GEORGIAN MEDICAL NEWS

ISSN 1512-0112

NO 10 (355) Октябрь 2024

ТБИЛИСИ - NEW YORK

ЕЖЕМЕСЯЧНЫЙ НАУЧНЫЙ ЖУРНАЛ

Медицинские новости Грузии

საქართველოს სამედიცინო სიახლენი

GEORGIAN MEDICAL NEWS

Monthly Georgia-US joint scientific journal published both in electronic and paper formats of the Agency of Medical Information of the Georgian Association of Business Press. Published since 1994. Distributed in NIS, EU and USA.

GMN: Georgian Medical News is peer-reviewed, published monthly journal committed to promoting the science and art of medicine and the betterment of public health, published by the GMN Editorial Board since 1994. GMN carries original scientific articles on medicine, biology and pharmacy, which are of experimental, theoretical and practical character; publishes original research, reviews, commentaries, editorials, essays, medical news, and correspondence in English and Russian.

GMN is indexed in MEDLINE, SCOPUS, PubMed and VINITI Russian Academy of Sciences. The full text content is available through EBSCO databases.

GMN: Медицинские новости Грузии - ежемесячный рецензируемый научный журнал, издаётся Редакционной коллегией с 1994 года на русском и английском языках в целях поддержки медицинской науки и улучшения здравоохранения. В журнале публикуются оригинальные научные статьи в области медицины, биологии и фармации, статьи обзорного характера, научные сообщения, новости медицины и здравоохранения. Журнал индексируется в MEDLINE, отражён в базе данных SCOPUS, PubMed и ВИНИТИ РАН. Полнотекстовые статьи журнала доступны через БД EBSCO.

GMN: Georgian Medical News – საქართველოს სამედიცინო სიახლენი – არის ყოველთვიური სამეცნიერო სამედიცინო რეცენზირებადი ჟურნალი, გამოიცემა 1994 წლიდან, წარმოადგენს სარედაქციო კოლეგიისა და აშშ-ის მეცნიერების, განათლების, ინდუსტრიის, ხელოვნებისა და ბუნებისმეტყველების საერთაშორისო აკადემიის ერთობლივ გამოცემას. GMN-ში რუსულ და ინგლისურ ენებზე ქვეყნდება ექსპერიმენტული, თეორიული და პრაქტიკული ხასიათის ორიგინალური სამეცნიერო სტატიები მედიცინის, ბიოლოგიისა და ფარმაციის სფეროში, მიმოხილვითი ხასიათის სტატიები.

ჟურნალი ინდექსირებულია MEDLINE-ის საერთაშორისო სისტემაში, ასახულია SCOPUS-ის, PubMed-ის და ВИНИТИ РАН-ის მონაცემთა ბაზებში. სტატიების სრული ტექსტი ხელმისაწვდომია EBSCO-ს მონაცემთა ბაზებიდან.

WEBSITE

www.geomednews.com

К СВЕДЕНИЮ АВТОРОВ!

При направлении статьи в редакцию необходимо соблюдать следующие правила:

1. Статья должна быть представлена в двух экземплярах, на русском или английском языках, напечатанная через **полтора интервала на одной стороне стандартного листа с шириной левого поля в три сантиметра**. Используемый компьютерный шрифт для текста на русском и английском языках - **Times New Roman** (**Кириллица**), для текста на грузинском языке следует использовать **AcadNusx.** Размер шрифта - **12**. К рукописи, напечатанной на компьютере, должен быть приложен CD со статьей.

2. Размер статьи должен быть не менее десяти и не более двадцати страниц машинописи, включая указатель литературы и резюме на английском, русском и грузинском языках.

3. В статье должны быть освещены актуальность данного материала, методы и результаты исследования и их обсуждение.

При представлении в печать научных экспериментальных работ авторы должны указывать вид и количество экспериментальных животных, применявшиеся методы обезболивания и усыпления (в ходе острых опытов).

4. К статье должны быть приложены краткое (на полстраницы) резюме на английском, русском и грузинском языках (включающее следующие разделы: цель исследования, материал и методы, результаты и заключение) и список ключевых слов (key words).

5. Таблицы необходимо представлять в печатной форме. Фотокопии не принимаются. **Все цифровые, итоговые и процентные данные в таблицах должны соответствовать таковым в тексте статьи**. Таблицы и графики должны быть озаглавлены.

6. Фотографии должны быть контрастными, фотокопии с рентгенограмм - в позитивном изображении. Рисунки, чертежи и диаграммы следует озаглавить, пронумеровать и вставить в соответствующее место текста **в tiff формате**.

В подписях к микрофотографиям следует указывать степень увеличения через окуляр или объектив и метод окраски или импрегнации срезов.

7. Фамилии отечественных авторов приводятся в оригинальной транскрипции.

