

Received: 01 August 2025 / Accepted: 11 January 2026 / Published online: 27 February 2026

DOI 10.34689/SH.2026.28.1.004

UDC 616.1-036.22:314.42

This work is licensed under a
Creative Commons Attribution 4.0
International License

ANALYSIS OF THE DYNAMICS OF BLOOD DISEASES INCIDENCE AMONG CHILD AND ADULT POPULATION OF ABAI DISTRICT FOR 2014-2023

Assel R. Tuginova¹, <https://orcid.org/0000-0003-0191-4392>**Zhanna A. Mussabekova**¹, <https://orcid.org/0000-0003-3442-4963>**Zukhra S. Siyazbekova**¹, <https://orcid.org/0000-0001-9244-7085>**Bakytzhan Ye. Kalbabayev**², <https://orcid.org/0009-0009-5621-4271>**Sazhida S. Akhmetova**¹, <https://orcid.org/0009-0001-9115-0519>¹ NJSC "Semey Medical University", Semey, Republic of Kazakhstan;² "Abai district hospital", Abai District, Republic of Kazakhstan.

Abstract

Background. Blood diseases represent a heterogeneous group of pathologies that have a significant impact on public health. In recent years, there has been an increase in the incidence and mortality from hematological diseases in various countries, including those in Central Asia.

The **aim** of this study was to analyze the dynamics of blood disease incidence among the child and adult population of Abai district from 2014 to 2023.

Materials and methods. This study utilized retrospective data on first-time registered cases of blood diseases among children (0–17 years) and adults (18 years and older) in Abai district from 2014 to 2023, based on medical reporting forms from primary and specialized care institutions. Incidence rates per 1000 population were calculated using official demographic statistics, with statistical and graphical analyses applied to assess trends and epidemiological patterns.

Results. The analysis of blood disease incidence in Abai District from 2014 to 2023 revealed a general upward trend in both children and adults, with peaks observed in 2022. Among children, the incidence rose from 37.4 to 74.5 per 1,000 between 2014 and 2022, followed by a decline to 56.4 in 2023. In adults, the rate increased from 29.7 to 67.0 per 1,000 over the same period, then decreased to 52.2 in 2023. The rise in incidence may be associated with improved diagnostics, heightened medical attention, and the impact of the COVID-19 pandemic.

Conclusion. The study underscores the necessity of continuous monitoring and collaborative action to effectively manage the increasing blood disease incidence in both children and adults in Abai District.

Keywords: adults, blood diseases, children, incidence.

For citation:

Tuginova A.R., Mussabekova Zh.A., Siyazbekova Z.S., Kalbabayev B.Ye., Akhmetova S.S. Analysis of the dynamics of blood diseases incidence among child and adult population of Abai district for 2014-2023 // *Nauka i Zdravookhranenie* [Science & Healthcare]. 2026. Vol.28 (1), pp. 30-37. doi 10.34689/SH.2026.28.1.004

Резюме

АНАЛИЗ ДИНАМИКИ ЗАБОЛЕВАЕМОСТИ БОЛЕЗНЯМИ КРОВИ СРЕДИ ДЕТСКОГО И ВЗРОСЛОГО НАСЕЛЕНИЯ АБАЙСКОГО РАЙОНА ЗА 2014–2023 ГОДЫ

Асель Р. Тукинова¹, <https://orcid.org/0000-0003-0191-4392>**Жанна А. Мусабекова**¹, <https://orcid.org/0000-0003-3442-4963>**Зухра С. Сиязбекова**¹, <https://orcid.org/0000-0001-9244-7085>**Бакытжан Е. Калбабаев**², <https://orcid.org/0009-0009-5621-4271>**Сажид С. Ахметова**¹, <https://orcid.org/0009-0001-9115-0519>¹ НАО «Медицинский университет Семей», г. Семей, Республика Казахстан;² КГП на ПХВ "Абайская районная больница" УЗ области Абай, Абайский район, Республика Казахстан.

Введение. Заболевания крови представляют собой разнородную группу патологий, оказывающих значительное влияние на общественное здоровье. В последние годы наблюдается рост заболеваемости и смертности от гематологических заболеваний в различных странах, включая государства Центральной Азии.

Цель исследования - проанализировать динамику заболеваемости болезнями крови среди детского и взрослого населения Абайского района за период с 2014 по 2023 год.

Материалы и методы. В исследовании использованы ретроспективные данные о впервые зарегистрированных случаях заболеваний крови среди детей (0–17 лет) и взрослых (18 лет и старше) в Абайском районе за 2014–2023 годы. Источником данных послужили медицинские учетные формы учреждений первичной и специализированной медико-санитарной помощи. Расчет показателей заболеваемости на 1000 населения проводился с использованием официальной демографической статистики. Для анализа использовались методы статистической обработки и графической визуализации.

Результаты. Анализ заболеваемости болезнями крови в Абайском районе за 2014–2023 годы выявил общую тенденцию к росту как среди детей, так и среди взрослых, с пиком в 2022 году. У детей уровень заболеваемости увеличился с 37,4 до 74,5 на 1000 человек в период с 2014 по 2022 год, после чего снизился до 56,4 в 2023 году. У взрослых показатели выросли с 29,7 до 67,0 на 1000 за тот же период, а затем снизились до 52,2 в 2023 году. Рост заболеваемости может быть связан с улучшением диагностики, повышенным вниманием к здоровью и последствиями пандемии COVID-19.

