Received: 29 May 2022 / Accepted: 22 October 2022 / Published online: 31 October 2022

DOI 10.34689/SH.2022.24.5.014

UDC 616.12-008.318.1

EPIDEMIOLOGY OF STROKE IN THE REPUBLIC OF KAZAKHSTAN

Gulnaz K. Kairatova[1], https://orcid.org/0000-0002-8879-564X

Asylzhan S. Kuanyshkalieva[2], https://orcid.org/0000-0003-3857-7473

Venera S. Rakhmetova[3], https://orcid.org/0000-0001-5721-6409

Alida Sh. Kaskabayeva[1], http://orcid.org/0000-0002-5184-214X

Zaituna A. Khismetova[1], https://orcid.org/0000-0001-5937-3045

Dariga S. Smailova[2], https://orcid.org/0000-0002-7152-7104

[1] NCJSC «Semey Medical University», Semey, Republic of Kazakhstan;
[2] Kazakhstan's Medical University «Kazakhstan School of Public Health», Almaty, Republic of Kazakhstan;
[3] NCJSC «Astana Medical University», Astana, Republic of Kazakhstan.

Abstract

Introduction. According to WHO, in 2019, 17.9 million people died from cardiovascular diseases (CVD), which accounted for 31% of the total structure of causes of death, in 2000 this figure was 16%. 85% of these deaths are related to heart attacks and strokes. The costs of noncommunicable diseases represent a global barrier to economic and social development. According to calculations, with an increase in mortality by 10%, economic growth decreases by 0.5%[3]. By 2030, deaths from CVD are projected to increase by more than 23.6 million people. In addition to cardiovascular disease, stroke is the 5th leading cause of death in the world after heart disease, cancer, respiratory disease and unintentional injury.

Aim. To study the incidence and mortality of stroke in Kazakhstan.

Materials and methods. A comparative retrospective analysis of the incidence and mortality from stroke in the context of the regions of the Republic of Kazakhstan for 2010-2020 was carried out according to the statistical collections "Health of the population of the Republic of Kazakhstan and the activities of healthcare organizations".

Results. Incidence of stroke in the Republic of Kazakhstan increases 2.3 times from 189 in 2011 to 433.7 per 100,000 population in 2020. In 2020, the average republican incidence rate was 433.7 per 100,000 population. The incidence of stroke per 100,000 population by region prevails in the East Kazakhstan region (625). And the lowest rate was recorded in Atyrau (221), Aktobe (249) and Almaty (279) regions. It can be seen that the dynamics of the mortality rate has relatively decreased. By the way, compared to 2011, in 2020 (78.49) there was a decrease of 15%. In 2011, death rates were registered 92.36 per 100,000 population. This is the maximum point of the studied time interval. The lowest death rate was recorded in 2012 (51.53).

Conclusion. Thus, in Kazakhstan for the study period (2011-2020), there is a decrease in mortality from stroke in dynamics. Thanks to the introduction of a screening program for the detection of arterial hypertension, diabetes mellitus in Kazakhstan, the detection rate of the incidence of stroke has sharply increased.

Key words: *stroke, stroke epidemiology, incidence, mortality.*

Резюме

ЭПИДЕМИОЛОГИЯ ИНСУЛЬТА В РЕСПУБЛИКЕ КАЗАХСТАН

Гульназ К. Кайратова[1], https://orcid.org/0000-0002-8879-564x

Асылжан С. Куанышкалиева[2], https://orcid.org/0000-0003-3857-7473

Венера С. Рахметова[3], https://orcid.org/0000-0001-5721-6409

Алида Ш. Каскабаева[1], http://orcid.org/0000-0002-5184-214X

Зайтуна А. Хисметова[1], https://orcid,org/0000-0001-5937-3045

Дарига С. Смаилова[2], https://orcid,org/0000-0002-7152-7104

[1] НАО «Медицинский университет Семей», г. Семей, Республика Казахстан.
[2] Казахстанский медицинский университет «Высшая школа общественного здравоохранения», г. Алматы, Республика Казахстан;
[3] НАО «Медицинский университет Астана», Астана, Республика Казахстан.

Введение. По данным ВОЗ, в 2019 году от сердечно-сосудистых заболеваний (далее - ССЗ) умерло 17,9 млн человек, что составило 31% в общей структуре причин смерти, в 2000 году этот показатель составлял 16%. 85% случаев смертей связаны с сердечными приступами и инсультами. Экономические издержки неинфекционных заболеваний представляют собой глобальные препятствия для социально-экономического развития. Согласно расчетам, при увеличении смертности на 10% экономический рост снижается на 0,5% [3]. По прогнозам, к 2030 году смертность от ССЗ увеличится более чем на 23,6 миллиона человек. Помимо ССЗ, инсульт занимает 5-е место среди причин смерти в мире после болезней сердца, рака, респираторных заболеваний и непреднамеренных травм.

Цель исследования: Изучить первичную заболеваемость и смертность от инсульта в Республике Казахстане.

Материалы и методы исследования. Сравнительный ретроспективный анализ первичной заболеваемости и смертности от инсульта в разрезе регионов Республики Казахстан за 2010-2020 годы проведен по данным статистических сборников «Здоровье населения Республики Казахстан и деятельность организаций здравоохранения».

Результаты. Заболеваемость инсультом в Казахстане увеличивается в 2,3 раза со 189 в 2011 году до 433,7 на 100 000 населения в 2020 году. Заболеваемость инсультом на 100 000 населения по регионам преобладает в Восточно-Казахстанской области (625). А самый низкий показатель зафиксирован в Атырауской (221), Актюбинской (249) и Алматинской (279) областях. Видно, что динамика смертности относительно снизилась. По сравнению с 2011 годом, в 2020 году (78,49) произошло снижение на 15%. В 2011 году смертность составила 92,36 на 100 000 населения. Это максимальная точка исследуемого временного интервала. Самая низкая смертность была зафиксирована в 2012 году (51,53).

Заключение. Таким образом, в Казахстане за исследуемый период (2011-2020 год) в динамике отмечается снижение смертности от инсульта. Благодаря внедрению скрининговой программы по выявлению артериальной гипертензии, сахарного диабета в Казахстане резко повысилась выявляемость заболеваемости инсультом.