8. При оформлении и направлении статей в журнал МНГ просим авторов соблюдать правила, изложенные в «Единых требованиях к рукописям, представляемым в биомедицинские журналы», принятых Международным комитетом редакторов медицинских журналов - http://www.spinesurgery.ru/files/publish.pdf и http://www.nlm.nih.gov/bsd/uniform_requirements.html
В конце каждой оригинальной статьи приводится библиографический список. В список литературы включаются все материалы, на которые имеются ссылки в тексте. Список составляется в алфавитном порядке и нумеруется. Литературный источник приводится на языке оригинала. В списке литературы сначала приводятся работы, написанные знаками грузинского алфавита, затем кириллицей и латиницей. Ссылки на цитируемые работы в тексте статьи даются в квадратных скобках в виде номера, соответствующего номеру данной работы в списке литературы. Большинство цитированных источников должны быть за последние 5-7 лет.

9. Для получения права на публикацию статья должна иметь от руководителя работы или учреждения визу и сопроводительное отношение, написанные или напечатанные на бланке и заверенные подписью и печатью.

10. В конце статьи должны быть подписи всех авторов, полностью приведены их фамилии, имена и отчества, указаны служебный и домашний номера телефонов и адреса или иные координаты. Количество авторов (соавторов) не должно превышать пяти человек.

11. Редакция оставляет за собой право сокращать и исправлять статьи. Корректура авторам не высылается, вся работа и сверка проводится по авторскому оригиналу.

12. Недопустимо направление в редакцию работ, представленных к печати в иных издательствах или опубликованных в других изданиях.

При нарушении указанных правил статьи не рассматриваются.

REQUIREMENTS

Please note, materials submitted to the Editorial Office Staff are supposed to meet the following requirements:

1. Articles must be provided with a double copy, in English or Russian languages and typed or compu-ter-printed on a single side of standard typing paper, with the left margin of **3** centimeters width, and **1.5** spacing between the lines, typeface - **Times New Roman** (**Cyrillic**), print size - **12** (referring to Georgian and Russian materials). With computer-printed texts please enclose a CD carrying the same file titled with Latin symbols.

2. Size of the article, including index and resume in English, Russian and Georgian languages must be at least 10 pages and not exceed the limit of 20 pages of typed or computer-printed text.

3. Submitted material must include a coverage of a topical subject, research methods, results, and review.

Authors of the scientific-research works must indicate the number of experimental biological species drawn in, list the employed methods of anesthetization and soporific means used during acute tests.

4. Articles must have a short (half page) abstract in English, Russian and Georgian (including the following sections: aim of study, material and methods, results and conclusions) and a list of key words.

5. Tables must be presented in an original typed or computer-printed form, instead of a photocopied version. **Numbers, totals, percentile data on the tables must coincide with those in the texts of the articles.** Tables and graphs must be headed.

6. Photographs are required to be contrasted and must be submitted with doubles. Please number each photograph with a pencil on its back, indicate author's name, title of the article (short version), and mark out its top and bottom parts. Drawings must be accurate, drafts and diagrams drawn in Indian ink (or black ink). Photocopies of the X-ray photographs must be presented in a positive image in **tiff format**.

Accurately numbered subtitles for each illustration must be listed on a separate sheet of paper. In the subtitles for the microphotographs please indicate the ocular and objective lens magnification power, method of coloring or impregnation of the microscopic sections (preparations).

7. Please indicate last names, first and middle initials of the native authors, present names and initials of the foreign authors in the transcription of the original language, enclose in parenthesis corresponding number under which the author is listed in the reference materials.

8. Please follow guidance offered to authors by The International Committee of Medical Journal Editors guidance in its Uniform Requirements for Manuscripts Submitted to Biomedical Journals publication available online at: http://www.nlm.nih.gov/bsd/uniform_requirements.html
http://www.icmje.org/urm_full.pdf
In GMN style for each work cited in the text, a bibliographic reference is given, and this is located at the end of the article under the title "References". All references cited in the text must be listed. The list of references should be arranged alphabetically and then numbered. References are numbered in the text [numbers in square brackets] and in the reference list and numbers are repeated throughout the text as needed. The bibliographic description is given in the language of publication (citations in Georgian script are followed by Cyrillic and Latin).

9. To obtain the rights of publication articles must be accompanied by a visa from the project instructor or the establishment, where the work has been performed, and a reference letter, both written or typed on a special signed form, certified by a stamp or a seal.

10. Articles must be signed by all of the authors at the end, and they must be provided with a list of full names, office and home phone numbers and addresses or other non-office locations where the authors could be reached. The number of the authors (co-authors) must not exceed the limit of 5 people.

11. Editorial Staff reserves the rights to cut down in size and correct the articles. Proof-sheets are not sent out to the authors. The entire editorial and collation work is performed according to the author's original text.

12. Sending in the works that have already been assigned to the press by other Editorial Staffs or have been printed by other publishers is not permissible.

Articles that Fail to Meet the Aforementioned Requirements are not Assigned to be Reviewed.

ავტორთა საყურადღებოდ!

