Received: 15 February 2025 / Accepted: 14 May 2025 / Published online: 30 June 2025

***DOI 10.34689/SH.2025.27.3.010***

***UDC 616-002.5***



# ANALYSIS OF SOCIO-DEMOGRAPHIC DETERMINANTS AND RISK FACTORS OF TUBERCULOSIS IN THE ABAI REGION DURING THE PERIOD 2014–2022

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**Abstract**

**Introduction:** Tuberculosis (TB) remains a major global health challenge, with over 7 million new cases reported in 2022 alone, partially due to pandemic-related disruptions. Despite global progress, drug-resistant forms and co-infections with HIV and diabetes continue to hinder TB control. In Kazakhstan, significant reductions in TB incidence and mortality have been achieved, yet multidrug-resistant TB and regional disparities persist. The Abai region, formed from the former East Kazakhstan area, has shown variable trends that warrant focused analysis.

The primary **objective** of this study was to assess the epidemiological situation of tuberculosis in the Abai region over the period from 2014 to 2022, with a particular focus on identifying key socio-demographic determinants and associated risk factors.

**Materials and Methods**: This retrospective epidemiological study was based on data from Form № TB-03/u of the National Tuberculosis Registry of Kazakhstan (NTR-TB RK) covering the period from 2014 to 2022. The registry includes detailed demographic, clinical, laboratory, and drug susceptibility data on all newly diagnosed and recurrent TB cases. Prior to analysis, the dataset was anonymized, standardized, and coded. Only complete records were included, while those with missing critical data were excluded. Statistical analysis involved incidence calculations, descriptive statistics, and appropriate comparative tests, with significance set at $p < 0.05$.

**Results:** A total of 3,555 TB cases were registered in the Abai region from 2014 to 2022, with a clear downward trend—from 752 cases in 2014 to 234 in 2022. Most patients were male (61.7%), and pulmonary TB predominated (85%), with infiltrative forms being the most common. Two-thirds of patients resided in urban areas, and nearly half (48.4%) were unemployed at diagnosis. Although no specific risk factors were identified in 84.8% of cases, alcohol abuse, diabetes, prior incarceration, and HIV infection were reported in a minority. Drug-resistant TB was detected in 29.3% of cases, and treatment success (cure or completion) was achieved in over 75% of patients.

**Conclusion:** To sustain and accelerate progress toward TB elimination, it is essential to integrate TB services into broader health and social care systems, with a focus on targeted support for high-risk groups and improved continuity of care across all stages of the treatment cascade.

***Keywords:*** *tuberculosis, epidemiology, risk factors, drug resistance, Kazakhstan*

***For citation:***

*Adilzhanov A.B., Adilgozhin M.S., Ibrayeva Zh.B., Urazalina N.M., Mukanova D.A., Zemlyanskaya N.S., Aitenova E.R., Shamshudinov T.M., Kassym L.T., Kussainova A.A.* Analysis of socio-demographic determinants and risk factors of tuberculosis in the Abai region during the period 2014–2022 // *Nauka i Zdravookhranenie* [Science & Healthcare]. 2025. Vol.27 (3), pp. 88-97. *doi 10.34689/SH.2025.27.3.010*

**Резюме**

# АНАЛИЗ СОЦИАЛЬНО-ДЕМОГРАФИЧЕСКИХ ДЕТЕРМИНАНТ И ФАКТОРОВ РИСКА ТУБЕРКУЛЁЗА В ОБЛАСТИ АБАЙ ЗА 2014–2022 ГОДЫ

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**Введение:** Туберкулёз (ТБ) остаётся одной из ведущих глобальных проблем здравоохранения: только в 2022 году было зарегистрировано более 7 миллионов новых случаев, что частично связано с последствиями пандемии. Несмотря на достигнутый прогресс, борьбу с туберкулёзом осложняют лекарственно-устойчивые формы заболевания, а также сочетанные инфекции с ВИЧ и сахарным диабетом. В Казахстане достигнуты значительные успехи в снижении заболеваемости и смертности от ТБ, однако сохраняется проблема мультирезистентного ТБ и выраженные региональные различия. Территория нынешнего Абайского региона, выделенного из Восточно-Казахстанской области, демонстрирует неоднородные эпидемиологические тенденции, требующие углублённого анализа.

**Целью** исследования являлась оценка эпидемиологической ситуации по туберкулёзу в области Абай в период с 2014 по 2022 год с акцентом на выявление ключевых социально-демографических детерминант и факторов риска.

**Материалы и методы:** Исследование выполнено в ретроспективном эпидемиологическом дизайне на основе данных формы № ТВ-03/у Национального регистра больных туберкулёзом Республики Казахстан (НРБ РК) за 2014–2022 годы. Регистр содержит подробную информацию о демографических характеристиках, клинических и лабораторных показателях, а также о лекарственной чувствительности возбудителя у всех впервые выявленных и рецидивирующих случаев ТБ. Перед началом анализа данные были обезличены, стандартизированы и закодированы. В выборку включались только полные записи; случаи с отсутствием ключевой информации исключались. Статистическая обработка включала расчёт заболеваемости, описательную статистику и методы сравнительного анализа с уровнем значимости $p < 0,05$.

**Результаты:** За период 2014–2022 годов в области Абай было зарегистрировано 3 555 случаев ТБ, при этом наблюдалась чёткая тенденция к снижению: с 752 случаев в 2014 году до 234 в 2022 году. Большинство пациентов составляли мужчины (61,7%), а преобладающей формой был лёгочный туберкулёз (85%), преимущественно инфильтративного типа. Две трети пациентов проживали в городах, при этом почти половина (48,4%) на момент постановки диагноза были безработными. Несмотря на то что в 84,8% случаев не были выявлены конкретные факторы риска, в части наблюдений отмечались злоупотребление алкоголем, наличие сахарного диабета, тюремное заключение в анамнезе и ВИЧ-инфекция. Лекарственно-устойчивые формы ТБ составили 29,3% случаев, при этом эффективность лечения (в виде выздоровления или завершения терапии) достигнута более чем у 75% пациентов.