Заключение. Результаты исследования подчеркивают необходимость постоянного мониторинга и межведомственного взаимодействия для эффективного управления ростом заболеваемости болезнями крови среди детского и взрослого населения Абайского района.

Ключевые слова: *взрослые, заболевания крови, дети, заболеваемость.*

Для цитирования:

Тукинова А.Р., Мусабекова Ж.А., Сиязбекова З.С., Калбабаев Б.Е., Ахметова С.С. Анализ динамики заболеваемости болезнями крови среди детского и взрослого населения Абайского района за 2014–2023 годы // Наука и Здравоохранение. 2026. Vol.28 (1), С. 30-37. doi 10.34689/SH.2026.28.1.004

Түйіндеме

2014–2023 ЖЫЛДАР АРАЛЫҒЫНДАҒЫ АБАЙ АУДАНЫНЫҢ БАЛА ЖӘНЕ ЕРЕСЕК ХАЛҚЫ АРАСЫНДАҒЫ ҚАН АУРУЛАРЫНЫҢ СЫРҚАТТАНУШЫЛЫҚ ДИНАМИКАСЫН ТАЛДАУ

Асель Р. Тукинова¹, <https://orcid.org/0000-0003-0191-4392>

Жанна А. Мусабекова¹, <https://orcid.org/0000-0003-3442-4963>

Зухра С. Сиязбекова¹, <https://orcid.org/0000-0001-9244-7085>

Бакытжан Е. Калбабаев², <https://orcid.org/0009-0009-5621-4271>

Сажид С. Ахметова¹, <https://orcid.org/0009-0001-9115-0519>

¹ «Семей медицина университеті» КеАҚ, Астана қ., Қазақстан Республикасы;

² Абай облысы ДСБ "Абай аудандық ауруханасы" ШЖҚКМК, Абай ауданы, Қазақстан Республикасы.

Кіріспе. Қан аурулары – халық денсаулығына айтарлықтай әсер ететін әртүрлі патологиялар тобына жатады. Соңғы жылдары Орталық Азия елдерін қоса алғанда, көптеген мемлекеттерде гематологиялық аурулардың сырқаттанушылық пен өлім-жітім деңгейінің өсуі байқалады.

Зерттеу мақсаты – 2014–2023 жылдар аралығында Абай ауданындағы бала және ересек тұрғындар арасындағы қан ауруларының сырқаттанушылық динамикасын талдау.

Материалдар мен әдістер. Зерттеуде 2014–2023 жылдар аралығында Абай ауданындағы алғашқы рет тіркелген қан аурулары жағдайлары туралы деректер пайдаланылды. Деректер бастапқы және мамандандырылған медициналық көмек мекемелерінің есептік нысандарына негізделген. Балалар (0–17 жас) және ересектер (18 жастан жоғары) бойынша 1000 тұрғынға шаққандағы сырқаттанушылық деңгейі ресми демографиялық статистика негізінде есептелді. Эпидемиологиялық үрдістер мен динамиканы бағалау үшін статистикалық және графикалық талдау әдістері қолданылды.

Нәтижелер. 2014–2023 жылдар аралығында Абай ауданында қан ауруларының сырқаттанушылық деңгейінің жалпы өсу үрдісі байқалды, ең жоғары көрсеткіш 2022 жылы тіркелді. Балалар арасында сырқаттанушылық деңгейі 2014 жылғы 1000 тұрғынға шаққандағы 37,4-тен 2022 жылы 74,5-ке дейін өсіп, 2023 жылы 56,4-ке дейін төмендеді. Ересектер арасында бұл көрсеткіш 29,7-ден 67,0-ге дейін өсіп, кейін 2023 жылы 52,2-ге дейін төмендеді. Аурушандықтың өсуі жақсартылған диагностикамен, медициналық көмекке назардың артуымен және COVID-19 пандемиясының әсерімен байланысты болуы мүмкін.

Қорытынды. Зерттеу нәтижелері Абай ауданындағы балалар мен ересектер арасында қан ауруларының артуын тиімді бақылау үшін тұрақты мониторинг пен бірлескен шаралардың қажеттілігін көрсетеді.

Түйінді сөздер: *ересектер, қан аурулары, балалар, сырқаттанушылық.*

Дәйексөз үшін:

Тукинова А.Р., Мусабекова Ж.А., Сиязбекова З.С., Калбабаев Б.Е., Ахметова С.С. 2014–2023 жылдар аралығындағы Абай ауданының бала және ересек халқы арасындағы қан ауруларының сырқаттанушылық динамикасын талдау // Ғылым және Денсаулық сақтау. 2026. Vol.28 (1), Б. 30-37. doi 10.34689/SH.2026.28.1.004

Introduction

Hematological disorders represent a broad spectrum of conditions involving irregularities in blood cell composition and function, as well as impairments in coagulation processes and hematopoiesis. According to the International Classification of Diseases, 10th Revision (ICD-10), this category covers various types of anemia, clotting abnormalities, purpura, and other hemorrhagic conditions. While these illnesses are not among the most prevalent worldwide, contemporary epidemiological research indicates a gradual rise in both incidence and mortality rates across several nations. For example, in Georgia, the death rate linked to hematologic conditions in 2016 significantly exceeded the rate reported in 2000. In Russia, from 2000 to 2019, the incidence rate increased by 10.5%, while mortality decreased by 33.3%, reflecting improved diagnostics and treatment [2,7]. The level of incidence depends not only on genetic factors, but also on socio-economic, ecological and hygienic conditions, including quality of life and the environment. Of particular significance are blood diseases in children, often accompanied by immune and neurological disorders, which impair quality of life and may lead to disability. In the post-Chernobyl period in Ukraine, the incidence of blood diseases among children increased by 48.1% from 1994 to 2017, with a 15.2% increase in children affected by the accident. There is a direct correlation between the level of radiation exposure and the prevalence of these diseases [1,18].