Ключевые слова: *инсульт, эпидемиология инсульта, заболеваемость, смертность.*

Түйіндеме

ҚАЗАҚСТАН РЕСПУБЛИКАСЫНДАҒЫ ИНСУЛЬТТІҢ ЭПИДЕМИОЛОГИЯСЫ

Гульназ К. Кайратова[1], https://orcid.org/0000-0002-8879-564x

Асылжан С. Куанышкалиева[2], https://orcid.org/0000-0003-3857-7473

Венера С. Рахметова[3], https://orcid.org/0000-0001-5721-6409

Алида Ш. Каскабаева[1], http://orcid.org/0000-0002-5184-214X

Зайтуна А. Хисметова[1], https://orcid,org/0000-0001-5937-3045

Дарига С. Смаилова[2], https://orcid,org/0000-0002-7152-7104

[1] «Семей медицина университеті» КеАҚ, Семей қ., Қазақстан Республикасы;
[2] Қазақстан медицина университеті "Қоғамдық денсаулық сақтау жоғары мектебі", Алматы қ., Қазақстан Республикасы;
[3] «Астана медицина университеті» КеАҚ, Астана қ., Қазақстан Республикасы.

Кіріспе. ДДҰ деректері бойынша жүрек - қантамырлары ауруларынан (бұдан әрі- ЖҚА) 2019 жылы 17,9 млн. адам қайтыс болған, бұл жалпы өлім себептері құрылымының 31% - ын құраған, бұл көрсеткіш 2000 жылы 16% - ды құраған болатын. Аталмыш өлімнің 85% жағдайы инфаркт және инсультпен байланысты. Инфекциялық емес аурулардан келетін экономикалық шығындар әлеуметтік-экономикалық даму үшін жаһандық кедергілерді келтіреді. Есептеулер бойынша, өлім-жітім 10% - ға артқан кезде экономикалық өсім 0,5% - ға төмендейді [3]. Жүрек-қантамыр ауруларынан болатын өлім-жітім 2030 жылға қарай 23,6 миллионнан астамға артады деп болжануда. Жүрек-қан тамырлары ауруларынан бөлек инсульт әлемде жүрек ауруынан, қатерлі ісік, респираторлық аурулар және абайсызда болатын жарақаттардан кейінгі өлім-жітімнің 5-ші себебі болып табылады. Дүние жүзінде 1990 және 2013 жылдар аралығында ЖҚА-на байланысты өлім-жітім шамамен 41,7%-ға өсті, сонымен қатар сол 2013 жылы инсульттан 6,5 миллион адам қайтыс болған және инсульт жүректің ишемиялық ауруларынан кейінгі өлімнің екінші себебі болды [11].

Зерттеу мақсаты: Қазақстан Республикасының өңірлері бойынша инсульттан болатын алғашқы сырқаттанушылық пен өлім-жітімді зерделеу.

Зерттеудің материалдары мен әдістері: «Қазақстан Республикасы халқының денсаулығы және денсаулық сақтау ұйымдарының қызметі» статистикалық жинақтары бойынша 2010-2020 жылдарға арналған Қазақстан Республикасының аймақтары бойынша инсульттан болатын өлім-жітімнің салыстырмалы ретроспективті талдауы жүргізілді [15], соның ішінде Mediform [5],

Нәтижелер: Қазақстанда инсультпен сырқаттанушылық 100 000 халыққа шаққанда 2011 жылы 189-дан 2020 жылы 433,7-ге дейін 2,3 есеге артады. 2020 жылы аурушаңдық көрсеткіші 100 000 халыққа шаққанда 433,7 құрады. Өңірлер бойынша 100 000 халыққа шаққанда инсультпен сырқаттанушылық көрсеткіші Шығыс Қазақстан облысында басым (625). Ал ең төменгі көрсеткіш Атырау (221), Ақтөбе (249) және Алматы (279) облыстарында тіркелді. Өлім-жітім динамикасы салыстырмалы түрде төмендегенін байқауға болады. 2011 жылмен салыстырғанда 2020 жылы (78,49) 15 пайызға төмендеген. 2011 жылы өлім-жітім көрсеткіші 100 000 халыққа шаққанда 92,36-ға тең болды. Бұл зерттелетін уақыт аралығының максималды нүктесі. Ең төменгі өлім көрсеткіші 2012 жылы (51,53) тіркелді.

Қорытынды. Осылайша, Қазақстанда зерттеу кезеңінде (2011-2020 ж.) динамикада инсульттен болатын өлім-жітімнің төмендеуі байқалады. Артериялық гипертензия мен қант диабетін анықтауға арналған скринингтік бағдарламаны енгізудің арқасында Қазақстанда инсультпен аурушаңдық көрсеткіші күрт өсті.

***Түйінді сөздер*:** инсульт, инсульт эпидемиологиясы, аурушаңдық, өлім-жітім.

Bibliographic citation:

Kairatova G.K., Kuanyshkalieva A.S., Rakhmetova V.S., Kaskabayeva A.Sh., Khismetova Z.A., Smailova D.S., Epidemiology of stroke in the Republic of Kazakhstan // *Nauka i Zdravookhranenie* [Science & Healthcare]. 2022, (Vol.24) 5, pp. 105-112. *doi 10.34689/SH.2022.24.5.014*

Кайратова Г.К., Куанышкалиева А.С., Рахметова В.С., Каскабаева А.Ш., Хисметова З.А., Смаилова Д.С. Эпидемиология инсульта в Республике Казахстан // Наука и Здравоохранение. 2022. 5(Т.24). С. 105-112. *doi 10.34689/SH.2022.24.5.014*

Кайратова Г.К., Куанышкалиева А.С., Рахметова В.С., Каскабаева А.Ш., Хисметова З.А., Смаилова Д.С. Қазақстан Республикасындағы инсульттің эпидемиологиясы // Ғылым және Денсаулық сақтау. 2022. 5(Т.24). Б. 105-112. *doi 10.34689/SH.2022.24.5.014*

Introduction

According to the World Health Organization (WHO), 17.9 million people died from cardiovascular diseases (CVD) in 2019, which accounted for 31% of the total causes of death, in 2000 this figure was 16%, 85 % of these deaths are associated with heart attacks and strokes. The economic costs of non-communicable diseases represent global obstacles to socio-economic development. According to calculations, with an increase in mortality by 10%, economic growth decreases by 0.5% [3]. According to forecasts, by 2030, mortality from cardiovascular diseases will increase by more than 23.6 million people. In addition to CVD, stroke ranks 5th among the causes of death in the world after heart disease, cancer, respiratory diseases and unintentional injuries.