**Заключение:** Для сохранения и ускорения достигнутого прогресса в ликвидации туберкулёза необходимо интегрировать услуги по ТБ в систему общего медицинского и социального обеспечения с особым вниманием к уязвимым группам населения и обеспечению преемственности медицинской помощи на всех этапах лечебного процесса.

***Ключевые слова:*** *туберкулез, эпидемиология, факторы риска, лекарственная устойчивость, Республика Казахстан.*

***Для цитирования:***

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**Түйіндеме**

# 2014–2022 ЖЫЛДАР АРАЛЫҒЫНДАҒЫ АБАЙ ОБЛЫСЫНДАҒЫ ТУБЕРКУЛЁЗДІҢ ӘЛЕУМЕТТІК-ДЕМОГРАФИЯЛЫҚ ДЕТЕРМИНАНТТАРЫ МЕН ҚАУІП ФАКТОРЛАРЫН ТАЛДАУ

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**Кіріспе:** Туберкулез (ТБ) — жаһандық денсаулық сақтау саласындағы өзекті мәселелердің бірі болып қала береді. 2022 жылының өзінде 7 миллионнан астам жаңа жағдай тіркеліп, бұл көрсеткіш пандемия салдарынан болған үзілістердің әсерін көрсетеді. Әлемдік деңгейде оң нәтижелерге қол жеткізілгенімен, дәріге төзімді формалар мен АИТВ және қант диабетімен қатар жүретін инфекциялар туберкулезге қарсы күресті қиындатуда. Қазақстанда туберкулездің аурушаңдығы мен өлім-жітімі айтарлықтай төмендегенімен, мультирезистентті формалар мен өңірлік айырмашылықтар сақталуда. Бұрынғы Шығыс Қазақстан облысының негізінде құрылған Абай өңірінде туберкулез бойынша әркелкі үрдістер байқалуда, бұл қосымша талдауды қажет етеді.

**Мақсат:** 2014–2022 жылдар аралығындағы Абай облысындағы туберкулездің эпидемиологиялық жағдайын бағалау, сондай-ақ негізгі әлеуметтік-демографиялық көрсеткіштер мен тәуекел факторларын анықтау болып табылады.

**Материалдар мен әдістер:** Зерттеу ретроспективті эпидемиологиялық сипатта жүргізіліп, 2014–2022 жылдар аралығындағы Қазақстан Республикасының Ұлттық туберкулез регистріндегі (НРБТ ҚР) № ТВ-03/у нысаны негізінде жүзеге асырылды. Бұл регистр жаңадан анықталған және қайталама ТБ жағдайлары туралы демографиялық, клиникалық, зертханалық және дәріге сезімталдық деректерін қамтиды. Деректер өңдеулер алдында анонимдендіріліп, стандартталып және кодталды. Зерттеуге тек толық толтырылған жазбалар енгізілді, ал маңызды өрістері жоқ жазбалар алынып тасталды. Статистикалық талдау аурушаңдық көрсеткіштерін есептеуді, сипаттамалық статистиканы және салыстырмалы сынақтарды қамтыды ($p < 0.05$).

**Нәтижелер:** 2014–2022 жылдар аралығында Абай облысында барлығы 3 555 туберкулез жағдайы тіркелді, бұл кезең ішінде анық төмендеу үрдісі байқалды: 2014 жылы 752 жағдай (21.2%) тіркелсе, 2022 жылы бұл көрсеткіш 234-ке (6.6%) дейін азайды. Науқастардың басым бөлігі ер адамдар (61.7%) болған, ал аурудың 85%-ы өкпелік формада тіркелген, олардың ішінде инфильтративті түрлері жиі кездескен. Екі науқастың бірі жұмыссыз болған (48.4%), ал тұрғындардың үштен екісі қалалық жерде өмір сүрген. Жағдайлардың 84.8%-ында нақты тәуекел факторлары анықталмағанымен, кейбір науқастарда алкогольге тәуелділік, қант диабеті, бас бостандығынан айырылу және АИТВ-инфекциясы кездескен. Дәріге төзімді ТБ 29.3% науқастарда анықталды, ал жалпы ем нәтижесі (жазылу немесе емді аяқтау) 75%-дан жоғары болды.

**Қорытынды:** Туберкулезбен күресте қол жеткізілген жетістіктерді сақтау және одан әрі ілгерілету үшін, ТБ қызметтерін жалпы денсаулық сақтау және әлеуметтік қолдау жүйелеріне біріктіру, жоғары тәуекел тобындағы тұлғаларға бағытталған көмекті күшейту және емдеу тізбегінің барлық кезеңдерінде үздіксіздікті қамтамасыз ету маңызды.

***Түйінді сөздер****: туберкулез, эпидемиология, қауіп факторлары, дәрілік тұрақтылық, Қазақстан Республикасы.*

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**Background**

Tuberculosis (TB) continues to pose a critical challenge to global public health in the 21st century [22]. According to the World Health Organization (WHO), an estimated 2.5 billion people are infected with *Mycobacterium tuberculosis* (MBT), representing roughly a third of the global population [18]. Despite notable advancements in diagnosis, treatment, and prevention, the global burden of TB remains substantial, with millions of new cases reported annually [4]. TB continues to rank among the leading causes of death from infectious diseases, surpassing HIV/AIDS in mortality in several regions [21]. The growing incidence of drug-resistant TB and co-infections with HIV or diabetes further complicates control efforts [25]. Although the WHO's End TB Strategy—launched in 2014—sets ambitious targets for reducing incidence and mortality by 2025 and eliminating TB as a public health threat by 2035, progress has been inconsistent [27]. In 2022 alone, 7.5 million new TB cases were reported—the highest figure since global surveillance began—largely attributed to disruptions in health services caused by the COVID-19 pandemic [10].