Globally, anemias are one of the most common groups of blood diseases. According to the Global Burden of Disease (GBD) 2021 study, the prevalence of anemia among all age groups was 24.3%, representing 1.92 billion cases. Women, children under 5 years of age and populations in low- and middle-income countries, such as the regions of South Asia and sub-Saharan Africa, are particularly vulnerable [8]. Hereditary blood diseases, in particular sickle cell anemia, remain a serious public health problem, especially in countries with limited access to health services. In 2021, the number of patients with the disease increased by 41.4% from 2000 to 7.74 million, and mortality remains high, especially among children under 5 years of age [9,19]. Hemato-oncologic diseases, which include leukemia, lymphoma, and myeloma, also are serious threats to public health. In 2019, there were 643,579 new cases of leukemia and 334,592 deaths from the disease. Despite a decrease in age-standardized incidence and mortality rates, the absolute number of cases is increasing due to increased life expectancy and improved diagnosis [16].

Hematological diseases, including anemias, leukemias, lymphomas and other blood disorders, represent a significant global health challenge. According to the Global Burden of Disease, by 2021, many regions in Central Asia were registering high incidence and a continued upward trend in leukemia despite a gradual decline in age-standardized incidence rate (ASIR) in many high- and middle-income countries [6,11,20]. Kazakhstan is among the regions with an increased burden of blood-related malignant diseases - especially among adults, while leukemia and lymphoma predominate in children [3,14].

Prolonged exposure to ionizing radiation in settlements located near the Semipalatinsk Nuclear Test Site has had a profound impact on public health, particularly among residents of the Abai region. Due to the region's

geographical proximity to the test site, the local population was subjected to continuous low-dose radiation over many years, which has significantly contributed to the increased incidence of hematological disorders such as anemia, leukemia, and other blood-related diseases.

Thus, the study of the epidemiology of blood diseases remains an important task for public health and science. Particularly important is the regional analysis of incidence, which allows to identify local features and risk factors, as well as to optimize prevention and treatment measures. In the conditions of Kazakhstan and, in particular, Abai district, the issues of incidence of blood diseases are insufficiently studied, which determines the relevance of this study.

Materials and Methods

The study used retrospective data on the first-time registered cases of blood diseases among children and adults in Abai district for the period from 2014 to 2023. The research topic was reviewed and approved at the meeting of the Ethics Committee (Protocol No.8, dated May 24, 2022). The administration of the institutions was informed about the progress of the study and had no objections to the publication of the research results in the open press.

The source of information were the reporting forms of medical institutions providing primary and specialized care in the framework of dispensary surveillance and outpatient care. The analysis was conducted separately for two age groups: children (0-17 years) and adults (18 years and older).

To estimate the level of primary incidence, the indicator per 1000 people of the corresponding population was used. The calculation was carried out according to the following formula: $Incidence\ per\ 1000\ people = (Number\ of\ first-time\ registered\ cases / Number\ of\ the\ relevant\ population) \times 1000$

The number of population by age groups was taken according to official statistics provided by regional health authorities. The analysis of incidence dynamics included both absolute values (number of new cases) and relative indicators (per 1000 people). Statistical and graphical analysis was performed to identify trends, periods of stabilization and sharp changes in incidence rates, and to identify possible epidemiological patterns. Pearson correlation analysis was performed to identify the relationship between incidence in children and adults. Linear regression analysis was performed to assess temporal trends in incidence rates (per 1,000 population) for children and adults between 2014 and 2023.

Results

Table 1 shows the dynamics of incidence of blood diseases among children and adults for 2014-2023 in Abai District.

Analysis of incidence of blood diseases for 2014-2023 revealed an increase in both children and adults. In children, incidence increased from 37.4 per 1000 in 2014 (164 cases) to a maximum of 74.5 per 1000 in 2022 (309 cases) and decreased to 56.4 per 1000 (229 cases) in 2023, remaining above the level of the beginning of the period. In adults, the rate increased from 29.7 per 1,000 in 2014 (253 cases) to 67.0 per 1,000 in 2022 (488 cases) and decreased to 52.2 per 1,000 in 2023 (367 cases), also remaining well above 2014-2018 levels.

Table 1.

Dynamics of incidence of blood diseases among children and adults in 2014-2023 in Abai district.

year	number of first-time cases of children	average population size	incidence per 1000 people	number of first-time cases of adults	average population size	incidence per 1000 people
2014	164	4 381	37,4	253	8528	29,7
2015	187	4 359	42,9	222	8497	26,1
2016	203	4 204	48,3	325	8348	38,9
2017	200	4 270	46,8	322	8149	39,5
2018	178	4 233	42,1	292	8008	36,5
2019	171	4 164	41,1	281	7809	35,9
2020	169	4 116	41,1	283	7639	37
2021	244	4 192	58,2	302	7425	40,7
2022	309	4 149	74,5	488	7289	67
2023	229	4 062	56,4	367	7029	52,2