რედაქციაში სტატიის წარმოდგენისას საჭიროა დავიცვათ შემდეგი წესები:

1. სტატია უნდა წარმოადგინოთ 2 ცალად, რუსულ ან ინგლისურ ენებზე,დაბეჭდილი სტანდარტული ფურცლის 1 გვერდზე, 3 სმ სიგანის მარცხენა ველისა და სტრიქონებს შორის 1,5 ინტერვალის დაცვით. გამოყენებული კომპიუტერული შრიფტი რუსულ და ინგლისურენოვან ტექსტებში - **Times New Roman (Кириллица)**, ხოლო ქართულენოვან ტექსტში საჭიროა გამოვიყენოთ **AcadNusx.** შრიფტის ზომა – 12. სტატიას თან უნდა ახლდეს CD სტატიით.

2. სტატიის მოცულობა არ უნდა შეადგენდეს 10 გვერდზე ნაკლებს და 20 გვერდზე მეტს ლიტერატურის სიის და რეზიუმეების (ინგლისურ, რუსულ და ქართულ ენებზე) ჩათვლით.

3. სტატიაში საჭიროა გაშუქდეს: საკითხის აქტუალობა; კვლევის მიზანი; საკვლევი მასალა და გამოყენებული მეთოდები; მიღებული შედეგები და მათი განსჯა. ექსპერიმენტული ხასიათის სტატიების წარმოდგენისას ავტორებმა უნდა მიუთითონ საექსპერიმენტო ცხოველების სახეობა და რაოდენობა; გაუტკივარებისა და დაძინების მეთოდები (მწვავე ცდების პირობებში).

4. სტატიას თან უნდა ახლდეს რეზიუმე ინგლისურ, რუსულ და ქართულ ენებზე არანაკლებ ნახევარი გვერდის მოცულობისა (სათაურის, ავტორების, დაწესებულების მითითებით და უნდა შეიცავდეს შემდეგ განყოფილებებს: მიზანი, მასალა და მეთოდები, შედეგები და დასკვნები; ტექსტუალური ნაწილი არ უნდა იყოს 15 სტრიქონზე ნაკლები) და საკვანძო სიტყვების ჩამონათვალი (key words).

5. ცხრილები საჭიროა წარმოადგინოთ ნაბეჭდი სახით. ყველა ციფრული, შემაჯამებელი და პროცენტული მონაცემები უნდა შეესაბამებოდეს ტექსტში მოყვანილს.

6. ფოტოსურათები უნდა იყოს კონტრასტული; სურათები, ნახაზები, დიაგრამები - დასათაურებული, დანომრილი და სათანადო ადგილას ჩასმული. რენტგენოგრამების ფოტოასლები წარმოადგინეთ პოზიტიური გამოსახულებით **tiff** ფორმატში. მიკროფოტოსურათების წარწერებში საჭიროა მიუთითოთ ოკულარის ან ობიექტივის საშუალებით გადიდების ხარისხი, ანათალების შეღებვის ან იმპრეგნაციის მეთოდი და აღნიშნოთ სურათის ზედა და ქვედა ნაწილები.

7. სამამულო ავტორების გვარები სტატიაში აღინიშნება ინიციალების თანდართვით, უცხოურისა – უცხოური ტრანსკრიპციით.

8. სტატიას თან უნდა ახლდეს ავტორის მიერ გამოყენებული სამამულო და უცხოური შრომების ბიბლიოგრაფიული სია (ბოლო 5-8 წლის სიღრმით). ანბანური წყობით წარმოდგენილ ბიბლიოგრაფიულ სიაში მიუთითეთ ჯერ სამამულო, შემდეგ უცხოელი ავტორები (გვარი, ინიციალები, სტატიის სათაური, ჟურნალის დასახელება, გამოცემის ადგილი, წელი, ჟურნალის №, პირველი და ბოლო გვერდები). მონოგრაფიის შემთხვევაში მიუთითეთ გამოცემის წელი, ადგილი და გვერდების საერთო რაოდენობა. ტექსტში კვადრატულ ფჩხილებში უნდა მიუთითოთ ავტორის შესაბამისი N ლიტერატურის სიის მიხედვით. მიზანშეწონილია, რომ ციტირებული წყაროების უმეტესი ნაწილი იყოს 5-6 წლის სიღრმის.

9. სტატიას თან უნდა ახლდეს: ა) დაწესებულების ან სამეცნიერო ხელმძღვანელის წარდგინება, დამოწმებული ხელმოწერითა და ბეჭდით; ბ) დარგის სპეციალისტის დამოწმებული რეცენზია, რომელშიც მითითებული იქნება საკითხის აქტუალობა, მასალის საკმაობა, მეთოდის სანდოობა, შედეგების სამეცნიერო-პრაქტიკული მნიშვნელობა.

10. სტატიის ბოლოს საჭიროა ყველა ავტორის ხელმოწერა, რომელთა რაოდენობა არ უნდა აღემატებოდეს 5-ს.

11. რედაქცია იტოვებს უფლებას შეასწოროს სტატია. ტექსტზე მუშაობა და შეჯერება ხდება საავტორო ორიგინალის მიხედვით.

12. დაუშვებელია რედაქციაში ისეთი სტატიის წარდგენა, რომელიც დასაბეჭდად წარდგენილი იყო სხვა რედაქციაში ან გამოქვეყნებული იყო სხვა გამოცემებში.