In Kazakhstan, a middle-income country and the most economically developed state in Central Asia, TB continues to exert a significant public health burden [3]. Although the country was once listed among the top ten globally for new and recurrent TB cases, recent decades have seen encouraging improvements. Between 2000 and 2022, TB incidence declined from 171 to 78 cases per 100,000 population, while mortality from pulmonary TB fell from 7.4 to 1.5 per 100,000 [11, 23]. These advances reflect national efforts to modernize TB control programs, expand access to DOTS-based treatment, and implement advanced diagnostic technologies, such as GeneXpert [13]. Nevertheless, multidrug-resistant TB (MDR-TB) remains a major concern: in 2019, drug resistance was detected in 27% of newly diagnosed patients and 44% of previously treated cases [5]. Despite these challenges, Kazakhstan has maintained high treatment success rates, with over 85% of patients with drug-susceptible TB and over 80% of MDR-TB patients completing therapy successfully in 2021 [30].

At the subnational level, TB epidemiology in Kazakhstan demonstrates considerable variation. In 2019, the highest incidence rates were observed in Kyzylorda (115.0 per 100,000), followed by North Kazakhstan (88.9), and Aktobe (81.1) regions, whereas the lowest rates were recorded in Karaganda (55.0) [1]. In East Kazakhstan—currently divided into East Kazakhstan and Abai regions—TB incidence was 69.3 per 100,000 [1].

Key determinants of disease activation among the infected include HIV co-infection, diabetes, malnutrition, smoking, alcohol abuse, and exposure to indoor air pollutants [17, 24]. Social vulnerabilities—such as poverty, overcrowding, homelessness, incarceration, and limited access to healthcare—exacerbate transmission, while high-risk populations include children under five, the elderly, and migrants [19]. Men are statistically more affected, although postpartum and lactating women also exhibit increased susceptibility [20]. Studies confirm that the intensity and duration of contact with highly infectious individuals directly influence infection risk [9]. In Kazakhstan, while official reports have classified most TB cases as lacking identifiable risk factors, recent evidence highlights the disproportionate burden among migrant populations in regions with high internal mobility and poor access to healthcare [7].

Since 2003, Kazakhstan has maintained a centralized TB case registration system that records all newly diagnosed and recurrent cases. These data are systematically collected and entered into an electronic database, enabling the Ministry of Health and relevant stakeholders to monitor TB incidence and prevalence at the national level [2]. The compiled information serves as the basis for annual reporting at both national and international levels. However, there remains a significant gap in region-specific epidemiological analysis of pulmonary TB, particularly concerning treatment categories and determinants of treatment failure. A more granular assessment of these indicators is essential to identify local transmission drivers—especially in regions such as Abai—and to forecast disease trends in the population over the coming years.

Accordingly, the primary **objective** of this study was to assess the epidemiological situation of tuberculosis in the Abai region over the period from 2014 to 2022, with a particular focus on identifying key socio-demographic determinants and associated risk factors.

**Materials and Methods**

**Study Design.** This study employed a retrospective epidemiological design.

**Data Sources.** Empirical data were extracted from Form № TB-03/u, which is part of the National tuberculosis registry of the Republic of Kazakhstan (NTR-TB RK), an electronic component of the Unified National Health System (UNHS RK). This system facilitates the integration and digitalization of healthcare service data across the country. The registry captures individualized patient-level information on all newly diagnosed and recurrent TB cases, including both demographic and clinical-diagnostic indicators.

Form No. TB-03/u contains comprehensive patient-level data, including registration date and number, sex, age, affiliated primary healthcare provider, site of TB infection, history of TB disease, clinical diagnosis, treatment category, socio-demographic status, citizenship, country of origin, radiographic and laboratory findings, as well as microbiological and molecular genetic drug susceptibility test (DST) results. The DST methods include Löwenstein–Jensen, BACTEC, GeneXpert, Hain Test, and Bioneer. Data also cover HIV status and antiretroviral therapy (ART) receipt.

Prior to statistical analysis, the extracted Excel dataset was standardized, coded, and fully anonymized to ensure confidentiality.

*Inclusion criteria:* all patient records documented in the NTR-TB system from 2014 to 2022. *Exclusion criteria:* records with incomplete data (i.e., missing critical fields).

**Ethical Considerations**. The study protocol was approved by the Local Ethics Committee of the Non-Profit Joint Stock Company "Semey Medical University" (Protocol No. 16, dated October 25, 2024).

**Statistical Analysis**. Tuberculosis incidence analysis: TB incidence was calculated as the ratio of newly registered TB cases to the total population of Kazakhstan for each year, expressed per 100,000 population. Descriptive analysis: categorical variables were summarized using

absolute and relative frequencies (percentages), while continuous variables were described using medians with interquartile ranges (IQRs) or means with standard deviations (SDs), depending on distribution. Comparative tests: student's t-test or the Mann–Whitney U test was used for comparing continuous variables, based on the distribution normality. Fisher's exact test was employed to assess associations between categorical variables. Statistical significance was set at $p < 0.05$.

**Results**

A total of 3,555 individuals were registered in the study between 2014 and 2022.

The highest number of registered TB cases was observed in 2014, accounting for 21.2% (n=752) of the total. A declining trend was noted thereafter, with the number of registered TB cases in the region dropping to 234 in 2022, representing 6.6% (n=234) of all cases studied.