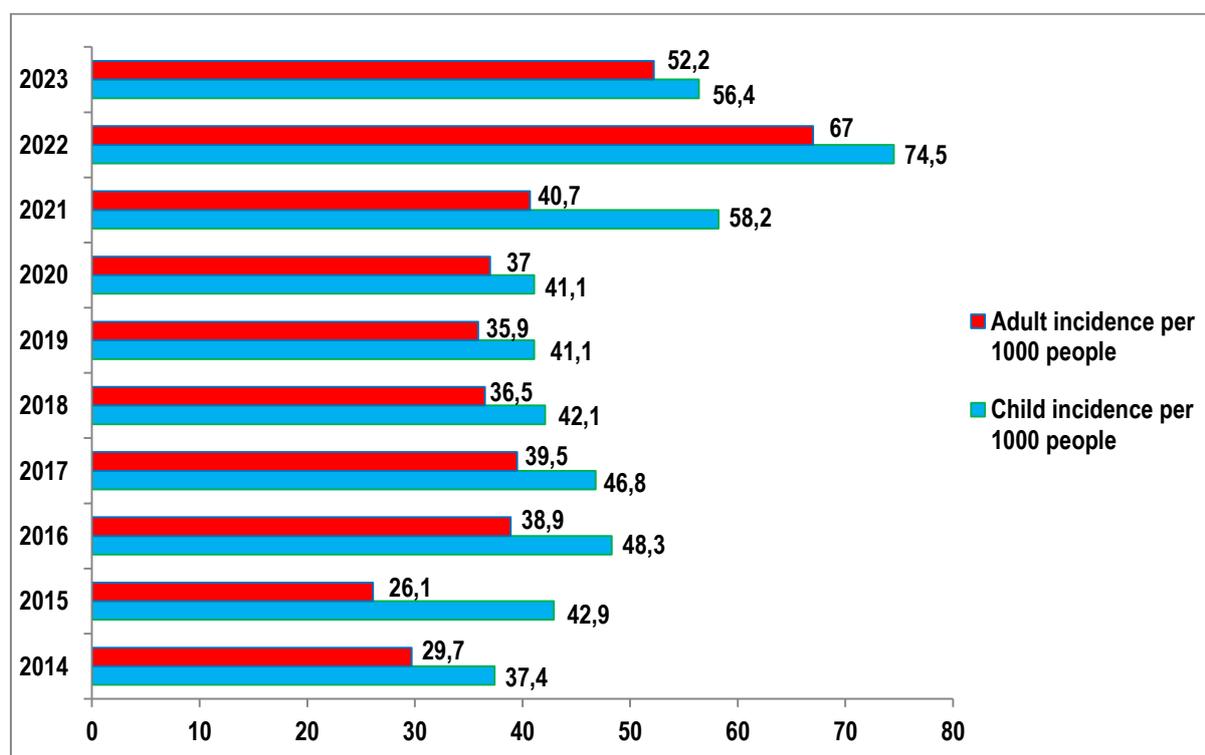


Figure 1. Comparative analysis of incidence of blood diseases among children and adults in 2014-2023 in Abai District.

A comparative analysis of the incidence of blood diseases per 1,000 people among children and adults for 2014-2023 in Abai District (Figure 1) showed that the incidence rate in children was generally higher than in adults. In 2014, the rate in children was 37.4 while the rate in adults was 29.7 per 1,000. From 2015 through 2017, pediatric incidence was consistently higher than adult incidence, and from 2018 through 2020, the rates in children and adults remained relatively stable. Beginning in 2021, both groups experienced sharp increases, peaking in 2022 at 74.5 per 1,000 in children and 67.0 in adults. In 2023, incidence decreased to 56.4 in children and 52.2 in adults, but remained well above the levels at the beginning of the period. A Pearson correlation analysis revealed a strong positive relationship between yearly incidence rates of hematologic disorders in pediatric and adult populations, yielding a correlation coefficient of $r = 0.94$ ($p < 0.001$). The yearly fluctuations in disease incidence among children

closely mirrored those observed in adults over the 2014–2023 timeframe, suggesting a possible epidemiological link between these two demographic groups.

Figure 2 illustrates the trends in pediatric hematologic disease incidence in Abai District from 2014 to 2023. Overall, the number of cases has been increasing, with the most noticeable growth occurring in the later years. In 2014, the incidence rate was 37.4 cases per 1,000 children, rising gradually to 48.3 per 1,000 by 2016. After that, the rate slightly declined and stabilized around 41 per 1,000 during 2019 and 2020. From 2021 onward, there was a marked increase, reaching its highest point in 2022 at 74.5 per 1,000 — nearly double the figure from 2014. Although the rate dropped to 56.4 per 1,000 in 2023, it remained noticeably above the average of earlier years.

Figure 3 provides insight into the temporal dynamics of hematologic disease incidence among the adult population of Abai District over the same time frame (2014–2023).