One of the urgent problems of modern medicine is the organization of medical care for patients who have suffered a stroke. In 2004, the WHO declared stroke a life-threatening global epidemic [6].

Stroke is the most common life-threatening neurological disease and one of the most important causes of disability both in Kazakhstan and around the world. Among the CIS countries, Kazakhstan ranks second place after Moldova in terms of mortality from CVD. Some researchers suggest that official statistics do not fully reflect the state of the problem in Kazakhstan due to the lack of representative population epidemiological studies [4]. In 2010, the Global Burden of Disease (GBD) study showed that age-standardized mortality rates from stroke worldwide have decreased over the past 2 decades, but the number of people with stroke and the number of people living with stroke and dying from it have increased every year [13].

Between 1990 and 2010, stroke mortality declined in high-income countries. However, there are no significant changes in morbidity in middle- and low-income countries, and the number of deaths from stroke has increased during this time [19, 22].

Studies have shown that the occurrence of stroke depends on many factors, the most common modifiable factors are hypertension, diabetes mellitus, overweight and unmodified factors - age, gender and ethnicity [1]. The prevalence of stroke depends on age, gender, nationality and geographical features of the place of residence. Stroke is more common in men than in women at an early age, and in middle age it is 10 times more common in women than in men, and causes severe functional disorders [15].

In France, the number of stroke-related hospitalizations was about 138,000 in 2009, which is 3% of total national health spending. In addition, after a stroke, the patient's health indicators deteriorate, including motor disorders, dementia, depression, increased fatigue, the risk of re-hospitalization is high, which is a negative situation from a socio-economic point of view. 5,9 million stroke-related deaths are registered annually in the world [12].

Central Asia is struggling with high rates of hemorrhagic stroke and subarachnoid hemorrhage, mortality and life expectancy associated with disability [18], since the growth of disability has a significant impact on the country's economy and the quality of life of the population. Looking at global trends, the incidence of ischemic stroke increased by 37%, this increase was accompanied by an increase in hemorrhagic stroke by 47 % and the total number of deaths from both types of stroke increased by about 20% between 1990 and 2010. That is, the economic and medical burden of stroke remains high [14].

Today, an increase in the life expectancy of the Asian population, that is, an aging population, a decrease in mortality from infectious diseases, and among countries with economies in transition, the burden of stroke will inevitably increase. In addition, the prevalence of stroke is more common in men than in women, and in many studies, the incidence rate among men is approx. It is often said that it is higher than 25-30% [20, 9].

According to statistics, in 2015, more than 40,000 Kazakhstan citizens suffered from a stroke, 24% of which were fatal. In the country, the incidence ranges from 2.5 to 3.7 per 1,000 people per year, and mortality ranges from 100 to 180 per 100,000 people, disability was 104.6 per 100,000 population [5].

Kazakhstan is an economically developed country and ranks second in terms of population in Central Asia. After the collapse of the Soviet Union, Kazakhstan began health care reforms starting in the 2000s to address the high burden of diseases, including CVD. Every citizen permanently residing in Kazakhstan, relatives (ethnic Kazakhs who moved to Kazakhstan from neighboring countries) can receive free medical care for preventive, diagnostic and other medical services supported by government and medical insurance fund. So, every patient after a stroke has an opportunity to have access to medical care [23].

More than 49,000 cases of stroke occur annually in the Republic of Kazakhstan. Thanks to the introduction of stroke registers in all regions of Kazakhstan, data on the epidemiology of stroke have been obtained. It was found that the incidence of stroke is 2.5-3.7 cases per 1000 people, and mortality is up to 1.8 cases per 1000 people per year. It was found that the disease increases dramatically with increasing age, the average age of stroke patients is 67 years. 29 percent of stroke patients are of working age (up to 60 years).

The total mortality rate during acute stroke was 35.2%, including 60.1% for women and 39.9% for men [7].

Over the past decade, life expectancy has increased worldwide, and there has been a shift from mortality and disability associated with infectious diseases to disability and mortality from chronic non-communicable diseases, including stroke and CVD [17].

Many studies have proven that the disease can be prevented based on the elimination or reduction of risk factors that affect the occurrence of stroke. Unfortunately, the main risk factors causing stroke in Kazakhstan have not been fully studied, so it is impossible to say exactly which main risk factor is most common [8,10].

The available official data on the problem of stroke in our country do not give a complete and accurate picture, so it still needs to be studied from a scientific point of view. Given that stroke is one of the leading causes of many diseases, identifying risk factors for stroke is important when developing high-quality preventive measures.

Aim. To study the incidence and mortality of stroke in Kazakhstan.

Materials and methods. A comparative retrospective analysis of stroke mortality in the context of the regions of the Republic of Kazakhstan for 2010-2020 was carried out according to the statistical collections "Health of the population of the Republic of Kazakhstan and the activities of healthcare organizations".

Results

The incidence of stroke in the Republic of Kazakhstan increases 2.3 times from 189 in 2011 to 433.7 per 100,000 population in 2020 (Fig 1).

