demonstrated in Fig. 4 the curve of the TB incidence rate estimate per 100,000 population in the period from 2016 to 2022 in the Chernivtsi region. The trend of TB registration is consistent but with varying rates of change. The period of the strict lockdown is characterized by a sharp decrease in the registration of TB cases. Over the past 2 years, a trend of increasing cases of active tuberculosis infection has been observed. [3].

With the onset of the SARS-CoV-2 COVID-19 pandemic in 2020, the number of newly diagnosed TB cases decreased, potentially leading to an accumulation of undiagnosed and latent TB cases that

pre-quarantine period, the second — 2020—2021 — the quarantine period associated with the COVID-19 pandemic, and 2022 — the period of the war in Ukraine [1].

In general, according to the results of the graphic analysis shown in Fig. 1, we observe a trend towards a significant decrease in the incidence rate of TB during the COVID-19 period, and the same trend is observed during the martial law both in the state as a whole and in Bukovina [8].

Thus, in 2020, the number of newly diagnosed TB cases in Ukraine decreased by 25 % compared to 2019, in Bukovina — by 20.6 %.

According to the Center for Public Health, in Ukraine in 2022, the number of first-time registered TB cases, including its recurrences, was 18,510, or 45.1 per 100,000 population, which is 2.5 % more than in 2021 (18,241, or 44.0 per 100,000 population). As for the Chernivtsi region, in 2022 a reliable tendency to increase the incidence rate compared to 2021 by 27.3 % was registered [9].

With the onset of the SARS-CoV-2 COVID-19 pandemic in 2020, the number of newly diagnosed TB cases decreased, potentially leading to an accumulation of undiagnosed and latent TB cases that...
detected in Bukovina compared to 2021 — 185 patients, the highest number of patients were detected in the Vyzhnytskyi district — 25 patients, which is 36 % higher than in 2021, where only 16 patients were detected. In particular, it is worth highlighting districts such as Storozhynetsky — where there is a 2-fold increase in the number of patients with newly diagnosed cases of TB: in 2022 there were 38 patients, and in 2021 — 19 patients, Hlybotskyi district, where in 2022 — 24 patients were detected,
and in 2021 year — 11 patients, Novoselytskyi — the number of patients for 2022 has tripled compared to 2021.

However, it is worth noting (see Fig. 5) that in certain regions of Bukovyna, the incidence rate decreased in 2022 compared to 2021. This is, in particular, the city Chernivtsi by 39.1 %, Zastavnivskyi district. — 33.1 %, Putylsky district — 25 %.

The data presented in Fig. 6 highlight the indicators of the prevalence of TB in the Chernivtsi region compared to the national ones in the dynamics of 2021—2022. Thus, in Bukovyna, the prevalence rate showed an increase in TB in the percentage ratio — by 14 %, which is clearly visible in such districts as Storozhinetskyi, Kitsmanskyi, Novoselytskyi, Khotynskyi, with the maximum increase in Putilskyi (mountain district). However, there are regions where a regression of prevalence is observed, in particular, it is the city of Chernivtsi, Zastavnivskyi, Vyzhnytskyi, Hertsavskyi districts.

Thus, we observe certain probable discrepancies in the indicators of the incidence and prevalence of TB in the Chernivtsi region in the dynamics of 2021—2022, a clear trend of a synchronous decrease of these indicators is being followed in the city Chernivtsi.

One of the main dimensions characterizing the epidemic situation with TB is the mortality rate. The mortality rate of the region’s population from TB was 4.7 per 100,000 population in 2021, and 4.4 per 100,000 population in 2022, which shows a downward trend [4, 5].

As you can see, the digital analysis shown in Fig. 7, reflects different results in most districts of the region, where an increase in deaths due to TB infection can be observed compared to last year. In particular, in districts such as Vyzhnytskyi, the rate has almost tripled, while in Hlybotskyi, there were no cases in 2021, but in 2022 there were 10.8 deaths per 100,000 population. Kitsmanskyi district saw an increase of almost 6 times compared to 2021. Not all regions of Bukovyna have observed an increase in the death rate; in some of them, there is a decrease or no deaths at all. This is particularly true for districts such as Sokyriansky, Hertsavskyi, and the city of Novodnistrovsk.