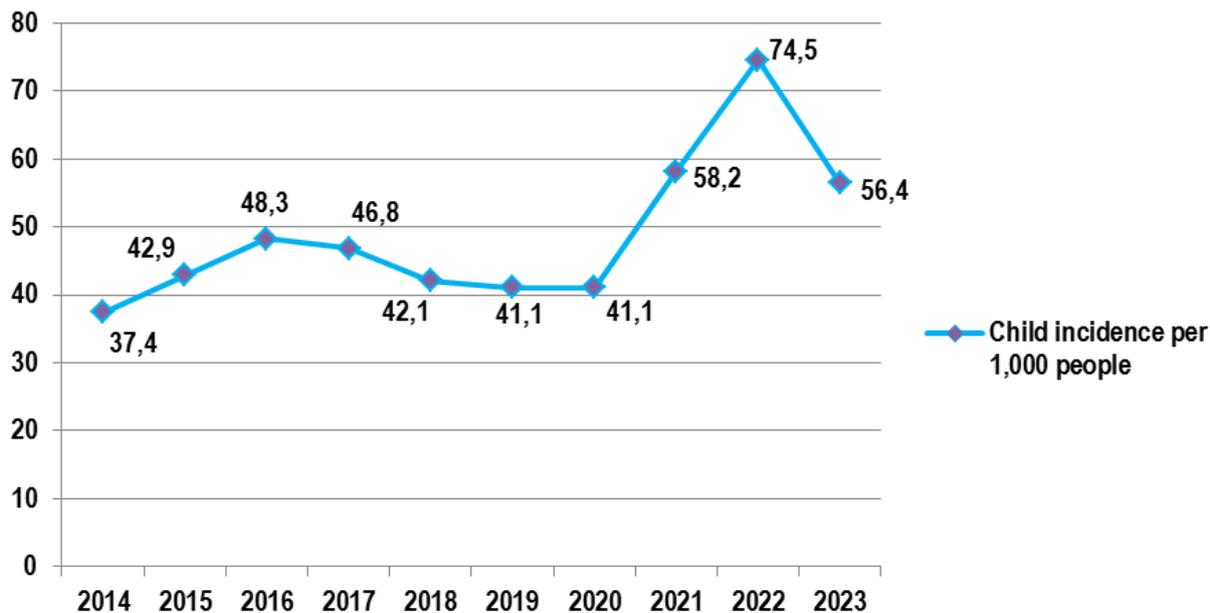


Figure 2. Trends in Children Hematologic Disease Incidence in Abai District over the period 2014–2023.

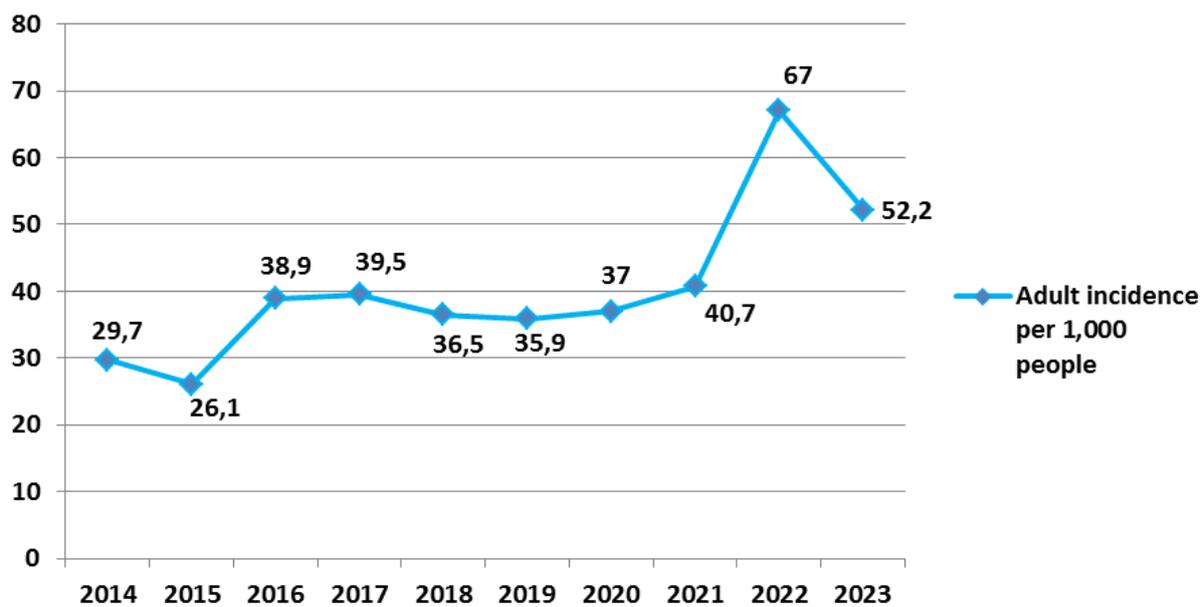


Figure 3. Trends in Adult Hematologic Disease Incidence in Abai District over the period 2014–2023.

Between 2014 and 2023, the occurrence of hematologic diseases in the adult population demonstrated a fluctuating pattern, though the general direction over time was one of growth. The incidence rate decreased from 29.7 per 1,000 in 2014 to a minimum of 26.1 in 2015, then gradually increased to a stable level of about 36 per 1,000 in 2018–2020. From 2021, there was a sharp increase, peaking at 67.0 per 1,000 in 2022, the highest value for the entire period. The rate declines to 52.2 in 2023, but remains well above the 2014–2020 level.

Table 2 illustrates that linear regression analysis identified a statistically significant increase in incidence

rates per 1,000 individuals among both pediatric and adult populations over the 2014–2023 period. In the pediatric group, the slope coefficient was 2.54 ($p = 0.027$), indicating an average annual increase in incidence of 2.5 cases per 1,000 children. In the adult group, the slope was higher at 2.95 ($p = 0.009$), suggesting a more pronounced rise over time. The coefficient of determination (R^2) was 0.477 for children and 0.591 for adults, indicating that nearly half (in children) and over half (in adults) of the variance in incidence rates can be explained by the linear effect of time.

Table 2.

Linear regression results of annual incidence per 1,000 population among children and adults (2014-2023).