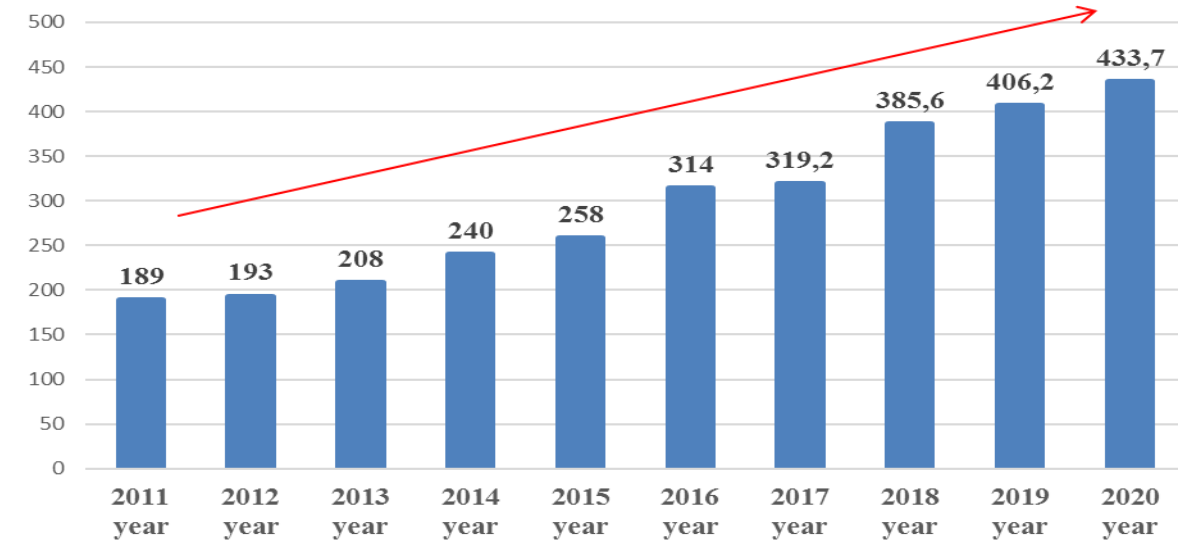

Figure 1. The incidence of stroke per 100,000 population in Kazakhstan.

Over the past 10 years, the dynamics of stroke incidence in the East Kazakhstan region has increased significantly. The highest incidence rate was recorded in 2020 (624.6), the lowest rate (155.02) was registered in 2011 (Fig. 2).

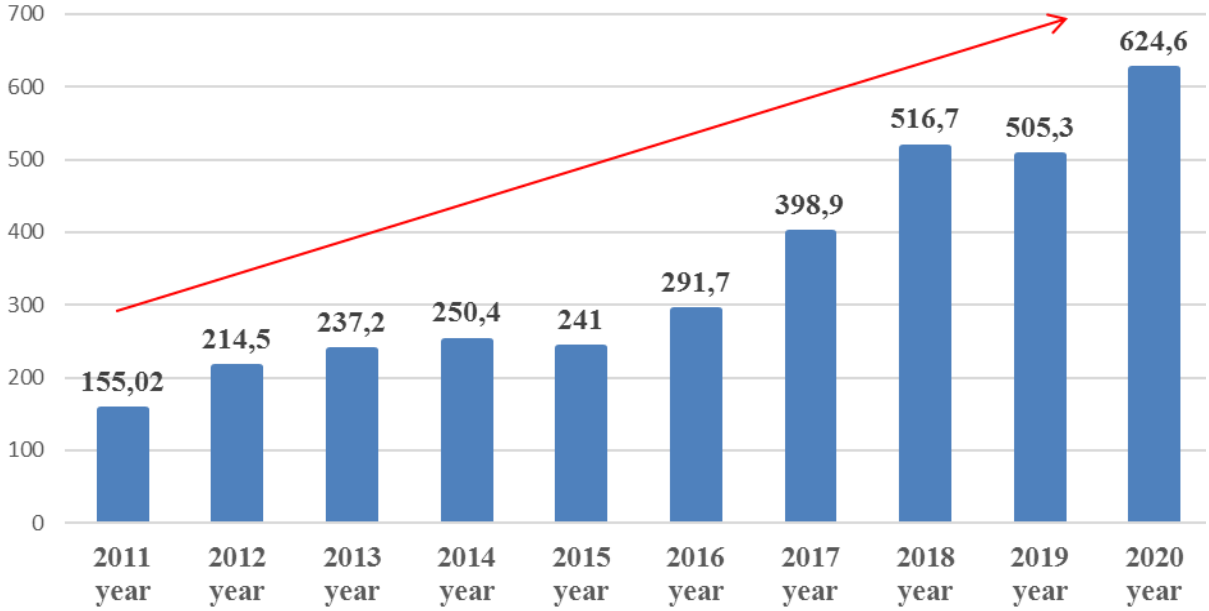

Figure 2. Incidence of stroke per 100,000 population in the period 2011-2020 in the East-Kazakhstan region.

In 2020, the incidence rate of stroke is 433.7 per 100,000 per population. The incidence of stroke per 100,000 population by region prevails in the East Kazakhstan region (625). And the lowest rate was recorded in Atyrau (221), Aktobe (249) and Almaty (279) regions (Fig. 3).