აღნიშნული წესების დარღვევის შემთხვევაში სტატიები არ განიხილება.

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Содержание:

GEORGIAN MEDICAL NEWS
No 10 (355) 2024

ACUTE FORMS OF CORONARY ARTERY DISEASE IN THE NOSOLOGICAL STRUCTURE OF HOSPITALIZATION OF YOUNG PEOPLE IN ALMATY CITY CARDIOLOGY CENTER

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Abstract.

Background: Cardiovascular diseases are the leaders in morbidity and mortality worldwide. The most common cause of emergency hospitalization of cardiac patients is acute coronary syndrome, represented by acute forms of coronary heart disease: unstable angina and myocardial infarction. Among the young population (18–44 years old, according to WHO), in contrast to the older cohort, there has been a significant increase in cardiovascular morbidity over the last two decades. In young patients, acute coronary syndrome is often the onset of the disease, which leads to an unfavorable prognosis in this category of patients. The purpose of this study was to analyze the frequency and structure of reasons for hospitalization of young people over a five-year period.

Methods: Retrospective data of medical records of 1827 young patients, hospitalized to Almaty City Cardiology center over a five-year period (2018–2022). The frequency of hospitalization, mortality and reasons for hospitalization of patients at a cardiology center were studied.

Results: Over a five-year period, we observed an increase in the number of hospitalizations of young patients, with a peak in 2019. The most common cause of hospitalization in the young group of patients were acute forms of coronary artery disease - 36%. The frequency of hospitalizations with acute coronary pathology tended to increase. The acute transmural myocardial infarction of the left ventricle was a leading type of myocardial infarction in young people.

Conclusions: The dynamics of the frequency of hospitalization of young patients with acute forms of coronary artery disease tended to increase during the period under review, and the most common reason for hospitalization was acute coronary syndrome. However, unstable angina was recorded more often than myocardial infarction, and the most common type of myocardial infarction was acute transmural myocardial infarction of the left ventricle, which probably determines the severity and poor prognosis in this population.

Key words. Acute coronary syndrome, myocardial infarction, unstable angina, coronary heart disease, young patients, COVID-19, frequency of hospitalization.

Introduction.

Cardiovascular diseases (CVD) are one of the most common causes of disability and mortality in the population [1-3]. According to the World Health Organization (WHO, 2023), an average of 17.9 million people die from CVDs every year [4]. The prevalence of CVDs has doubled from 271 million in 1990 to 523 million in 2019. WHO reported, that more than 75% of deaths from CVDs occur in low- and middle-income countries, increasing the burden of noncommunicable diseases on public health.

In the Central Asian population, which numbers more than 66 million people, cardiovascular mortality also occupies a leading position [5]. In Kazakhstan, overall mortality from cardiovascular diseases is higher than in developed countries [6]. An analysis of cardiovascular morbidity for the period 2010–2020, according to the National Bureau of Statistics, also revealed a steady upward trend. Over a 10-year period, the incidence increased by 31.6% [7], rising from 2086.7 to 3024.4 per 100,000 population. The reasons were high prevalence of risk factors among residents such as arterial hypertension (26%), diabetes mellitus (12%), and high rates of overweight and obesity. In addition, adherence to an unhealthy lifestyle, smoking (44% of men), alcohol (54% of men) [8], as well as one of the highest levels of salt consumption in the world - 17 grams per day, which is 4 times the daily intake recommended by WHO [9]. It should be noted that Kazakhstan also belongs to an epidemiologically disadvantaged region for iodine deficiency. According to some reports, about 30% of the population suffers from one or another pathology of the thyroid gland [10]. Even though risk factor control is carried out through national government programs in the form of screening for cardiovascular disease, Kazakhstan still lags behind other countries with economies of similar size on many health indicators [11].

In connection with the above, improving the effectiveness of preventive strategies, especially among young populations, is of particular importance. In this age cohort (18–44 years, according to WHO), the last two decades have seen a significant increase in cardiovascular morbidity. Mortality rates, according to some data, have increased by 15% over 20 years [2]. In agreement with the American Heart Association, CVD was found to be prevalent in 25% of the young population aged 20–39 years. In particular, there has been an expansion in the percentage of this age group in the structure of incidence of acute forms of coronary heart disease, which is of great socio-economic significance [12]. The most dangerous form of them is myocardial infarction (MI), which is recorded at the onset of the disease in most young people. According to various sources, among all patients with MI, the proportion of patients under 45 years of age was 4–10% [13]. The development of acute coronary pathology in the absence of a coronary history probably determined the unfavorable prognosis in this group of patients. Thus, in one out of ten young patients, myocardial infarction was either fatal or a recurrent cardiovascular event was observed [14].