Group	B	St. error	β	t	p	R ²	F	p (F)
Children	2,539	0,941	0,690	2,699	0,027	0,477	7,287	0,027
Adults	2,945	0,866	0,769	3,402	0,009	0,591	11,576	0,009

Discussion

Our study reveals a statistically significant and consistent upward trend in the incidence of blood diseases among both children and adults in the Abai District over the past decade, with a particularly sharp increase observed around 2020–2021. This trend is likely multifactorial, reflecting a combination of epidemiological changes, the impact of the COVID-19 pandemic, enhanced diagnostic capabilities, and possible shifts in healthcare accessibility. A stronger association observed in adults may indicate that this age group is more influenced by time-related or systemic factors. Since the incidence trends are similar across all age groups, it's important to implement public health strategies that address everyone. Additional studies are required to gain deeper insight into the medical, social, and environmental factors contributing to these trends, and to assess the efficacy of existing prevention and diagnostic strategies. Going forward, priority should be given to improving surveillance systems and coordinating interventions for both children and adults.

In the pediatric group, there is a steady increase in incidence rates, reaching a maximum in 2022 - 74.5 per 1,000 children in Abai district. This increase is in line with data for Kazakhstan, according to which the incidence of acute lymphoblastic leukemia (ALL) in 2021 was 3.4 per 100,000 population, which is higher than the incidence of acute myeloid leukemia (AML) of 1.2 per 100,000 population. The increase in incidence may be due to improved diagnosis, increased awareness among health care providers, and possible environmental factors specific to the region [14].

The adult population of Abai District also shows an increase in incidence rates, peaking in 2022 at 67.0 per 1,000 adults. This trend is consistent with national data indicating an increase in the incidence of cardiovascular diseases in Kazakhstan, including hypertension and coronary heart disease. The increase in incidence may be due to an aging population, lifestyle changes and improved diagnostic methods [13].

Data comparison shows that in the Liu et al. study (2000-2016), the annual increase in the incidence of acute lymphoblastic leukemia (ALL) among children was 1.5% (95% CI: 1.1-1.8), whereas in our study, the incidence of blood diseases in children increased from 37.4 per 1000 in 2014 to 74.5 in 2022, almost doubling. Among adults, Liu's study recorded a 2.5% annual increase in the incidence of ALL and acute myeloid leukemia (AML) by 0.9%, while in our study the incidence in adults increased from 29.7 to 67.0 per 1000 over the same period. Both studies record a sharp increase after 2021, but in our case this was accompanied by a marked decrease in rates in 2023 (to 56.4 in children and 52.2 in adults), which may indicate temporary external factors, including the impact of the COVID-19 pandemic [12].

Comparison of data from the Tang H. et al. study (1990-2019) with our Abai District study (2014-2023) shows differences in both the magnitude and pattern of incidence. In the global study, the number of new cases of hereditary anemias in 2019 was 44.9 million, with the highest incidence in regions with low socio-demographic development, especially in Central Sub-Saharan Africa. In our study, the incidence of all blood diseases among children increased from 37.4 to 74.5 per 1000 from 2014 to 2022, and among adults from 29.7 to 67.0 per 1000, also indicating a marked increase. However, in contrast to global data, our case is a general group of blood diseases, without singling out hereditary anemias, and the sharp increase in incidence occurs after 2020 and may be partly related to the COVID-19 pandemic and improved diagnosis. Despite differences in coverage and data structure, both studies confirm the growing burden of blood diseases and the importance of considering socioeconomic conditions in assessing epidemiologic trends [17].

Comparison of our study with Hu Y. et al. (2024) global analysis covering 1990-2021 reveals both common and divergent trends. The GBD study on childhood acute lymphoblastic leukemia (CLL) showed that incidence remained unstable, showing fluctuations, with the highest incidence rates recorded in countries with high SDI but low mortality and DALYs due to effective treatment. In our study in Abai District, the incidence of blood diseases among children also showed a wave-like pattern, from 37.4 per 1000 in 2014 to a maximum of 74.5 in 2022, with a subsequent decrease to 56.4 in 2023 [10].

Abai District is located near uranium mining facilities, which raises concerns about possible environmental impacts contributing to increased incidence of blood diseases. A pilot study identified increased risks of somatic diseases among the population living in the zone of influence of uranium mining operations in Kazakhstan. Although this study did not focus specifically on hematologic diseases, the findings emphasize the need for further study of environmental risk factors in Abai District [15]. The study by Atchabarov A. et al. details the effects of chronic low-dose radiation exposure on residents of Abai, Beskaragai and Shubartau districts. Pathological blood changes in humans and animals were revealed: anemia, leukopenia, thrombocytopenia, eosinophilia, disorders of hematopoiesis and erythrocyte and leukocyte function [4]. Bersimbaev R.I. et al. point to significant genotoxic effects in the population of northern and eastern Kazakhstan, including a high incidence of immune system disorders and somatic diseases in residents of uranium mining areas. They note immune dysfunctions, chromosomal aberrations and chronic diseases of internal organs, also affecting the hematopoietic infrastructure [5].