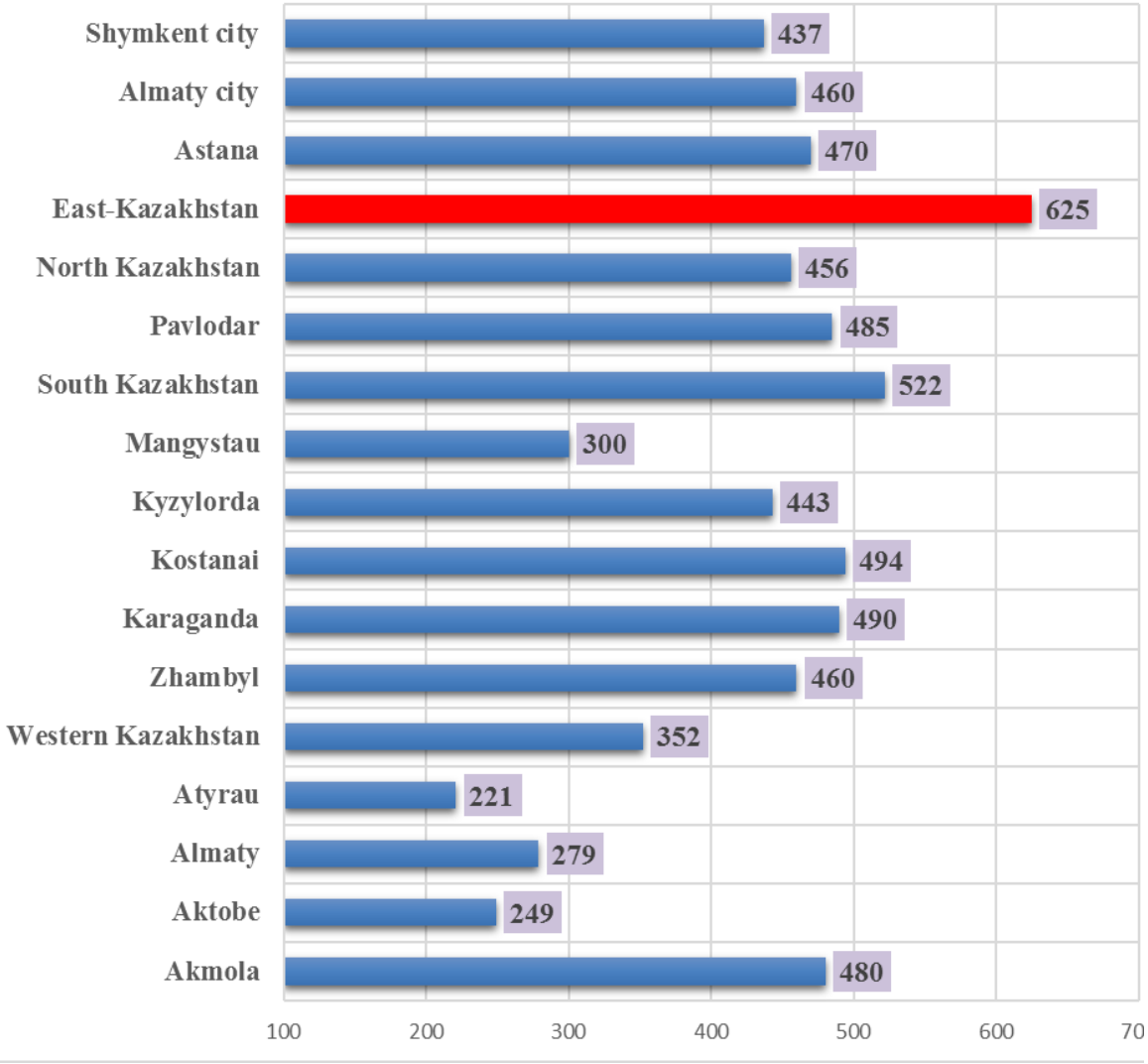

Figure 3. Stroke incidence per 100,000 population in 2020 by regions of the Republic of Kazakhstan.

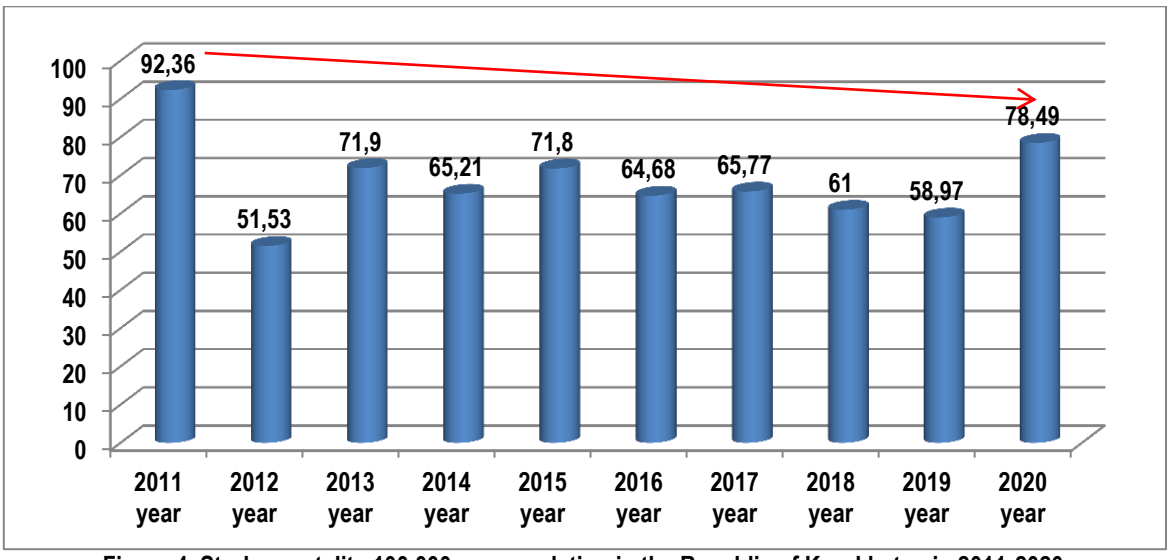

Figure 4. Stroke mortality 100 000 per population in the Republic of Kazakhstan in 2011-2020.

It can be noted that the dynamics of the mortality rate has relatively decreased. By the way, compared to 2011, in 2020 (78.49) there was a decrease of 15%. In 2011, 92.36 mortality rates per 100 000 per population were registered. This is the maximum point of the investigated time interval. The lowest mortality rate was recorded in 2012 (51.53). (Fig. 4.)

