

# Dynamics of the epidemiological indicators of tuberculosis in the Republic of Moldova during different periods and during the COVID-19 epidemics

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**Conflict of interest:** none

**BACKGROUND.** The second milestone of the World Health Organization developed End TB Strategy to be met in 2025 was the declining of the incidence by 50 % and the absolute number of deaths by 75 % from 2015 levels.

**OBJECTIVE.** To establish the dynamics of the main epidemiological indicators of tuberculosis in the Republic of Moldova during different periods including the period of COVID-19 pandemics in the frame of a prospective longitudinal study.

**MATERIALS AND METHODS.** A prospective study, compared the statistical indicators of tuberculosis: global incidence, prevalence and mortality published in the informational system of monitoring and evaluation (SIME TB).

**RESULTS.** The global incidence was declining from 2015 till 2020, and then increased from 56.68 per 100,000 population in 2020 to 66.34 per 100,000 population in 2024 with 17 % rise. The analysis of prevalence revealed significant changes between the periods 2015-2019 and 2020-2024: considering the overall frequency of all case-types, localization and micro-biological state, it was established that in 2015-2019 the total tuberculosis cases decreased from 4,056 in 2015 to 3,186 in 2019, with the prevalence rate dropping from 100.55 to 79.31 per 100,000 population and in 2020-2024 the total tuberculosis cases further decreased from 2,220 in 2020 to 1,589 in 2024, with the prevalence rate falling from 71.54 to 54.45 per 100,000 population. Tuberculosis mortality for 2020 was 5.2 per 100,000 population (207 cases), in 2021 it was 6.5 per 100,000 population (199 cases) with 3.9 % decreased. In 2022 mortality rate was 6.7 per 100,000 population (207 cases), in 2023 – 3.1 per 100,000 population (125 cases) and in 2024 – 2.2 per 100,000 population (99 cases).

**CONCLUSIONS.** Trends in tuberculosis prevalence and mortality indicate a general improvement in the control of this disease in Moldova over the past decades, with significant reductions in recent years. The increase with 17 % of the global incidence during the period of COVID-19 pandemic highlighted the challenges in tuberculosis control efforts in the country, underscoring the need for intensified interventions to reverse this trend and align with global reduction goals.

**KEY WORDS:** tuberculosis, indicators, COVID-19.

## Динаміка епідеміологічних показників туберкульозу в Республіці Молдова в різні періоди та під час епідемії COVID-19

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**ОБҐРУНТУВАННЯ.** Другою віхою розробленої Всесвітньою організацією охорони здоров'я стратегії подолання туберкульозу, яка має бути досягнута 2025 року, стало зниження захворюваності на 50 % і абсолютної кількості смертей на 75 % порівняно з рівнями 2015 року.

**МЕТА.** Встановити динаміку основних епідеміологічних показників туберкульозу в Республіці Молдова протягом різних періодів, включно з періодом пандемії COVID-19, у межах проспективного лонгітюдного дослідження.

**МАТЕРІАЛИ ТА МЕТОДИ.** У проспективному дослідженні порівнювалися статистичні показники туберкульозу: глобальна захворюваність, поширеність і смертність, опубліковані в інформаційній системі моніторингу й оцінювання (SIME TB).

**РЕЗУЛЬТАТИ.** Глобальна захворюваність знижувалася з 2015 по 2020 рік, а потім зросла з 56,68 на 100 тис. населення 2020 року до 66,34 на 100 тис. населення 2024 року (підвищення на 17 %). Аналіз поширеності виявив значні зміни між періодами 2015-2019 та 2020-2024 років: з огляду на загальну частоту всіх типів випадків, локалізації та мікробіологічного стану було встановлено, що у 2015-2019 роках загальна кількість випадків туберкульозу зменшилася з 4056 у 2015 році до 3186 у 2019 році, причому поширеність знизилася зі 100,55 до 79,31 на 100 тис. населення, тоді як у 2020-2024 роках загальна кількість випадків туберкульозу ще більше знизилася – з 2220 у 2020 році до 1589 у 2024 році, а поширеність упала із 71,54 до 54,45 на 100 тис. населення. Смертність від туберкульозу 2020 року становила 5,2 на 100 тис. населення (207 випадків), 2021 року – 6,5 на 100 тис. населення (199 випадків) зі зниженням на 3,9 %. У 2022 році рівень смертності становив 6,7 на 100 тис. населення (207 випадків), у 2023 році – 3,1 на 100 тис. населення (125 випадків), у 2024 році – 2,2 на 100 тис. населення (99 випадків).