**Conclusions**

In the Chernivtsi region, from 2019 to 2022, there is a trend towards a significant decrease in the TB incidence rate, both during the epidemic period and the conditions of war, which correlates with the national trend. Due to the onset of the COVID-19 pandemic caused by SARS-CoV-2, the number of newly diagnosed TB cases decreased in 2020 compared to 2019. This potentially led to an accumulation of undiagnosed and latent TB cases that were detected at later stages and in more severe forms, indicating a potential increase in the number of active cases in 2022.

Some potential variations in the incidence and prevalence of TB in the Chernivtsi region during the period of 2021—2022 have been identified. However, there is a clear trend of simultaneous decrease in these indicators in the city of Chernivtsi.

The difference between the national and regional mortality rates for 2019—2021 was as follows: in 2019 — 34.1 %, in 2020 — 37.8 %, and in 2021 — 37.3 %, with a smaller difference observed in Bukovyna. Conversely, in 2022, we observe a trend towards equilibrium in this indicator, with a poten-
ЕПІДЕМІЧНА СИТУАЦІЯ / EPIDEMIC SITUATION

There is no conflict of interest.


References

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Динаміка основних показників епідеміології туберкульозу на Буковині, вплив пандемії COVID-19 та умов війни

За даними ВООЗ, Україна належить до 27 країн світу, на які припадає 85 % випадків захворюваності на туберкульоз (ТБ), і посідає 4-те місце у світі за його поширеністю.

Мета роботи — проаналізувати регіональні особливості епідеміології ТБ у Чернівецькій області в умовах впливу несприятливих соціально-економічних чинників.

Матеріали та методи. Проаналізовано медичні картки всіх пацієнтів із вперше діагностованим ТБ, зареєстрованих у Чернівецькому обласному клінічному протитуберкульозному диспансері у період з січня 2021 р. до грудня 2022 р. Статистичну обробку отриманих даних проведено за допомогою програми IBM SPSS Statistics v26.0.

Результати та обговорення. Аналіз захворюваності на ТБ серед дорослого населення вірогідно зріс. Ситуація локдауну, спричинена пандемією COVID-19, та умови воєнного стану внесли свої негативні корективи. Так, аналіз поширеності ТБ на Буковині показав зменшення цього показника за 2020 рік порівняно з 2019 р. на 25,9 %, у 2021 р. темпи регресії зменшилися до 1,5 % порівняно з 2020 р., проте в 2022 р. можна спостерігати вірогідне збільшення показника поширеності ТБ у Чернівецькій області — на 16,1 %.

Висновки. У Чернівецькій області у період з 2019 до 2022 р. зафіксовано тенденцію до суттєвого зниження показника захворюваності на ТБ як під час пандемії COVID-19, так і в умовах воєнного стану, що не відрізняється від тенденції в Україні в цілому. У зв'язку з початком пандемії COVID-19, спричиненої вірусом SARS-CoV-2, у 2020 р. зменшилася кількість вперше виявлених випадків ТБ порівняно з 2019 р., що потенційно могло призвести до накопичення недодіагностованих та латентних випадків ТБ, виявлених на пізніших стадіях та у тяжких формах, і зростання кількості активних випадків у 2022 р. Показник смертності на Буковині в умовах негативної дії соціально-економічних чинників становив у 2021 р. — 4,7 на 100 тис. населення, у 2022 р. — 4,4 на 100 тис. населення, тобто має місце тенденція до зниження цього показника.

Ключові слова: туберкульоз, захворюваність, поширеність, пандемія COVID-19, воєнний стан.

ДЛЯ ЦИТУВАННЯ
• Todoriko LD, Todorika YaI, Huska II, Karnas NO. Dynamics of the Main Indicators of Tuberculosis Epidemiology in Bukovina, the Influence of the COVID-19 Pandemic and Wartime Conditions. Туберкульоз, легеневі хвороби, ВІЛ-інфекція. 2023;3:79-85. doi: 10.30978/TB-2023-3-79.