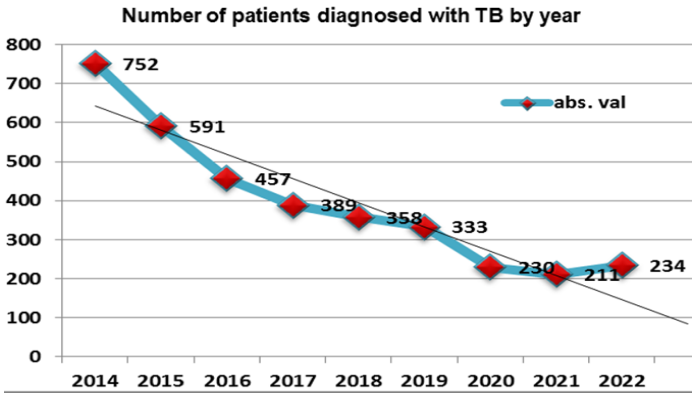


**Figure 1. The overall incidence of TB in the period from 2014 to 2022.**

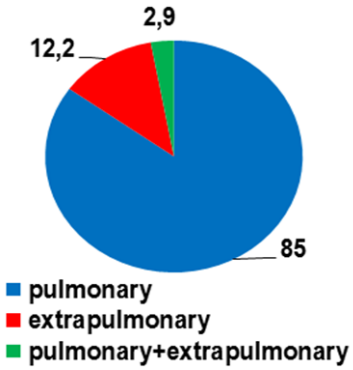


**Figure 2. The form of tuberculosis localization.**

The majority of respondents were male, comprising 61.7% (n=2,195), while females accounted for 38.3% (n=1,360). The mean age was 43.5 ± 16.2 years for men and 42.1 ± 16.0 years for women ($p$=0.026).

With regard to the localization of TB, the majority of cases were pulmonary (85%, n=3,020), while extrapulmonary TB accounted for 12.2% (n=432). The remaining 2.9% (n=103) had both pulmonary and extrapulmonary TB.

*Table 1.*

**Sex and age characteristics of the studied patients**

| | Gender | | Age | | *p* |
|---|---|---|---|---|---|
| | Frequency | Percent | Average value | Standard deviation | |
| male | 2195 | 61,7 | 43, 5 | 16,2 | 0,026 |
| female | 1360 | 38,3 | 42,1 | 16,0 | |
| Total | 3555 | 100,0 | | | |

A wide range of TB types was observed, with the most common being infiltrative pulmonary TB without bacterial excretion (39.7%, n=1,413) and infiltrative pulmonary TB with bacterial excretion (36%, n=1,280). Pulmonary tuberculoma without bacterial excretion was detected in 3.6% of patients (n=128), while bone and joint TB was also diagnosed in 3.6% (n=127). Tuberculous pleurisy (including empyema), either bacteriologically or histologically confirmed or unconfirmed, was found in 3.3% (n=118) and 3.0% (n=108) of cases, respectively. Focal pulmonary TB without bacterial excretion was noted in 2.0% (n=70) of cases. Other forms of TB were diagnosed in fewer than 2% of cases throughout the entire observation period (Table 2).

Over the entire observation period, approximately two-thirds of TB patients resided in urban areas, while one-third were from rural areas. This distribution remained consistent throughout the study period ($p$=0.002).

As illustrated in Figure 3, nearly half of the patients (48.4%, n=1,722) were unemployed at the time of TB diagnosis. Employed individuals constituted one-fifth of the cohort (n=710), retirees accounted for 16.4% (n=583), and students made up 4.1% (n=204). The employment status of 11.1% (n=394) of TB patients was undocumented.

In the majority of cases (84.8%, n=3,016), no specific risk factors for TB development were identified. A history of direct contact with a TB patient was reported by 3.8% (n=135) of the patients. Alcohol abuse was identified as a risk factor in 3.9% (n=138), diabetes mellitus in 3.0% (n=107), imprisonment in 1.3% (n=69), and drug addiction in 0.3% (n=9). Pregnancy was also reported as a risk factor in 1.3% of cases (n=47).

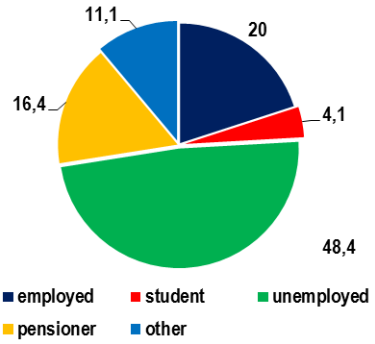


**Figure 3. Social status of TB patients.**

Statistically significant changes in risk factors were observed over the nine-year period ($p$<0.001). Diabetes mellitus peaked as a risk factor in 2018, reaching 6.7% (n=24). In contrast, incarceration as a risk factor showed a downward trend, declining to 0.9% (n=2) in 2022 compared to 3.2% (n=24) in 2014. The frequency of contact with TB patients also decreased over time, indicating improved TB control measures.

*Table 2.* **Prevalence of TB depending on diagnosis in the period from 2014 to 2022.**

| Diagnosis | Frequency | Percentage |
|---|---|---|
| Focal lung TB without bacterial excretion | 70 | 2,0 |
| Tuberculosis of the lungs without bacterial excretion | 128 | 3,6 |
| Infiltrative lung TB without bacterial excretion | 1413 | 39,7 |
| Infiltrative pulmonary TB with bacterial excretion | 1280 | 36,0 |
| Disseminated acute pulmonary TB without bacterial excretion | 25 | ,7 |
| Disseminated acute pulmonary TB with bacterial excretion | 19 | ,5 |
| Disseminated subacute pulmonary TB with bacterial excretion | 3 | ,1 |
| Disseminated chronic pulmonary TB with bacterial excretion | 1 | ,0 |
| Fibrous-cavernous lung TB without bacterial excretion | 5 | ,1 |
| Fibrous-cavernous pulmonary TB with bacterial excretion | 46 | 1,3 |
| Primary tuberculosis complex without bacterial excretion | 3 | ,1 |
| Generalized tuberculosis | 1 | ,0 |
| Tuberculous pleurisy (including empyema) not confirmed bacteriologically, histologically | 108 | 3,0 |
| TB of the bronchi, trachea of the upper respiratory tract, etc.(nose, mouth, pharynx) | 11 | ,3 |
| TB of intrathoracic lymph nodes without bacterial excretion | 31 | ,9 |
| TB of peripheral lymph nodes | 56 | 1,6 |
| TB of the intestine, peritoneum and mesenteric lymph nodes | 12 | ,3 |
| TB from other organs | 15 | ,4 |
| Tuberculous meningitis | 2 | ,1 |
| TB of bones and joints | 127 | 3,6 |
| TB of the genitourinary organs | 48 | 1,4 |
| Acute miliary TB of one specified localization | 5 | ,1 |
| Disseminated subacute pulmonary TB without bacterial excretion | 1 | ,0 |
| Tuberculous meningitis | 7 | ,2 |
| Cirrhotic lung TB without bacterial excretion | 1 | ,0 |
| Tuberculous pleurisy (including empyema) confirmed bacteriologically, histologically | 118 | 3,3 |
| Pulmonary tuberculosis with bacterial excretion | 1 | ,0 |
| Disseminated chronic pulmonary TB with bacterial excretion | 4 | ,1 |
| TB of skin | 3 | ,1 |
| Primary tuberculosis complex without bacterial excretion | 7 | ,2 |
| Generalized tuberculosis | 2 | ,1 |
| Cavernous pulmonary TB with bacterial excretion | 1 | ,0 |
| Acute miliary TB of multiple localization | 1 | ,0 |
| **Total** | **3555** | **100,0** |