**ВИСНОВКИ.** Тенденції поширеності туберкульозу та смертності від нього свідчать про загальне покращення контролю цієї хвороби в Молдові за останні десятиліття, зі значним зниженням останніми роками. Збільшення глобальної захворюваності на 17 % протягом періоду пандемії COVID-19 підсвітило проблеми в боротьбі з туберкульозом у країні, вказуючи на потребу посилення утручань для того, щоби змінити цю тенденцію й узгодити з глобальними цілями щодо подолання хвороби.

**КЛЮЧОВІ СЛОВА:** туберкульоз, показники, COVID-19.

### Introduction

Tuberculosis (TB), a communicable disease caused by *Mycobacterium tuberculosis*, which affects approximately 10 million people globally each year despite being preventable and curable [1, 10, 12]. In 2014, the World Health Assembly endorsed global targets to reduce TB burden from 2016 to 2035, aligning with the Sustainable Development Goals and the World Health Organization (WHO) End TB Strategy [2, 8, 11]. This strategy comprises three pillars and four principles, emphasizing government leadership, civil society engagement, human rights, equity, and country-specific adaptations. Successful implementation relies on countries adhering to these principles while executing interventions within each pillar [1, 3, 6, 7]. The End TB Strategy envisions a world free of TB, aiming to reduce global TB incidence to 10 per 100,000 population by 2035. Its initial 2020 milestones targeted a 35 % decrease in TB deaths and a 20 % reduction in TB incidence compared to 2015 levels. For 2025, the strategy aims to have TB incidence reduce by 50 % and the absolute number of deaths by 75 % relative to 2015 [2, 4, 5, 9, 10].

The purpose of the study was to establish the dynamics of the main epidemiological indicators of TB: global incidence, prevalence and mortality in the Republic of Moldova during different periods including the period of coronavirus disease (COVID-19) pandemics in the frame of a prospective longitudinal study.

### Materials and methods

A prospective study, compared the statistical indicators of TB: global incidence, prevalence and mortality published in the informational system of monitoring and evaluation (SIME TB) and the annual WHO reports [3-10].

### Results and discussion

In the Republic of Moldova, the TB incidence declined, as from 2015 from 70.88 per 100,000 (2,859 cases), 2016: 70.57 per 100,000 (2,845 cases), 2017: 66.66 per 100,000

(2,682 cases), 2018: 60.99 per 100,000 (2,450 cases), 2019: 56.73 per 100,000 (2,279 cases). However, during the period from 2020 to 2024 was established an increase, with the incidence rate rising from 56.68 (cases) to 66.34 per 100,000 population (cases). This upward trend contrasts with the previous 21.7 % decrease observed from 2015 to 2020, indicating a significant shift in TB epidemiology in Moldova. Regional disparities were evident while comparing the incidence. The Right Bank had an increase from 1,421 cases in 2020 to 1,649 in 2024, while Transnistria (Left Bank) experienced a decline from 338 to 287 cases over the same period. Significant local variations included Stefan Voda, which recorded the highest increase of 151.72 % (from 29 to 73 cases), and Donduseni, with the notable decrease of 63.64 % (from 22 to 8 cases). Chisinau, the capital, showed a moderate rise from 281 to 308 cases.

While comparing the global incidence the improving trend was established in 2019: 71.6 per 100,000 population (2,877 cases), in 2018 it was 75.1 per 100,000 population (3,016 cases), in 2017 – 83.3 per 100,000 population (3,358 cases), in 2016 – 88.5 per 100,000 population (3,569 cases). It was showed a decrease of 19.1 % was noted for the period 2016-2019. Then TB global incidence has shown a changing trend. In 2020, the rate was 56.68 per 100,000 population (1,759 cases), which increased to 66.34 per 100,000 (1,936 cases) by 2024. This represents a 17.1 % rise over four years, contrasting with the previous declining trend observed from 2016 to 2019. The data suggests a reversal in TB control progress, highlighting the need for intensified efforts to combat the disease in Moldova. The significant decrease in TB case detection during the initial phase of COVID-19 pandemics (2020-2022) was related to factors: a) mobility restrictions and lockdowns and other measures limited access to TB diagnosis, treatment, and care services; b) disruption of TB services: many TB programs were reduced or suspended as health systems prioritized COVID-19 response; c) resource reallocation: human, financial,

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and technical resources, including laboratory equipment, were diverted from TB to COVID-19 efforts; d) reduced healthcare seeking as patients avoided medical facilities due to fears of COVID-19 exposure; e) stigma because some similarity between TB and COVID-19 symptoms led to increased stigma, potentially discouraging individuals from seeking TB-related care. These factors collectively contributed to the substantial decline in TB case detection and reporting during this period, being mentioned in the international reports [4-10].