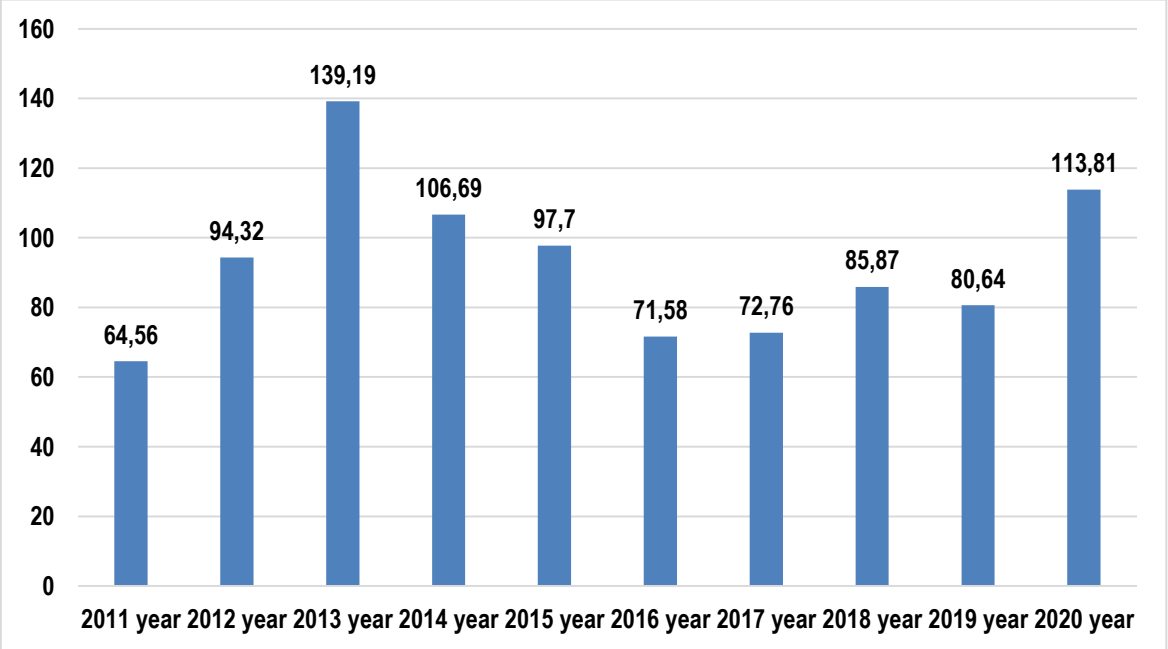

Figure 5. Stroke mortality per 100,000 per population in the East Kazakhstan region for 2011-2020.

A retrospective analysis of stroke mortality in the East Kazakhstan region for 2011-2020 shows that the maximum point was recorded in 2013 (139.19), followed by subsequent years until 2016, the mortality rate decreased significantly (71.58). Since 2017, the death rate from stroke has increased slightly. In 2020, the mortality rate increased to 113.81 (Fig.5.).

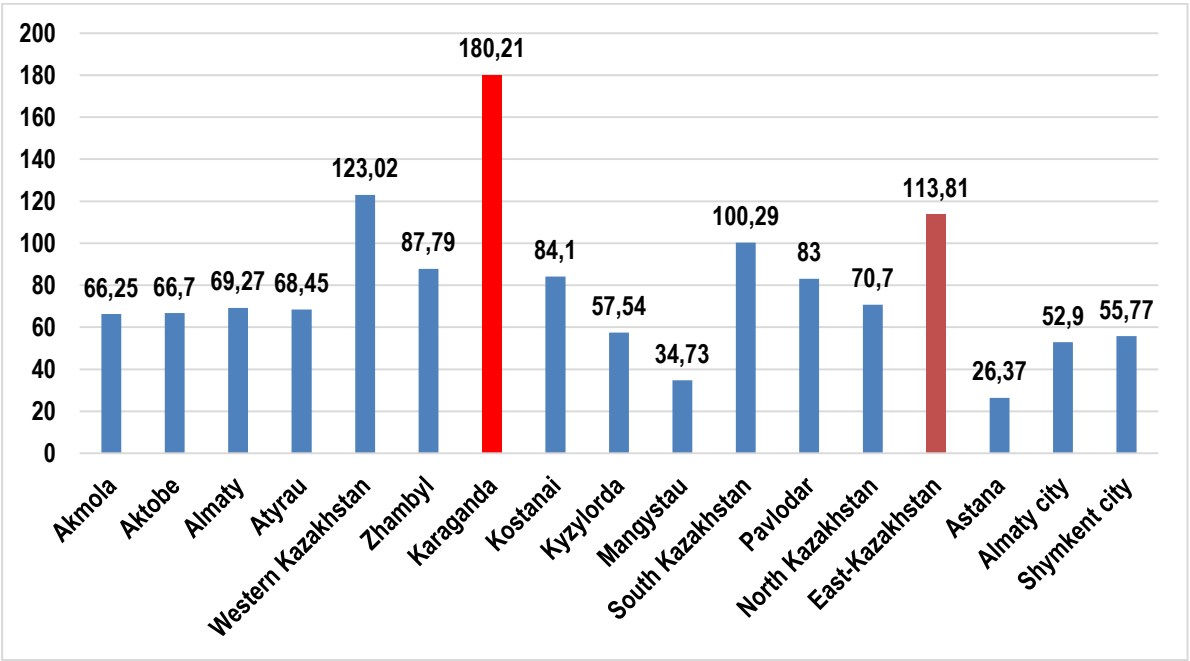

Figure 6. Stroke mortality in the regions of the Republic of Kazakhstan in 2020/

The analysis for 2020 by regions of the country shows that the leader in stroke mortality is the Karaganda region (180.21), Western Kazakhstan is in second place (123.02) and in third place in East Kazakhstan region (113.81). The lowest indicator was recorded in the Astana region (26.37) (Fig. 6).

Discussion

According to the study, a high incidence was registered in all regions of the country. In 2020, a high incidence of stroke was registered in East Kazakhstan, Pavlodar, Kostanay, Karaganda, and North Kazakhstan regions.

In this case, the increase in morbidity can be interpreted as positive, i.e., due to the introduction of screening examinations of the adult population aimed at early detection and prevention of cardiovascular diseases with arterial hypertension and diabetes mellitus at the primary healthcare level due to improved early diagnosis (detection) of patients.

Compared to 2011, in 2019, stroke mortality decreased significantly by 36.1%. However, the death rate rose by 24.8 % from 51.53 to 78.49 between 2019 and 2020. Most likely, such a sharp jump is associated with the Covid-19 pandemic. A history of cardiovascular disease may be an important risk factor for the adverse clinical course of COVID-19 [20].

Nevertheless, the increase in morbidity and mortality in certain regions indicates that the work on prevention, treatment and medical examination at the primary healthcare level is not carried out at the proper level for various reasons [2]. The main risk factor of stroke is a high prevalence of arterial hypertension (85.5%). In addition, four other changing risk factors are common: sedentary lifestyle (80.9%), smoking (55%), alcoholism (48.1%) and dyslipidemia (47.3%) [16].

Thus, the prevention of cardiovascular diseases, namely the prevention or slowing of the clinical manifestations of the disease in asymptomatic or high-risk individuals, remains the main goal of modern preventive and clinical medicine.