Factors, contributing to the development of coronary artery disease (CAD) at a young age, can be divided into 4 categories: abuse of narcotic or potent drugs, conditions associated with hypercoagulability, atherosclerotic coronary artery disease, and non-atherosclerotic coronary heart disease [15]. The influence of such traditional cardiovascular risk factors as male gender, arterial hypertension, obesity, dyslipidemia, diabetes, smoking, genetic predisposition, etc. [16-19], has been described by numerous researchers since the 90s of the last century. Choudhury L et al. (1999) established a clear association of MI in a group of patients under 44 years of age with male gender, smoking, family history, hyperlipidemia and obesity [20]. The correlation between the number of identified risk factors, the level of cardiovascular risk (according to the SCORE scale) and the number of altered coronary vessels in young patients with MI in 2017 was determined by Kazakh researchers Zhussupbekova L. et al [21].

The COVID-19 pandemic, which occurred in 2020–2023, had a significant impact on cardiovascular morbidity and mortality in Kazakhstan, as well as throughout the world. According to the statistics bureau of the Republic of Kazakhstan, a decrease in CVD's morbidity was noted at the end of the pandemic period -from 3024.4 in 2020 to 2781.3 per 100,000 in 2023, which corresponds to the level before the pandemic - in 2018 [7].

According to the published data, coronavirus infection had a direct impact on the incidence of cardiovascular events in all age groups through myocardial damage due to a pronounced inflammatory response, a discrepancy between the need and delivery of oxygen to the myocardium, vasculitis and microthrombosis, and possibly due to the great psychological stress during quarantine [22]. Proneness to thrombotic complications in patients with COVID-19 occurred in approximately 5–23% of cases [23]. Persson J et al. noted an increase in cases of acute coronary syndrome (ACS) in young patients without risk factors [24]. Li B and Yang J noted in their observations that at least 8% of patients with COVID-19 had COVID-associated myocardial damage as a result of direct or indirect effects of viral infection on the heart muscle, which provoked cardiovascular symptoms [25]. Kravtsiva A.V. et al. noted the most common (in 41.9% of patients) cardiovascular complication was the transformation of CAD in the form of a transition from stable to unstable, as well as the progression of artherial hypertension and chronic heart failure [26]. According to Khan M.S., from 15 to 70% of deaths from COVID-19 were observed in patients with concomitant cardiovascular pathology [27].

Considering the relevance of the above problem, there was a need to study the dynamics of cardiovascular morbidity in a cohort of patients from 18 to 44 years of age during the COVID-19 pandemic. In Kazakhstan, there is no data on the epidemiology of cardiovascular pathologies in this group of patients, and therefore we planned work to study the frequency of hospitalization in the cardiology hospital in Almaty.

The purpose of the work was to analyze the dynamics of the frequency and structure of hospitalization of young people over a five-year period (2018–2022) at the City Cardiology Center of Almaty, Republic of Kazakhstan.

Materials and Methods.

Study design: observational, descriptive, cross-sectional. The study was based on a retrospective analysis of medical records of young patients (18–44 years old) hospitalized with ACS for the period from January 2018 to December 2022 inclusive. The choice of the period under consideration was determined by the task assigned to the researchers to compare the frequency of hospitalization before and during the pandemic. The intervals 2020–2022 are determined by the timing of quarantine measures for coronavirus infection in the context of the COVID-19 pandemic [28].

Inclusion criteria were:

- age from 18 to 44 years.
- diagnosis of Ischemic Heart disease, Unstable angina, ICD code I20.0, verified in accordance with the criteria of the European Society of Cardiology.
- verified in accordance with the criteria of the European Society of Cardiology MI with and without ST elevation on the ECG. The diagnosis of MI was made on the basis of the International Classification of Diseases, XI revision.
- negative SARS-CoV-2 PCR test.

MI type was identified from coding based on the index and stratified as ST-elevation MI (STEMI, I21.0-I21.3), non-ST-elevation MI (NSTEMI, I21.4), and unspecified MI (I21.9).

The following codes were taken into account:

I21.0 - acute transmural myocardial infarction of the anterior wall of the left ventricle.

I21.1 - acute transmural myocardial infarction of the lower wall of the left ventricle.

I21.2 - acute transmural myocardial infarction of other specified localizations.

I21.3 - acute transmural myocardial infarction of unspecified localization.

I21.4 - acute subendocardial myocardial infarction.

I22.0 - repeated myocardial infarction of the anterior wall of the left ventricle.

I22.1 - repeated infarction of the inferior wall of the left ventricle.

I22.8 - repeated myocardial infarction of another specified location.

The authors analyzed the collected data in the SPSS-statistic 26 program. The level of statistical significance was defined as $p<0.05$. The decision on the type of data distribution was made using the Shapiro-Wilk criterion. In the case of a normal distribution of quantitative variables, the indicators are presented in the form of the mean and standard deviation (M±SD), in the case of a distribution of variables other than normal, the data were presented in the form of a median and quartiles (Me (Q1; Q3)).

This article does not contain any material generated by artificial intelligence.

Ethics approval and consent to participate.

The study was approved by the Local Ethics Committee of "Kazakhstan School of Public Health" (extract from protocol No. IRB-12-2023 of 25.01.2023). All methods were performed

in accordance with the relevant guidelines and regulations. All participants provided informed consent online before the survey. This study adhered to the principles outlined in the Declaration of Helsinki.