Over the entire observation period, hematologic disorder incidence consistently remained higher in children

compared to adults. This ongoing disparity likely results from a complex combination of factors such as genetic susceptibility, age-related differences in exposure to environmental risks, and variations in healthcare access and utilization between younger and older populations. In addition, the interruption of healthcare services and disease surveillance caused by the COVID-19 pandemic throughout the study period should be taken into account, as it might have influenced the identification and reporting of these disorders. The patterns observed highlight the pressing need for a well-rounded and proactive public health approach. This approach should focus on enhancing disease surveillance, developing prevention strategies tailored to different age groups, and ensuring equitable access to timely diagnostics and specialized treatment. More research is needed to better understand the various factors behind these trends. Particular attention should be given to environmental factors, genetic predispositions, and the strengths and limitations of local healthcare systems. Long-term cohort studies and carefully designed case-control investigations will be important to clarify cause-and-effect relationships and help design effective, evidence-based interventions to lessen the disease burden across all ages.

The relevance of studying disease prevalence in this area is underscored by the fact that radioactive contamination persists to this day, owing to the long half-lives of certain radionuclides. This ongoing environmental hazard continues to pose health risks not only to current residents but also to future generations. Given the unique radiological background resulting from past nuclear tests, it is essential to conduct systematic monitoring and analysis of hematological health indicators. Such research is crucial not only for understanding the long-term consequences of radiation exposure but also for developing targeted healthcare strategies and preventive measures. In this regard, examining the condition of the hematopoietic system among the population of the Abai region plays a critical role in assessing the overall health impact caused by the legacy of nuclear testing in the area.

Conclusion

In summary, the findings from the Abai District study highlight the critical role of continuous monitoring and detailed research into the epidemiology of hematologic diseases in both children and adults. Addressing these emerging trends effectively will demand a coordinated, multidisciplinary approach, with collaboration between public health organizations, academic researchers, and governmental bodies. Such coordinated actions are key to lowering the long-term burden of these diseases on affected populations and ensuring equitable access to prevention, diagnosis, and treatment services.

Conflict of interest: none

Funding: none

Authors' contributions: The authors contributed equally to the writing, and editing.

Literature:

1. Волосовец О.П., Бекетова Г.В., Кривоустов С.П., Банадица Н.В., Колоскова Е.К., Волосянко А.Б., Карулина Ю.В. Болезни крови и кроветворных органов у детей Украины: постчернобыльская ретроспектива изменений

заболеваемости, распространенности и инвалидности. Педиатрия. Восточная Европа. 2021. 9(4).

2. Ермолицкая М.З., Кику П.Ф., Абакумов А.И. Статистический анализ взаимосвязи социально-гигиенических факторов с уровнем заболеваемости болезнями крови и кроветворных органов населения Приморского края. Экология человека. 2021. 11. С. 33-41.

3. Aitbekov R., Murzakhmetova M., Zhamanbayeva G., Zhaparkulova N., Seel H. Epidemiological Features of Acute Myeloid Leukemia in Five Regions of the Republic of Kazakhstan: Population Study. Asian Pacific Journal of Cancer Prevention. 2022. 23(12). 4163-4167. doi: 10.31557/APJCP.2022.23.12.4163.

4. Atchabarov A. Kainar Syndrome: History of the First Epidemiological Case-control Study of the Effect of Radiation and Malnutrition. Cent Asian J Glob Health. 2015. 4(1):221. doi:10.5195/cajgh.2015.221.

5. Bersimbaev R.I., Bulgakova O. The health effects of radon and uranium on the population of Kazakhstan. Genes and Environment. 2015. 37(1):18. doi:10.1186/s41021-015-0019-3

6. Dong Y., Shi O., Zeng Q., Lu X., Wang W., Li Y., Wang Q. Leukemia incidence trends at the global, regional, and national level between 1990 and 2017. Exp Hematol Oncol. 2020.9:14. doi:10.1186/s40164-020-00170-6

7. Duthé G., Guillot M., Meslé F., Vallin J., Badurashvili I., Denisenko M., Gavrilova N., Kuyumjyan K., Torgasheva L. Adult mortality patterns in the former Soviet Union's southern tier: Armenia and Georgia in comparative perspective. Demogr Res. 2017. 36. 589-608. doi: 10.4054/DemRes.2017.36.19.

8. GBD 2021 Anaemia Collaborators. Prevalence, years lived with disability, and trends in anaemia burden by severity and cause, 1990-2021: findings from the Global Burden of Disease Study 2021. Lancet Haematol. 2023. 10(9):e713-e734. doi: 10.1016/S2352-3026(23)00160-6.

9. GBD 2021 Sickle Cell Disease Collaborators. Global, regional, and national prevalence and mortality burden of sickle cell disease, 2000-2021: a systematic analysis from the Global Burden of Disease Study 2021. Lancet Haematol. 2023. 10(8):e585-e599. doi: 10.1016/S2352-3026(23)00118-7.

10. Hu Y., Liu Y., Fu J., Liu Y., Wang H., Song Y. Global, regional, and national burden of acute lymphoblastic leukemia in children: Epidemiological trends analysis from 1990 to 2021. iScience. 2024. 27(12):111356. doi: 10.1016/j.isci.2024.111356.

11. Huang P., Zhang J. Global leukemia burden and trends: a comprehensive analysis of temporal and spatial variations from 1990—2021 using GBD (Global Burden of Disease) data. BMC Public Health. 2025. 25(1):262. doi: 10.1186/s12889-025-21428-w.

12. Liu S., Hu B., Zhang J. Epidemiological characteristics and influencing factors of acute leukemia in children and adolescents and adults: a large population-based study. Hematology. 2024. 29(1):2327916. doi: 10.1080/16078454.2024.2327916.

13. Markabaeva A., Kerimkulova A., Nurpeissova R., Ospanova A., Zekenova Y. Prevalence of cardiovascular diseases in Kazakhstan for 2013-2020. Journal of Hypertension. 2024. 42(1):e162. doi: 10.1097/01.hjh.0001021004.41104.0b.