Conclusion. Thus, in Kazakhstan during the study period (2011-2020), there is a decrease in stroke mortality in dynamics. Thanks to involving screening programs for detection arterial hypertension and diabetes in Kazakhstan the incidence of stroke increases dramatically.

Conflicts of Interest: *The authors declare no competing conflict interest.*

Authors' Contribution: *All authors contributed to study conception and design. All authors have read and approve the final manuscript.*

Acknowledgement. *The study was supported by the grant of the Ministry of Healthcare of the Republic of Kazakhstan "National Programme for the Introduction of Personalized and Preventive Medicine in The Republic of Kazakhstan (2021–2023)" (Grant number OR12165486). Dariga S. Smailova, Asylzhan S. Kuanyshkalieva take part in the given project.*

Литература:

1. *Акимжанова А.К., Хайбуллин Т.Н., Гржибовский А.М.* Факторы риска 28-дневной летальности после инсульта в Казахстане: когортное исследование // Экология человека. 2016. №3. С.52-58. URL: https://cyberleninka.ru/article/n/faktory-riska-28-dnevnoy-letalnosti-posle-insulta-v-kazahstane-kogortnoe-issledovanie (дата обращения: 10.01.2022).

2. *Ахметжанова З.Б., Медуханова С.Г., Жумабаева Г.К., Адильбеков Е.Б.* Инсульт в Казахстане // Нейрохирургия и неврология Казахстана. 2019. №2. С.8-44. URL: https://cyberleninka.ru/article/n/insult-v-kazahstane (дата обращения: 15.11.2022).

3. *Всемирная Организация здравоохранения* / Сердечно-сосудистые заболевания/ https://www.who.int/ru/news-room/fact-sheets/detail/cardiovascular-diseases-(cvds). (дата обращения: 10.01.2022).

4. *Еркебаева С.К., Нургужаев Е.С., Гафуров Б.Г., Жаркинбекова Н.А., Абасова Г.Б.* Эпидемиология и климатогеографические факторы риска инсульта в Южно-Казахстанской области // Журнал Неврологии и Психиатрии имени С.С. Корсакова. 2013. №3. С.3-8. PMID: 23612391.

5. *Кастей Р.М., Дюсембеков Е.К., Зетов А.Ш., и др*. Эпидемиологические аспекты и факторы развития острых нарушений мозгового кровообращения (Литературный обзор) // Вестник КазНМУ. 2020. №2-1. С.591-596. URL: https://cyberleninka.ru/article/n/epidemiologicheskie-aspekty-i-faktory-razvitiya-ostryh-narusheniy-mozgovogo-krovoobrascheniya-literaturnyy-obzor (дата обращения: 13.11.2022).

6. *Коныспаева К.К., Токмурзиева Г.Ж., Попова Т.В., и др.* Организация и состояние инсультной службы в Республике Казахстан // Журнал развития здравоохранения. 2018. №28. С.46-56.URL:https://cyberleninka.ru/article/n/organizatsiya-i-sostoyanie-insultnoy-sluzhby-v-respublike-kazahstan-1 (дата обращения: 12.11.2022).

7. *Смаилов Н.С.* Профилактика инсультов и оценка информированности о факторах риска // Наука и здравоохранение. 2014. №1. С.67-69.

8. *Шамрай В.Ю., Махмутова А.М., Ерубаева Б.Б.* Сравнительный анализ основных факторов риска инсульта // Нейрохирургия и неврология Казахстана. 2019. №2. С.85-89. URL: https://cyberleninka.ru/article/n/sravnitelnyy-analiz-osnovnyh-faktorov-riska-insulta (дата обращения: 12.11.2022).

9. *Appelros P., Stegmire B., Terent A.* Sex differences in the epidemiology of stroke: a systematicreview.//Stroke. 2019. №4. P.1082-1090.URL:http:doi.org/10.1161/strokeaha.108.540781 .

10. *Arnao V., Acciaresi M., Cittadini E., Caso V.* Incidence, prevalence, and mortality from stroke in women worldwide // International Journal of Stroke. 2016. №3. P.287-301. doi: 10.1177/1747493016632245. PMID: 26984193.

11. *Béjot Y., Daubail B., Giroud M.* Epidemiology of stroke and transient ischemic attacks: current knowledge and perspectives // Revue Neurologique (Paris). 2016. №1. P.59-68. doi: 10.1016/j.neurol.2015.07.013. PMID: 26718592.

12. *Benjamin E.J., Virani S.S., Callaway C.W. et al.* Statistical Committee of the American Heart Association Council on Epidemiology and Prevention and Subcommittee on Stroke Statistics 2018 Cardiovascular Disease and Stroke Statistics Update: Report from the American Heart Association // Circulation. 2018. №137. P.56-528. doi: 10.1161/CIR.0000000000000558. PMID: 29386200.

13. *Feigin V.L., Krishnamurti R.V., Parmar P. et al*. Update on the global burden of ischemic and hemorrhagic stroke 1990-2013: 2013 GBD study // Neuroepidemiology. 2015. №3. P.161-176. doi: 10.1159/000441085. PMCID: PMC4633282.

14. *Feigin V.L., Nichols E., Alam T. et al.* Global, Regional and National Burden of Neurological Disorders, 1990–2016: A Systematic Analysis for the Global Burden of

Disease Study 2016 // The Lancet Neurology. 2019. №5. P.459-480. doi: 10.1016/S1474-4422(18)30499-X. PMID: 30879893.

15. *Guzik A., Bushnell S.* Stroke epidemiology and risk factor management: Continuity: lifelong learning in neuroscience // AAN publications. 2017. №1. P.15-39. doi: 10.1212/CON.0000000000000416. PMID: 28157742.

16. *Konermann S.* HHS Public Access // Physiology & behavior. 2019. №1. P.665–676.

17. *Krishnamurthi R.V., Moran A.E., Forouzanfar M.H., et al.* The global burden of hemorrhagic stroke: a summary of the results of the 2010 GBD study // Global Heart. 2014. №1. P.101-106. doi: 10.1016/j.gheart.2014.01.003. PMID: 25432119.