Results.

During the research, the frequency and structure of hospitalization of young adults at the City Cardiac Center of Almaty for the period 2018–2022 were analyzed. In total, during this period, 38.054 patients with cardiovascular pathology were hospitalized, whose average age was 62.8 ± 4.7 years. The total group included 36.227 older patients - 95.2% (over 45 years old, mean age 63.5±5.1 years) and 1827 young patients - 4.8% (under 44 years old; 36.7±4.4 years). In 2018, the number of hospitalized young patients accounted for 3.3% of the total number of hospitalizations, while in 2022 - 5%, which was 1.6 times higher than the previous year ($p<0.05$). The peak rate of hospitalizations for young people was set in 2019 (8.5%), while the peak mortality rate was in 2021 (1.5%). The number of hospitalizations of patients in the older group (over 45 years of age) prevailed in 2018 (97.7%). The dynamics of hospitalization and mortality rates for the studied period of the general group of patients are noted in Table 1.

Table 1. *Dynamics of the frequency of hospitalizations and mortality (2018–2022).*

Years,%	**Patients > 44 years old**		**Patients < 44 years old**	
	Hospitalization	**Mortality**	**Hospitalization**	**Mortality**
2018, %	97.7	2.4	3.3	0.9
2019, %	91.4	2.6	8.5	0.5
2020, %	96	2.5	4	1.3
2021, %	94.7	3.2	5.3	1.5
2022, %	95	2	5	0.9

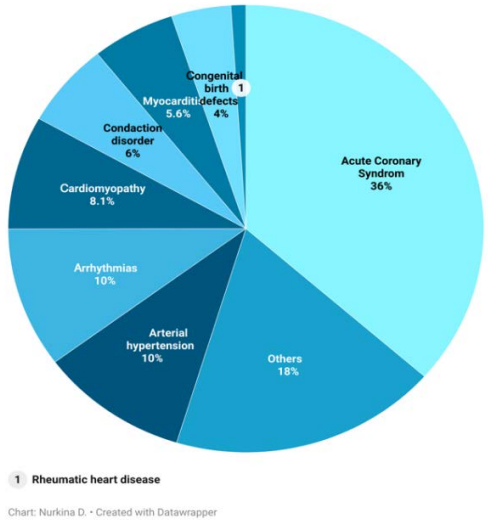
It must be taken into account that the period 2020–2022 occurred during the COVID-19 pandemic, which significantly affected the dynamics of hospitalization and mortality rates. Thus, according to the National Bureau of Statistics, the number of deaths from diseases of the circulatory system increased from 163.14 in 2019 to 193.79 per 100,000 population in 2020 and to 226.9 in 2021 [7], followed by decline to 154.4 in 2022 and 144.45 in 2023 [29]. Among CVD mortality rates from coronary heart disease tended to increase from 58.25 in 2019, 67.57 in 2020 to 87.02 in 2021, with a subsequent reduction to 51.98 in 2022 and 46.86 per 100,000 population in 2023 [30]. The impact of coronaviruses on morbidity and mortality from cardiovascular diseases remains open. Given that all hospitalized patients during the pandemic have a negative PCR result, it is difficult to think about the distribution of SARS-CoV-2 infections to the development of the CAD in the population we study. As practice has shown during the pandemic, the PCR test did not always reflect SARS-CoV-2 infection, which was confirmed in numerous studies on the diagnostic significance of the PCR test for Covid-19 [31].

According to our 5-year study of the causes of hospitalization, 36 % (n=657) of all cases of hospitalization of young people were acute forms of coronary heart disease. Among which unstable angina was 23.5% (n=429) and myocardial infarction - 12.2% (n=222) (Figure 1). The third position (n=182) was occupied by arterial hypertension - 9.9%. In descending order, the following nosologies followed: cardiomyopathies - 8.1% (n=148) and acute myocarditis - 5.6% (n=102). The top ten most common reasons for hospitalization included rhythm disturbances, in particular supraventricular tachycardia, atrial fibrillation/flutter and WPW syndrome. Less common (less than 2%) were atrioventricular block, rheumatic heart disease, developmental anomalies, non-rheumatic valve lesions, infective endocarditis, pericarditis, pulmonary embolism, sick sinus syndrome, pulmonary hypertension.

Analyzing the dynamics of the frequency of hospitalizations of patients with acute forms of coronary artery disease by year, we observed a downward trend in the general group of hospitalized patients from 2018–2022. However, among young patients, the frequency of hospitalizations with acute coronary pathology tended to increase. Thus, the number of patients with MI in 2018 and 2019 was 9,6% and 8,5% (of the reasons of hospitalizations), respectively, while in 2020 it increased to 12.2%. Hospitalization rates peaked in 2021 at 13.5%, followed by a slight decline to 12.3% in 2022. The number of hospitalizations of patients diagnosed with unstable angina from 2018 to 2021 tended to decrease, from 25,6% to 19,8%, with a subsequent increase to 27% in 2022 (Figure 2). The decrease in the number of hospitalizations of patients with unstable angina may have been associated with the late presentation of patients for medical care, low compliance with outpatient treatment due to the widespread fear of potential contact with Covid patients in medical institutions, including clinics. An increase in hospitalizations for myocardial infarction has been caused by the same reasons. At the same time, we do not exclude SARS-CoV-2 infection as the cause of myocardial diseases, destabilization of arterial hypertension, and rhythm disturbances in hospitalized patients, despite the negative result of the PCR test.