The incidence of TB relapses in 2024 was 377 cases (12.92 per 100,000 population), in 2023: 434 cases (14.87 per 100,000 population), while in 2022 it was 453 cases compared to 454 cases in 2021, the indicator being 15.08 per 100,000 population (compared to 14.82 per 100,000 population in 2021) with an increase of 1.7 %. In 2020 the incidence of relapses was 12.37 per 100,000 population (384 cases), in 2019 it was 14.86 per 100,000 population (597 cases), in 2018 – 14.06 per 100,000 population (565 cases), in 2017 – 16.68 per 100,000 population (671 cases), in 2016 – 17.93 per 100,000 population (723 cases), in 2015 – 18.52 per 100,000 population (747 cases). A decrease in the rate of TB relapses was by 18.6 % was noted during the period 2015-2020. During the period 2020-2024 the total number of relapsed increased from 384 in 2020 to 377 in 2024. The incidence of the relapses reported per 100,000 population rose from 12.37 in 2020 to 12.92 in 2024, a 4.45 % increase. Regional variations on the Right Bank consisted on the number of cases which increased from 302 in 2020 to 328 in 2024 with the incidence rate rose from 11.46 to 13.34 per 100,000, a 16.4 % increase. In Transnistria (Left Bank) the cases decreased significantly from 82 in 2020 to 49 in 2024 and the relapse incidence rate dropped from 17.51 to 10.64 per 100,000, a 39.2 % decrease. The notable changes in specific regions was in Ialoveni with the highest increase, from 16 cases (21.03 per 100,000) to 23 cases (32.44 per 100,000), Orhei with a significant rise from 11 cases (12.98 per 100,000) to 25 cases (32.57 per 100,000) and Ribnita with a substantial decrease from 20 cases (29.81 per 100,000) to 4 cases (6.11 per 100,000). Gender distribution showed that the rate of male cases decreased from 84 % in 2020 to 79 % in 2024 and female cases increased from 16 % in 2020 to 21 % in 2024. Chisinau (capital) showed a slight increase from 66 cases (9.91 per 100,000) to 71 cases (10.63 per 100,000). In rural areas was generally showed higher increases in incidence rates compared to urban areas.

The analysis of TB prevalence revealed significant changes between the periods 2015-2019 and 2020-2024. Considering the overall frequency of all case-types, localization and microbiological state (positive either negative), it has established that in 2015-2019 as regard the total number of TB cases decreased from 4,056 in 2015 to 3,186 in 2019, with the prevalence rate dropping from 100.55 to 79.31 per 100,000 population and in 2020-2024 the total TB cases further decreased from 2,220 in 2020 to 1,589 in 2024, with the prevalence rate falling from 71.54 to 54.45 per 100,000 population. This indicates a consistent downward trend in TB prevalence over the entire period. Regional variations in the Right Bank established that during 2015-2019 the total num-

ber of cases decreased from 3,254 to 2,533 and during 2020-2024 the absolute number of cases further reduced from 1,718 to 1,325. In Transnistria (Left Bank) during 2015-2019 the number of cases decreased from 802 to 653 and from 2020-2024 the number of cases significantly reduced from 502 to 264. Notable changes in specific regions in Chisinau (capital) in 2015-2019 decreased from 782 to 616 cases and in 2020-2024 further reduced from 425 to 332 cases. In Stefan Voda during 2015-2019 was determined a decreased from 53 to 44 cases and during 2020-2024 and increased from 33 to 45 cases, showing a reversal in trend. Gender distribution during 2015-2019 the rate of male cases remained stable at around 77-78 % and during 2020-2024 the rate of male cases slightly decreased from 80 % to 79 %.

WHO reports demonstrated that the COVID-19 pandemic significantly impacted TB case-detection and treatment globally [2, 5, 11]. Reported globally TB cases dropped from 7.1 million in 2019 to 5.8 million in 2020, before partially recovering to 6.4 million in 2021. This decline suggests a substantial increase in undiagnosed and untreated TB cases during the pandemic. Consequently, TB-related deaths increased due to disruptions in diagnosis and treatment services. In the COVID-19 context TB mortality in Moldova fluctuated and was reported at 5.2 per 100,000 population (207 deaths) in 2022 with an increased to 6.5 per 100,000 (199 deaths) compared with 2021, representing a 25 % rise in the mortality rate. The mortality in 2023 was reported at 3.1 per 100,000 population (125 cases) and in 2024 was 2.2 per 100,000 population (99 cases). This trend suggests ongoing challenges in TB control efforts in Moldova during this period.