*Table 3.* **The status of the place of residence of TB patients in the context from 2014 to 2022.**

| Year | | Resident city/village | | Total | *p* |
|---|---|---|---|---|---|
| | | city | village | | |
| 2014 | Frequency | 421 | 331 | 752 | 0,002 |
| | % per year | 56,0% | 44,0% | 100,0% | |
| 2015 | Frequency | 369 | 222 | 591 | |
| | % per year | 62,4% | 37,6% | 100,0% | |
| 2016 | Frequency | 283 | 174 | 457 | |
| | % per year | 61,9% | 38,1% | 100,0% | |
| 2017 | Frequency | 262 | 127 | 389 | |
| | % per year | 67,4% | 32,6% | 100,0% | |
| 2018 | Frequency | 235 | 123 | 358 | |
| | % per year | 65,6% | 34,4% | 100,0% | |
| 2019 | Frequency | 197 | 136 | 333 | |
| | % per year | 59,2% | 40,8% | 100,0% | |
| 2020 | Frequency | 154 | 76 | 230 | |
| | % per year | 67,0% | 33,0% | 100,0% | |
| 2021 | Frequency | 142 | 69 | 211 | |
| | % per year | 67,3% | 32,7% | 100,0% | |
| 2022 | Frequency | 141 | 93 | 234 | |
| | % per year | 60,3% | 39,7% | 100,0% | |
| **Total** | Frequency | 2204 | 1351 | 3555 | |
| | % per year | 62,0% | 38,0% | 100,0% | |

*Table 4.* **Risk factors for TB development in dynamics over 9 years.**

| Year | | | Risk factor | | | | | | | | Total |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | unknown | contact with TB | diabetes mellitus | HIV | Alcoholism | Drug addiction | prisoners | pregnancy | more than one factor | |
| 2014 | Frequency | 630 | 43 | 15 | 2 | 28 | 3 | 24 | 7 | 0 | 752 |
| | % per year | 83,8% | 5,7% | 2,0% | 0,3% | 3,7% | 0,4% | 3,2% | 0,9% | 0,0% | 100,0% |
| 2015 | Frequency | 513 | 20 | 8 | 3 | 18 | 1 | 19 | 9 | 0 | 591 |
| | % per year | 86,8% | 3,4% | 1,4% | 0,5% | 3,0% | 0,2% | 3,2% | 1,5% | 0,0% | 100,0% |
| 2016 | Frequency | 386 | 18 | 10 | 0 | 23 | 0 | 12 | 8 | 0 | 457 |
| | % per year | 84,5% | 3,9% | 2,2% | 0,0% | 5,0% | 0,0% | 2,6% | 1,8% | 0,0% | 100,0% |
| 2017 | Frequency | 343 | 10 | 15 | 3 | 12 | 3 | 1 | 2 | 0 | 389 |
| | % per year | 88,2% | 2,6% | 3,9% | 0,8% | 3,1% | 0,8% | 0,3% | 0,5% | 0,0% | 100,0% |
| 2018 | Frequency | 285 | 20 | 24 | 3 | 14 | 0 | 5 | 7 | 0 | 358 |
| | % per year | 79,6% | 5,6% | 6,7% | 0,8% | 3,9% | 0,0% | 1,4% | 2,0% | 0,0% | 100,0% |
| 2019 | Frequency | 294 | 8 | 14 | 3 | 6 | 1 | 2 | 5 | 0 | 333 |
| | % per year | 88,3% | 2,4% | 4,2% | 0,9% | 1,8% | 0,3% | 0,6% | 1,5% | 0,0% | 100,0% |
| 2020 | Frequency | 193 | 10 | 8 | 6 | 10 | 1 | 1 | 1 | 0 | 230 |
| | % per year | 83,9% | 4,3% | 3,5% | 2,6% | 4,3% | 0,4% | 0,4% | 0,4% | 0,0% | 100,0% |
| 2021 | Frequency | 179 | 5 | 5 | 2 | 13 | 0 | 3 | 4 | 0 | 211 |
| | % per year | 84,8% | 2,4% | 2,4% | 0,9% | 6,2% | 0,0% | 1,4% | 1,9% | 0,0% | 100,0% |
| 2022 | Frequency | 193 | 1 | 8 | 1 | 14 | 0 | 2 | 4 | 11 | 234 |
| | % per year | 82,5% | 0,4% | 3,4% | 0,4% | 6,0% | 0,0% | 0,9% | 1,7% | 4,7% | 100,0% |
| **Total** | Frequency | 3016 | 135 | 107 | 23 | 138 | 9 | 69 | 47 | 11 | 3555 |
| | % per year | 84,8% | 3,8% | 3,0% | 0,6% | 3,9% | 0,3% | 1,9% | 1,3% | 0,3% | 100,0% |

The majority of TB patients (70.7%, n=2,514) had drug-sensitive TB, whereas 29.3% (n=1,041) had drug-resistant TB. Among all TB cases recorded in the database, 1.4% (n=49) were diagnosed with HIV, which is considered a major risk factor for both the development and severity of the disease.