Carrying out a detailed analysis of the frequency of occurrence of various types of MI for 2018-2022 (Figure 3), it should be especially noted that among all the reasons for hospitalization of young patients, the most common was acute transmural myocardial infarction of the anterior wall of the left ventricle (I21.0), the second most common was acute transmural myocardial infarction of the inferior wall (I21.1), the third - acute subendocardial (I21.4). The following in terms of frequency of occurrence: repeated transmural infarction of the anterior wall (I22.0), repeated myocardial infarction of the inferior wall (I22.1) and repeated myocardial infarction of unspecified localization (I22.8) [30].

According to our data, registered MI in 88.6% of cases was the debut of ischemic heart disease, while in 16.3% of young patients a recurrent infarction was recorded. Depending on the cause of MI, data on the incidence of recurrent events vary, but the prognosis for young patients with MI is not benign. Thus, patients with coronary artery dissection had a relapse rate of 10-30% after 2-3 years, according to Alfonso F. [29], and within 10 years - approximately 50% [32]. A poor prognosis for both recurrent cardiovascular events and mortality has been observed in patients with documented microvascular dysfunction [30]. In



Unstable angina	23,5%
Myocardial infarction	12,2%
Arterial hypertension	10%
Arrythmia	10%
Cardiomyopathies	9%
Condaction dicorders	6%
Acute myocarditis	5,6%
Congenital birth defects	4,7%
Rheumatic heart disease	1%
Other	18%

Figure 1. *Analysis of the morbidity structure of young patients (2018–2022, %).*

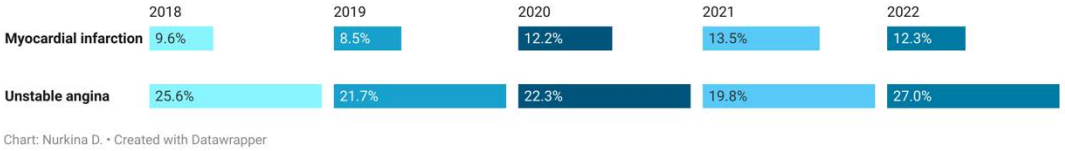
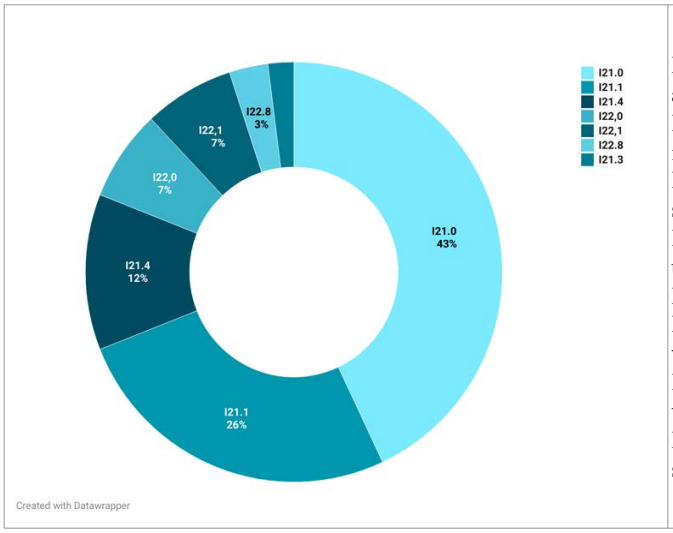


Figure 2. *Dynamics of the frequency of hospitalizations of young patients with CAD (2018–2022).*



I21.0 - acute transmural myocardial infarction of the anterior wall of the left ventricle
I21.1 - acute transmural myocardial infarction of the inferior wall of the left ventricle.
I21.2 - acute transmural myocardial infarction of other specified locations
I21.3 - acute transmural myocardial infarction of unspecified localization
I21.4 - acute subendocardial myocardial infarction
I22.0 - repeated myocardial infarction of the anterior wall of the left ventricle
I22.1 - repeated infarction of the inferior wall of the left ventricle
I22.8- recurrent myocardial infarction of another specified location

Figure 3. *Frequency of occurrence of types of MI based on ICD-11 classification (n, %).*

50% of patients with resolution of myocarditis over the next 2-4 weeks, 12% to 25% worsened and developed congestive heart failure, which would lead to further progress and heart transplantation [31]. Based on the data of foreign authors and our study, it can be assumed that myocardial infarction in young people, predominantly transmural, as the onset of coronary artery disease in the absence of a coronary history, can determine the unfavorable outcome of ACS. This prognosis is presumably associated with the lack of collateral circulation, as well as the predominant damage to the main branches of the coronary arteries. Clinical assessment of the risk of poor prognosis in patients was carried out according to the Killip classification. The number of patients in each Killip class from I to IV was 23.8%, 67.6%, 5.7%, 2.9%, respectively, indicating a fairly high level of poor prognosis in the young. Thus, according to some data, death would be expected within 30 days in 67% of patients with severity class II [32].