14. *Mussina K., Kuanova B., Syssoyev D., Gaipov A., Poddighe D., Shaikhyzada K., Aimyshev T., Galiyeva D.* Epidemiology of pediatric hematological malignancies in Kazakhstan: Data from Unified National Electronic Healthcare System 2014-2021. *Eur J Pediatr.* 2024. 183(4). 1683-1691. doi: 10.1007/s00431-023-05412-3.

15. *Saifulina E., Janabayev D., Kashkinbayev Y., Shokabaeva A., Ibrayeva D., Aumalikova M., Kazymbet P., Bakhtin M.* Epidemiology of Somatic Diseases and Risk Factors in the Population Living in the Zone of Influence of Uranium Mining Enterprises of Kazakhstan: A Pilot Study. *Healthcare (Basel).* 2023. 11(6):804. doi: 10.3390/healthcare11060804.

16. *Sharma R., Jani C.* Mapping incidence and mortality of leukemia and its subtypes in 21 world regions in last three decades and projections to 2030. *Ann Hematol.* 2022.101(7).1523-1534. doi: 10.1007/s00277-022-04843-6.

17. *Tang H., Zhang N., Liu X., Xiao H., Zhang H., Zhou K., Deng J.* Incidence Trends of Inherited Anemias at the Global, Regional, and National Levels Over Three Decades. *J Epidemiol Glob Health.* 2024. 14(1). 72-85. doi: 10.1007/s44197-023-00170-9.

18. *Volosovets O.P., Kryvopustov S.P., Volosovets T.M., Abaturov O.E., Kryuchko T.O.* Changes in health status of child population of Ukraine after Chernobyl catastrophe. *Wiad Lek.* 2019.72(10).1974-1976

19. *Wastnedge E., Waters D., Patel S., Morrison K., Goh M.Y., Adeloje D., Rudan I.* The global burden of sickle cell disease in children under five years of age: a

systematic review and meta-analysis. *J Glob Health.* 2018. 8(2):021103. doi: 10.7189/jogh.08.021103.

20. *Zhang N., Wu J., Wang Q., Liang Y., Li X., Chen G., Ma L., Liu X., Zhou F.* Global burden of hematologic malignancies and evolution patterns over the past 30 years. *Blood Cancer J.* 2023. 13(1):82. doi: 10.1038/s41408-023-00853-3.

References: [1-2]

1. *Volosovec' O.P., Beketova G.V., Krivopustov S.P., Banadiga N.V., Koloskova E.K., Volosjanko A.B., Karulina Ju.V.* Bolezni krovi i krovetvornykh organov u detei Ukrainy: postchernobyl'skaya retrospektiva izmenenii zabolevaemosti, rasprostranennosti i invalidnosti [Diseases of the blood and hematopoietic organs in children of Ukraine: post-Chernobyl retrospective of changes in incidence, prevalence and disability]. *Pediatrics. Vostochnaya Evropa [Pediatrics. Eastern Europe].* 2021. 9(4). [in Russian]

2. *Ermolickaja M.Z., Kiku P.F., Abakumov A.I.* Statisticheskii analiz vzaimosvyazi sotsial'no-gigienicheskikh faktorov s urovnem zabolevaemosti boleznyami krovi i krovetvornykh organov naseleniya Primorskogo kraja [Statistical analysis of the relationship between socio-hygienic factors and the incidence of diseases of the blood and hematopoietic organs in the population of Primorsky Krai]. *Ekologija cheloveka [Human ecology].* 2021. 11. pp. 33-41. [in Russian]

Information about the authors:

Assel Tukinova – PhD, Senior lecturer of epidemiology and biostatistics department, Semey Medical University, Semey, Kazakhstan, 103 Abay Street, Semey 071400, Kazakhstan, Tel: +77779809317, E-mail: assel.tukinova@smu.edu.kz, <https://orcid.org/0000-0003-0191-4392>

Zhanna Mussabekova - Candidate of Medical Sciences, Dean of the School of Postgraduate Education, Semey Medical University, Semey, Kazakhstan, 103 Abay Street, Semey 071400, Kazakhstan, Tel: +77789197169, E-mail: janna.mussabekova@smu.edu.kz, <https://orcid.org/0000-0003-3442-4963>

Zukhra Siyazbekova - PhD, Head of Personnel Development Department, Semey Medical University, Semey, Kazakhstan, 103 Abay Street, Semey 071400, Kazakhstan, Tel: +77079931301, E-mail: zukhra.siyazbekova@smu.edu.kz, <https://orcid.org/0000-0001-9244-7085>

Bakytzhan Kalbabayev - Medical Director, Abay district hospital, Abay District, Kazakhstan, Tel: +77071657451, E-mail: bakytzhan_kalbabayev@bk.ru, <https://orcid.org/0009-0009-5621-4271>

Sazhida Akhmetova - Assistant of General Practice department of Ust-Kamenogorsk city, Semey Medical University, Semey, Kazakhstan, 103 Abay Street, Semey 071400, Kazakhstan, Tel: +77772809672, E-mail: sazhida.akhmetova@smu.edu.kz, <https://orcid.org/0009-0001-9115-0519>

Corresponding Author:

Zhanna Mussabekova - Semey Medical University
Address: 071400, st. Abay 103, Semey, Republic of Kazakhstan
E-mail: janna.mussabekova@smu.edu.kz
Phone: +77789197169