Comparing obtained data and those reported by the WHO and international studies, COVID-19 outbreak significantly reduced TB notifications worldwide with a global decline of TB notifications which dropped by 18 % from 7.1 million cases in 2019 to 5.8 million cases in 2020, with regional variations meaning that in the 10 high-burden countries with the largest reported shortfalls, the overall decrease in TB notifications was 28 % compared to 2019 [10]. The estimated impact by WHO was that 1.4 million fewer people received care for TB in 2022 than in 2019, a 21 % reduction across 84 countries [6-9]. A partial recovery of TB notifications showed only a partial recovery in 2021, with 6.4 million cases reported [7]. These reductions in TB notifications during the COVID-19 pandemic have likely led to a significant increase in undiagnosed and untreated TB cases worldwide [10, 11]. In Moldova the COVID-19 pandemic significantly impacted TB detection and treatment. Because the reported cases dropped and was followed by the gradual restoration of TB services and detection capabilities in the post-pandemic periods (2023-2024), increase of certain indicators (global incidence, relapsed cases) suggesting a potential improvement in the case-detection.

### Conclusions

Trends in TB prevalence and mortality indicate a general improvement in the control of this disease in Moldova over the past decades, with significant reductions in recent years. The increase with 17 % of the global incidence during

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the period of COVID-19 pandemic highlighted the challenges in TB control efforts in the country, underscoring the need for intensified interventions to reverse this trend and align with global reduction goals.

During COVID-19 pandemic there was a significant decrease in TB case detection and reporting due to mobility

restrictions, disruption of TB services, resource reallocation such as human, financial, and technical, including laboratory equipment, were diverted from TB to COVID-19 efforts, reduced healthcare seeking behavior, stigma. These factors collectively contributed to the substantial decline in TB case detection and reporting during this period.

### Література/References

1. WHO. The End TB Strategy. Available at: <https://www.who.int/teams/global-tuberculosis-programme/the-end-tstrategy#:~:text=The%20End%20TB%20Strategy%20builds,Strategy%20at%20the%20country%20level>.
2. United Nations. Sustainable Development Goals. Available at: <https://sdgs.un.org/goals>.
3. Informational System of Monitoring and Evaluation of Tuberculosis (SIME TB). Available at: <https://simetb.ifp.md>.
4. WHO. Global Tuberculosis Report 2024. Available at: <https://www.who.int/teams/global-tuberculosis-programme/tb-reports/global-tuberculosis-report-2024#:~:text=The%20WHO%20Global%20tuberculosis%20report,TB%20commitments%2C%20strategies%20and%20targets>.
5. WHO. Global Tuberculosis Report 2023. Available at: <https://www.who.int/teams/global-tuberculosis-programme/tb-reports/global-tuberculosis-report-2023>.
6. WHO. Global Tuberculosis Report 2022. Available at: <https://www.who.int/teams/global-tuberculosis-programme/tb-reports/global-tuberculosis-report-2022>.
7. WHO. Global Tuberculosis Report 2021. Available at: <https://www.who.int/publications/digital/global-tuberculosis-report-2021>.
8. WHO. Global Tuberculosis Report 2020. Available at: <https://www.who.int/publications/i/item/9789240013131>.
9. Falzon D., Zignol M., Bastard M., Floyd K., Kasaeva T. The impact of the COVID-19 pandemic on the global tuberculosis epidemic. *Front. Immunol.* 2023 Aug 29; 14: 1234785. DOI: 10.3389/fimmu.2023.1234785. PMID: 37795102; PMCID: PMC10546619.
10. Ledesma J.R., Basting A., Chu H.T., Ma J., Zhang M., et al. Global, regional, and national-level impacts of the COVID-19 pandemic on tuberculosis diagnoses, 2020-2021. *Microorganisms.* 2023; 11: 2191. DOI: 10.3390/microorganisms11092191.
11. Vykliuk Ya., Semianiv I., Nevinskyi D., Todoriko L., Boyko N. Applying geospatial multi-agent system to model various aspects of tuberculosis transmission. *New Microbes and New Infections.* 2024; 59: 101417.
12. Todoriko L.D., Andriiets O.A., Vykliuk Ya.I., Semianiv I.O., Margineanu I., Lesnic E., Nevinskyi D.V., Yeremenchuk I.V. Prospects for the use of artificial intelligence to predict the spread of tuberculosis infection in the WHO European Region. *Tuberkuloz, lehenevi khvoroby, VIL-infektsiia.* 2023; 2 (53): 86-92.

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DOI: 10.32902/2663-0338-2025-1-20-23