*Table 5.* **Sensitivity to antibiotic therapy.**

| R sensitivity | Frequency | Percentage |
|---|---|---|
| TB+,R- | 2514 | 70,7 |
| TB+,R+ | 1041 | 29,3 |
| **Total** | 3555 | 100,0 |

Regarding treatment outcomes, treatment completion was achieved in 51.6% (n=1,834) of patients, while 25.2% (n=895) were documented as cured. A total of 12.3% (n=437) of patients were transferred to second-line anti-TB therapy. Ineffective treatment was reported in 2.7% (n=95) of cases. Death from non-TB-related causes occurred in 4.1% (n=146), while TB-related mortality in hospital was observed in 1.3% (n=47), and TB-related death outside the hospital was recorded in 8 cases. Furthermore, 1.0% (n=37) of patients were lost to follow-up, which may have contributed to a worsening of the TB epidemiological situation.

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*Table 6.* **Treatment outcomes in TB patients.**

| Treatment outcome | Frequency | Percentage |
|---|---|---|
| treatment completed | 1834 | 51,6 |
| cure | 895 | 25,2 |
| transferred to treatment of type II TB | 437 | 12,3 |
| death in hospital | 47 | 1,3 |
| ineffective treatment | 95 | 2,7 |
| loss for follow-up | 37 | 1,0 |
| death other causes | 146 | 4,1 |
| result not evaluated | 52 | 1,5 |
| death from TB not in hospital | 8 | ,2 |
| left for another country | 1 | ,0 |
| transferred to treatment of type II TB other causes | 3 | ,1 |
| Total | 3555 | 100,0 |

**Discussion**

The main finding of our study is that, between 2014 and 2022, the Abai region demonstrated a consistent decline in TB incidence. This trend may be attributed to improvements in early detection and treatment programs, as well as the implementation of modern therapeutic regimens, including those targeting drug-resistant TB forms. These findings are consistent with other national and international research. For example, *Kulmirzayeva D. et al.* (2025) similarly reported a sustained decline in TB incidence in Kazakhstan between 2000 and 2023, highlighting a significant reduction in the national incidence rate from 153.2 to 34.7 cases per 100,000 population [14]. On a global scale, a study conducted by *Lönnroth K. et al.* (2015) highlighted that several countries in Eastern Europe and Central Asia have experienced a gradual decrease in TB notification rates due to strengthened public health strategies, including active case finding, contact tracing, and scale-up of

directly observed therapy [15]. Furthermore, WHO reports indicate that between 2015 and 2021, global TB incidence declined by approximately 11%, reflecting the cumulative effect of global efforts under the End TB Strategy [29]. The observed decline in the Abai region thus aligns with broader trends, supporting the efficacy of integrated national TB control measures.

Pulmonary infiltrative tuberculosis remains the most prevalent clinical form of the disease, accounting for over 80% of all diagnosed TB cases. Treatment outcomes are strongly influenced by the clinical form and the presence of drug resistance. In our study, more than half of the patients successfully completed treatment; however, an appreciable proportion still experienced unfavorable outcomes, including mortality and loss to follow-up. These findings underscore the urgent need to strengthen patient management and monitoring at all stages of healthcare delivery. In Kazakhstan, *Urazayeva S. et al.* (2019) observed that infiltrative pulmonary TB accounted for the majority of cases, and the treatment success rate was compromised by multidrug-resistant TB (MDR-TB) and social determinants such as treatment interruptions and poor adherence [28]. In another study, *Sakko Y.* and colleagues (2023) reported that from 2014 to 2019, the incidence of tuberculosis declined significantly from 227 to 15.2 per 100,000 individuals, while all-cause mortality increased from 8.4 to 15.2 per 100,000 [23]. Internationally, *Lönnroth K. et al.* (2010) and *Glaziou P. et al.* (2018) have emphasized that unfavorable outcomes—particularly loss to follow-up and mortality-are frequently linked to late diagnosis, inadequate treatment monitoring, and drug resistance, especially in low- and middle-income countries [12, 16]. Furthermore, the WHO has identified that failure to retain patients throughout the treatment cascade remains a critical barrier to TB control globally [24]. Loss to follow-up is particularly concerning, as it contributes to ongoing transmission, acquired resistance, and worse long-term outcomes. According to *Toczek A. et al.* (2013), loss to follow-up is one of the main reasons for poor program performance in MDR-TB treatment cohorts [26].

Our study confirms that TB remains a socially significant disease, predominantly affecting unemployed individuals and the elderly (retirees). Additional risk factors of notable importance included prior contact with a TB patient, alcoholism, incarceration, and a history of diabetes mellitus. However, in nearly 84.8% of cases, it was not possible to determine the presence of specific risk factors. This underscores the urgent need to strengthen preventive measures among socially vulnerable populations and to integrate TB care into broader social support and geriatric healthcare programs. For example, In a study by *Davis A.* and colleagues (2017), participants who had ever smoked tobacco (aOR 1.73, 95% CI: 1.23–2.43, $P \leq 0.01$), consumed alcohol (aOR 1.41, 95% CI: 1.03–1.93, $P \leq 0.05$), were HIV-positive (aOR 36.37, 95% CI: 2.05–646.13, $P \leq 0.05$), or had diabetes mellitus (aOR 13.96, 95% CI: 6.37–30.56, $P \leq 0.01$) were significantly more likely to have tuberculosis [8]. Globally, comparable trends have been observed. According to *Lönnroth K. et al.* (2009), social determinants such as unemployment, poor living conditions, malnutrition, and substance abuse are consistently associated with a higher risk of TB infection and disease progression [16]. *Dara M. et al.* (2015) emphasize that vulnerable groups—including the homeless, migrants, prisoners, and the elderly—should be a primary target of TB control interventions in the WHO European Region [6].