Discussion.

This study focused on studying the frequency and structure of hospitalization of young patients receiving inpatient treatment at the Almaty City Cardiology Center from 2018 to 2022. Despite the relevance of assessing the prevalence of cardiovascular diseases in general, there is insufficient data regarding this age group in our region, which is especially important in connection with Kazakhstan's inclusion in the group of countries with high

cardiovascular risk and in the group of countries in Eastern Europe that have a high life expectancy under the burden of disease (DALY) [33], according to WHO.

The study found that the proportion of young patients over five years was 4.8%, which is consistent with data from international studies. Thus, the INTERHEART study demonstrated that the highest percentage of patients under 40 years of age with MI -11% was observed in the Middle East and North Africa, which is much higher than this figure in North America and Western Europe [34].

Having analyzed the frequency of hospitalization by year, we observed a range from 3.3% in 2018 to 8.5% of all hospitalizations of young people in 2019. The decrease in hospitalization rates in 2020 to 4% may have been related to the COVID-19 pandemic. Similar dynamics were recorded in Europe during the pandemic. Italian researchers noted a decrease in hospitalization rates in 2020–2021 regarding cardiovascular diseases [35,36], compared to 2018–2019, explaining this trend by the fact that during the lockdown, patients avoided using ambulance services to avoid infection with COVID-19. We also observed a peak in hospital mortality in 2021 both in the group of young and older patients (1.5% and 3.2%, respectively). The data from our study correlate with statistics for Kazakhstan in the form of an increase in overall mortality and mortality from diseases of the circulatory system. It should be noted that patients with a negative COVID test were subject to hospitalization, while patients with a positive test were hospitalized in a special facility.

Having examined the structure of the reasons for hospitalization among young people, we came to the conclusion that acute forms of ischemic heart disease were the most common, with unstable angina pectoris more common than MI. The top three positions also included arterial hypertension, which is a risk factor for coronary artery disease. According to Ashild Faresjö (2023), among younger patients, higher blood pressure numbers were observed and less frequently controlled than in the older cohort [37]. Thus, early detection of hypertension, as well as early intervention, would help prevent the development of coronary artery disease in this age group.

The dynamics of the frequency of hospitalization of patients with acute forms of coronary artery disease was also affected by the outbreak of coronavirus infection. The increase in the frequency of hospitalizations of patients with MI (with a peak in 2021) and the decrease in the number of patients with unstable angina (with a minimum in 2021) that we identified correlated with the data of some researchers. Thus, a British study based on the analysis of data from 117,327 patients with STEMI and NSTEMI who were included in a national register from January 1, 2017, to May 22, 2020, demonstrated a decrease in the number of daily hospitalizations for NSTEMI with the introduction of isolation in the UK. At the same time, the authors noted that patients with this form of ACS were generally younger and significantly less likely to have CVD risk factors [38].

Analysis of the incidence of various types of myocardial infarction showed the predominance of acute transmural left ventricular MI (I21.0) - STEMI (ST-elevation myocardial infarction). Multiple data from researchers varied in different years, depending on the region. Thus, Western scientists published data that 60-70% of patients with ACS had NSTEMI [39] (non-ST-elevation myocardial infarction), while in India - 60% STEMI [40]. Later, in 2022, Kolfinna Gautadottir et al., analyzing the SCAAR-SWEDEHEART database for the period 2014-2020, confirmed the prevalence of STEMI (ST elevation myocardial infarction) among young patients (52%) [41]. According to the National Register of Great Britain and Wales (2013-2014), it was also found that 2/3 of young patients had STEMI [42]. Moreover, according to Kingma J, NSTEMI predominated in the general population, in a ratio of 39% and 61%, respectively [43-45], which is comparable to the results of the current study.

To date, we do not have sufficient data on cardiovascular morbidity among young people in Kazakhstan. In our study, we were limited to a small sample that included patients at a cardiology hospital in the largest city of the republic, Almaty, which may affect the possibility of projecting the identified trends to rural regions. Accordingly, conducting large-scale studies at the national level would improve public awareness in this area, enable effective work to control the main risk factors, help identify additional risk factors, and keep the focus on the young population.

Conclusion.

Analysis of the frequency of hospitalization of young cardiac patients for 2018–2022 showed an upward trend. Acute forms of coronary artery disease were the leading cause of hospitalization, while unstable angina was diagnosed more often than myocardial infarction. The predominant type of myocardial infarction in young people was acute transmural myocardial infarction of the left ventricle (I21.0), which probably determined the severity and poor prognosis in this age population. The peak of mortality rate in young cardiac patients was observed in 2021, during the COVID-19 pandemic.

Funding: This research received no external funding.

Conflicts of Interest: The authors declare no conflicts of interest.

All authors have read, agreed to the final version of the manuscript, and signed the copyright transfer form.

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