18. *Krishnamurti R.V., Feigin V.L., Foruzanfar M.Kh. et al.* Global and regional burden of first ever ischemic and hemorrhagic stroke 1990-2010: results from the 2010 Global Burden of Disease Study // The Lancet Global Health. 2013.№5. P.245-254.

19. *Mozaffarian D, Benjamin E.J., Go A.S., et al.* Heart Disease and Stroke Statistics - 2016 Update // Circulation. 2016. №4. P.38-360. doi: 10.1016/s0140-6736(13)61953-4. PMC4181600.

20. *Siepmann T., Sedghi A., Barlinn J.* Association of history of cerebrovascular disease with severity of COVID-19 // *Journal of Neurology*. 2021 март; 268(3) P.773-784. doi: 10.1007/s00415-020-10121-0. Epub 2020 6

21. *Venketasubramanian N., Yun B.V., Pandian J., Navarro J.S.* The epidemiology of stroke in South, Oriental and SouthOriental Asia: a review // Journal of Stroke. 2017.№3. P.286-294. PMID: 29037005; PMCID: PMC5647629.

22. *Vos T., Barber R.M., Bell B. et al.* Global, regional and national incidence, prevalence, and years of disability for 301 acute and chronic diseases and injuries in 188 countries, 1990–2013: a systematic analysis for research global burden of disease 2013 // The Lancet. 2015.№9995. P.743-800. doi: 10.1016/S0140-6736(15)60692-4. PMID: 26063472.

23. *Zhukov Yu., Dyusembekov Yu.K.K., Aringazina A. et al.* Dynamics of the epidemiology of hemorrhagic stroke among the urban population of Kazakhstan over time // Open Access Macedonian Journal of Medical Sciences. 2022. P.402-408. https://oamjms.eu/index.php/mjms/article/view/8688

References:

1. Akimzhanova A.K., Khaybullin T.N., Grzhibovskiy A.M. Faktory riska 28-dnevnoy letal'nosti posle insul't a v Kazakhstane: kogortnoe issledovanie[Risk factors for 28-day mortality in Kazakhstan: a cohort study]. *Ekologiya cheloveka* [Human Ecology]. 2016. №3. pp.52-58. URL: https://cyberleninka.ru/article/n/faktory-riska-28-dnevnoy-letalnosti-posle-insulta-v-kazahstane-kogortnoe-issledovanie (acecced: 10.01.2022). [in Russian].

2. Akhmetzhanova Z.B., Medukhanova S.G., Zhumabaeva G.K., Adil'bekov E.B. Insul't v Kazakhstane [Stroke in Kazakhstan]. *Neyrokhirurgiya i nevrologiya Kazakhstana* [Neurosurgery and Neurology of Kazakhstan]. 2019. №2. pp.8-44. URL: https://cyberleninka.ru/article/n/insult-v-kazahstane (acecced:15.11.2022).[in Russian].

3. *Vsemirnaya Organizatsiya Zdravookhraneniya / Serdechno-sosudistye zabolevaniya* [*WHO* /Cardiovascular diseases]/ https://www.who.int/ru/news-room/fact-sheets/detail/cardiovascular-diseases-(cvds) .

4. Erkebaeva S.K., Nurguzhaev E.S., Gafurov B.G., Zharkinbekova N.A., Abasova G.B. Epidemiologiya i klimatogeograficheskie faktory riska insul't a v Yuzhno-Kazakhstanskoy oblasti [Epidemiology and climatogeographic risk factors of stroke in South Kazakhstan region]. *Zhurnal nevrologii i psikhiatrii imeni S.S. Korsakova* [Journal of Neurology and Psychiatry named after S.S. Korsakov]. 2013. №3. pp.3-8. PMID: 23612391. [in Russian].

5. Kastey R.M., Dyusembekov E.K., Zetov A.Sh. et al. Epidemiologicheskie aspekty i faktory razvitiya ostrykh narusheniy mozgovogo krovoobrashcheniya (Literaturnyy obzor) [Epidemiological aspects and factors of development of acute disorders of cerebral circulation (Literary review)]. *Vestnik KazNMU* [Bulletin of KazNMU]. 2020. №2-1. pp.591-596. URL: https://cyberleninka.ru/article/n/epidemiologicheskie-aspekty-i-faktory-razvitiya-ostryh-narusheniy-mozgovogo-krovoobrascheniya-literaturnyy-obzor (acecced: 13.11.2022). [in Russian].

6. Konysbaeva K.K., Tokmurzieva G.Zh., Popova T.V. et al. Organizatsiya i sostoyanie insul'tnoy sluzhby v Respublike Kazakhstan [Organization and condition of stroke service in the Republic of Kazakhstan]. *Zhurnal razvitiya zdravookhraneniya* [Journal of Healthcare Development]. 2018. №3. pp.28. URL:https://cyberleninka.ru/article/n/organizatsiya-i-sostoyanie-insultnoy-sluzhby-v-respublike-kazahstan-1 (acecced: 12.11.2022). [in Russian].

7. Smailov N.S. Profilaktika insul'tov i otsenka informirovannosti o faktorakh riska [Stroke prevention and risk factor awareness assessment]. Nauka i zdravookhranenie [Science and healthcare]. 2014. №1. pp.67-69. [in Russian].

8. Shamray V.Yu., Makhmutova A.M., Erubaeva B.B. Sravnitel'nyy analiz osnovnykh faktorov riska insul'ta [Comparative analysis of the main risk factors for stroke]. *Neyrokhirurgiya i nevrologiya Kazakhstana* [Neurosurgery and neurology of Kazakhstan]. 2019. №2. pp.85-89. URL: https://cyberleninka.ru/article/n/sravnitelnyy-analiz-osnovnyh-faktorov-riska-insulta (acecced: 12.11.2022). [in Russian].

Автор-корреспондент:
Кайратова Гульназ Кайраткызы - докторант PhD, НАО «Медицинский университет Семей», Республика Казахстан.
Почтовый индекс: Республика Казахстан, 071400, г.Семей, ул.Абая 103
Email: gulnaz.kairatova@nao-mus.kz
Телефон: +7 747 425 23 32