The inability to identify risk factors in a majority of cases, as observed in our research, may reflect insufficient epidemiological investigation or the presence of latent, complex social vulnerabilities. This further strengthens the argument for the integration of TB control into multisectoral public health strategies, especially within programs addressing social welfare, elderly care, and chronic disease management.

**Conclusion**

To sustain and accelerate progress toward TB elimination, it is essential to integrate TB services into broader health and social care systems, with a focus on targeted support for high-risk groups and improved continuity of care across all stages of the treatment cascade. This includes strengthening collaborations between tuberculosis programs, primary healthcare, social protection services, and geriatric care to ensure a more holistic and patient-centered approach. Community-based interventions, such as mobile screening units, directly observed therapy (DOT) support, and patient education campaigns, should be scaled up to enhance early detection and adherence. Furthermore, addressing structural determinants—such as poverty, housing instability, and limited access to healthcare—will be critical to reducing both incidence and treatment failure. Investment in data-driven surveillance and follow-up systems can help identify gaps in care and allow for real-time intervention, especially in populations at risk of being lost to follow-up. Ultimately, a multisectoral strategy that incorporates medical, social, and economic dimensions is key to achieving sustained TB control and long-term disease elimination.

***Conflict of Interest.*** *The authors declare that they have no conflict of interest.*

***Contribution of authors.*** *All authors were equally involved in the writing of this article.*

***Funding:*** *No funding was provided.*

***Literature:***

*1. Арингазина А.М., Айтамбаева Н.Н., Назарова Л.З., Алимбекова Г.Т., Исмаилов Ш.Ш., Аденов М.М., Джазыбекова П.М., Мусабекова Г.А., Аликеева Э.А.* Уровень осведомленности в вопросах туберкулеза населения и ключевых групп Республики Казахстан. Наука и Здравоохранение. 2021. 5(Т.23). С. 67-77. doi 10.34689/SH.2021.23.5.008

2. Приказ Министра здравоохранения Республики Казахстан от 29 июля 2022 года № ҚР ДСМ-69 «О внесении изменений в приказ Министра здравоохранения Республики Казахстан от 24 марта 2022 года № ҚР-ДСМ-27 «Об утверждении Стандарта оказания медицинской помощи в стационарных условиях в Республике Казахстан»

*3. Akhmetova A., Bismilda V., Chingissova L., Filipenko M., Akilzhanova A., Kozhamkulov U.* Prevalence of Beijing Central Asian/Russian Cluster 94-32 among Multidrug-Resistant M. tuberculosis in Kazakhstan. Antibiotics (Basel). 2023. 13(1). 9. doi: 10.3390/antibiotics13010009.

*4. Chakaya J., Khan M., Ntoumi F., Aklillu E., Fatima R., Mwaba P., et al. Global* Tuberculosis Report 2020 -

Reflections on the Global TB burden, treatment and prevention efforts. Int J Infect Dis. 2021. 113 Suppl 1(Suppl 1). S7-S12. doi: 10.1016/j.ijid.2021.02.107.

*5. Daniyarov A., Molkenov A., Rakhimova S., Akhmetova A., et al.* Genomic Analysis of Multidrug-Resistant Mycobacterium tuberculosis Strains From Patients in Kazakhstan. Front Genet. 2021. 12. 683515. doi: 10.3389/fgene.2021.683515.

*6. Dara M., Acosta C.D., Melchers N.V.S., et al.* Tuberculosis control in prisons: current situation and research gaps. European Respiratory Journal. 2015. 45(3). 759–762.

*7. Darisheva M., Tracy M., Terlikbayeva A., Zhussupov B., Schluger N., McCrimmon T.* Knowledge and attitudes towards ambulatory treatment of tuberculosis in Kazakhstan. BMC Health Serv Res. 2020. 20(1). 563. doi: 10.1186/s12913-020-05413-0.

*8. Davis A., Terlikbayeva A., Aifah A., Hermosilla S., Zhumadilov Z., et al.* Risks for tuberculosis in Kazakhstan: implications for prevention. Int J Tuberc Lung Dis. 2017. 21(1). 86-92. doi: 10.5588/ijtld.15.0838.

*9. Escombe A., Ticona E., Chávez-Pérez V.* et al. Improving natural ventilation in hospital waiting and consulting rooms to reduce nosocomial tuberculosis transmission risk in a low resource setting. BMC Infect. 2019. 19. 88. https://doi.org/10.1186/s12879-019-3717-9

*10. 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. 14. 1234785. doi: 10.3389/fimmu.2023.1234785.

*11. Furin J., Cox H., Pai M.* Tuberculosis. Lancet. 2019. 393(10181). 1642-1656. doi: 10.1016/S0140-6736(19)30308-3.

*12. Glaziou, P., Floyd, K., Raviglione, M. C.* Global tuberculosis epidemic and progress in care, prevention, and research: an overview. The Lancet Respiratory Medicine. 2018. 6(4). 299–314. https://doi.org/10.1016/S2213-2600(18)30057-2

*13. Khanna A., Saha R., Ahmad N.* National TB elimination programme - What has changed. Indian J Med Microbiol. 2023. 42. 103-107. doi: 10.1016/j.ijmmb.2022.10.008.

*14. Kulmirzayeva D., Prabakaran I., Javaid M.* Retrospective analysis of tuberculosis incidence in Kazakhstan for 2000-2023. Journal of Health Development. 2025. №1. URL: https://cyberleninka.ru/article/n/retrospective-analysis-of-tuberculosis-incidence-in-kazakhstan-for-2000-2023

*15. Lönnroth, K., Castro,K.G., Chakaya J.M., Chauhan L.S., et al.* Tuberculosis control and elimination 2015–2035: cure, care and social development. The Lancet. 2015. 385(9979). 1814–1829. https://doi.org/10.1016/S0140-6736(15)60670-0

*16. Lönnroth K., Jaramillo E., Williams B.G., Dye, C., & Raviglione, M.* Drivers of tuberculosis epidemics: The role of risk factors and social determinants. Social Science & Medicine. 2009. 68(12). 2240–2246.

*17. Marrella V., Nicchiotti F., Cassani B.* Microbiota and Immunity during Respiratory Infections: Lung and Gut Affair. Int J Mol Sci. 2024. 25(7). 4051. doi: 10.3390/ijms25074051.

*18. Mbewana Ntshanka N.G., Msagati TAM.* Trends and Progress on Antibiotic-Resistant Mycobacterium tuberculosis and Genes in relation to Human Immunodeficiency Virus. Can J Infect Dis Med Microbiol. 2023. 6659212. doi: 10.1155/2023/6659212.

*19. Melsew Y.A., Doan T.N., Gambhir M., Cheng A.C., McBryde E., Trauer J.M.* Risk factors for infectiousness of patients with tuberculosis: a systematic review and meta-analysis. Epidemiol Infect. 2018. 146(3). 345-353. doi: 10.1017/S0950268817003041.

*20. Murphy M.E., Wills G.H., Murthy S., Louw C., Bateson AL.C, et al.* REMoxTB consortium. Gender differences in tuberculosis treatment outcomes: a post hoc analysis of the REMoxTB study. BMC Med. 2018. 16(1). 189. doi: 10.1186/s12916-018-1169-5.

*21. Qi CC., Xu LR., Zhao CJ.* et al. Prevalence and risk factors of tuberculosis among people living with HIV/AIDS in China: a systematic review and meta-analysis. BMC Infect Dis. 2023. 23. 584. https://doi.org/10.1186/s12879-023-08575-4

*22. Ristić L., Rancić M., Radović M.* Tuberculosis in the 21st century--challenges, endeavours and recommendations to doctors. Med Pregl. 2010. 63(11-12). 811-5. doi: 10.2298/mpns1012811r.

*23. Sakko Y., Madikenova M., Kim A., Syssoyev D., Mussina K., et al.* Epidemiology of tuberculosis in Kazakhstan: data from the Unified National Electronic Healthcare System 2014-2019. BMJ Open. 2023. 13(10). e074208. doi: 10.1136/bmjopen-2023-074208.

*24. Seth-Smith HMB., Imkamp F., Tagini F., Cuénod A., Hömke R., Jahn K., Tschacher A., et al.* Discovery and Characterization of Mycobacterium basiliense sp. nov., a Nontuberculous Mycobacterium Isolated From Human Lungs. Front. Microbiol. 2019. 9. 3184. doi: 10.3389/fmicb.2018.03184

*25. Singh A., Prasad R., Balasubramanian V., Gupta N.* Drug-Resistant Tuberculosis and HIV Infection: Current Perspectives. HIV AIDS (Auckl). 2020. 12. 9-31. doi: 10.2147/HIV.S193059.

*26. Toczek A., Cox H., Du Cros P., Cooke G., & Ford N.* Strategies for reducing treatment default in drug-resistant tuberculosis: systematic review and meta-analysis. PLOS ONE 2013. 8(8). e68300. https://doi.org/10.1371/journal.pone.0068300

*27. Uplekar M., Raviglione M.* WHO's End TB Strategy: From stopping to ending the global TB epidemic. Indian J Tuberc. 2015. 62(4). 196-9. doi: 10.1016/j.ijtb.2015.11.001.

*28. Urazayeva S.T., Turegaliyeva Z.T., Tussupkalieva K. Sh., et al.* Tuberculosis morbidity and mortality in the Aktobe province of Kazakhstan for the period 2008-2017. ROMJ. 2019. №1.

29. World Health Organization. Global tuberculosis report 2022. Geneva: World Health Organization. 2022. https://www.who.int/publications/i/item/9789240061729

*30. Yerezhepov D., Gabdulkayum A., Akhmetova A., et al.* Pulmonary tuberculosis epidemiology and genetics in Kazakhstan. Front Public Health. 2024. 12. 1340673. doi: 10.3389/fpubh.2024.1340673.

***References: [1-2]***

*1. Aringazina A.M., Ajtambaeva N.N., Nazarova L.Z., Alimbekova G.T., Ismailov Sh.Sh., Adenov M.M., Dzhazybekova P.M., Musabekova G.A., Alikeeva E.A.* Uroven' osvedomlennosti v voprosah tuberkuleza

naseleniya i klyuchevyh grupp Respubliki Kazahstan [The level of awareness of the population and key groups in tuberculosis issues in the Republic of Kazakhstan]. *Nauka i Zdravookhranenie* [Science and Healthcare]. 2021. 5(T.23). pp. 67-77. doi 10.34689/SH.2021.23.5.008 [in Russian]

2. Prikaz Ministra zdravoohraneniya Respubliki Kazahstan ot 29 iyulya 2022 goda № ҚR DSM-69 «O vnesenii izmenenij v prikaz Ministra zdravoohraneniya Respubliki Kazahstan ot 24 marta 2022 goda № ҚR-DSM-27 «Ob utverzhdenii Standarta okazaniya medicinskoj pomoshchi v stacionarnyh usloviyah v Respublike Kazahstan» [Order of the Minister of Health of the Republic of Kazakhstan dated July 29, 2022 No. ҚР ДСМ-69 "On Amendments to the Order of the Minister of Health of the Republic of Kazakhstan dated March 24, 2022 No. ҚР-ДСМ-27 "On Approval of the Standard for the Provision of Medical Care in Inpatient Settings in the Republic of Kazakhstan] [in Russian]

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