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ЕЖЕМЕСЯЧНЫЙ НАУЧНЫЙ ЖУРНАЛ

Медицинские новости Грузии

საქართველოს სამედიცინო სიახლენი

GEORGIAN MEDICAL NEWS

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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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ASSESSMENT OF RISK FACTORS OF MYOCARDIAL INFARCTION IN YOUNG PERSONS

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Abstract.

Introduction: In terms of morbidity and mortality, cardiovascular illnesses are the main cause of death worldwide. Half of all noncommunicable diseases on the earth are caused by them. Due to the steadily rising mortality rates from circulatory diseases in Kazakhstan, our region was identified as having a high cardiovascular risk in 2021 when the updated Score 2 (Systematic COronary Risk Evaluation) scale was developed. There has been a recent increase in this pathology's prevalence among younger people (up to 44 years). In this regard, a large number of scholars are engaged in active research into the variables that affect the onset of coronary heart disease in this population, particularly its acute forms, which frequently mark the onset of the disease in this age group.

The research of international experts supports the impact of classic risk factors such arterial hypertension, smoking, dyslipidemia, diabetes mellitus, inactivity, and loaded anamnesis on the early development of atherosclerosis. The Fourth Universal Definition distinguishes five different forms of myocardial infarction, and if the first type is directly linked to atherogenesis, the second type develops as a result of ischemia imbalance in the absence of coronary artery obstructive lesions. There are currently no definite, widely acknowledged standards for the identification and management of type 2 myocardial infarction. Thereby there was a need to research the impact of additional risk factors, such as subclinical systemic inflammation, genetic polymorphism of genes involved in lipid metabolism, thrombosis, and responsible for the development of endothelial dysfunction, given the differences in the pathogenetic mechanisms of different types of myocardial infarction. It's still up for debate whether comorbidity has any impact on the frequency of early cardiovascular events in the population of young individuals.

Aim: Is to study international approach in an assessment of risk factors of the development of myocardial infarction at young population.

Methods: The review used content analysis on the research topic, national guidelines, WHO recommendations. The electronic databases Pubmed, eLibrary from 1999 to 2022 were used as sources of information. The search was conducted on the keywords «myocardial infarction», «infarction in young», «risk factors» and MeSH terms «myocardial infarction/etiology», «myocardial infarction/young», «myocardial infarction/risk factors». Of the 50 sources found, 37 corresponded to the research request.

Conclusion: This field of scientific study is one of the most important today because of the prevalence of formation and poor prognosis of non-atherothrombogenic myocardial infarctions, compared with type 1 infarcts. Numerous foreign and domestic authors have been motivated to look for new markers of the early onset of coronary heart disease, develop adequate risk stratification algorithms, and create efficient primary and secondary prevention strategies at the level of primary healthcare and hospitals as a result of the high mortality and disability rates in this age group that are a significant economic and social problem.

Key words. Myocardial infarction, young patients, risk factors.

Introduction.

Prevention and control of noncommunicable diseases (NCDs) is one of the global strategies of the World Health Organization (WHO). In Kazakhstan, diseases such as cancer, cardiovascular diseases, diabetes mellitus and pathology of the respiratory system were the cause of death in 27% of premature deaths in 2016 [1]. The unfavorable trend in relation to NCDs in our republic contributed to the development by the WHO, together with the Ministry of Health of Kazakhstan, in 2017 of a plan to introduce a number of measures aimed at reducing the burden of these diseases. Due to the high cardiovascular mortality in our country, one of the key directions of the plan to combat NCDs was the impact on intermediate and behavioral risk factors, such as arterial hypertension, diabetes mellitus, dyslipidemia, obesity, as well as bad habits, sedentary lifestyle, and unhealthy diet. Of particular importance in the context of the socio-economic significance of cardiovascular diseases and their complications is the "rejuvenation" of vascular pathology. However, in the young population, in addition to traditional risk factors, the topic of the degree of influence of additional factors on the development of coronary heart disease remains undisclosed.

According to a classification based on the differences in the pathogenetic pathways of various forms of myocardial infarction, this study will highlight contemporary approaches to the diagnosis and prevention of myocardial infarction in young individuals.

Epidemiology and risk stratification of myocardial infarction in young people.

Cardiovascular diseases (CVD) are currently the leading cause of death globally, accounting for 50% of all non-communicable diseases in the global population. WHO reports that since 2000, there have been 2 million more deaths from CVD, totaling 9 million in 2019 [2]. According to the American Heart Association, 23.6 million individuals will die from CVD by 2030 [3].

In Kazakhstan, the prevalence of CVD increased from 16,982.9 per 100,000 population to 17,799 from 2019 to 2020. The mortality rate from cardiovascular disorders also tended to rise; it was 163 per 100,000 people in 2019 compared to 194 in 2020. In 2020, 68 deaths per 100,000 people were attributable to coronary artery disease (CAD), up from 58 in 2019 [4]. The reasons, according to the estimates, were the high prevalence of such risk factors as arterial hypertension (26% of the adult population), diabetes mellitus (12%), as well as one of the highest rates of overweight and obesity in the WHO European Region. In addition, the adherence of the male population to an unhealthy lifestyle was important - 44% of men smoke, 54% consume alcohol, an extremely high level of salt intake [1]. It should be noted that Kazakhstan also belongs to an epidemiologically unfavorable region for iodine deficiency. According to some reports, about 30% of the population suffers from one or another pathology of the thyroid gland [5]. This is especially true for environmentally problematic arias of the Aral Sea region and the Semipalatinsk nuclear test site [6]. The COVID-19 pandemic also had a direct impact on the incidence of cardiovascular events in all age groups, through myocardial damage due to a pronounced inflammatory response, a mismatch between the need for and delivery of oxygen to the myocardium, vasculitis and microthrombosis [7], and as well indirectly, through great psychological stress during quarantine.

Given that Kazakhstan death rate from CVD is twice as high as that of European nations, per WHO data, Kazakhstan was designated as a region with a high cardiovascular risk (CVR) when the Score 2 (Systematic Coronary Risk Evaluation) scale was amended in 2021 [8]. The percentage likelihood of fatal and non-fatal cardiovascular events over the following ten years is displayed on this scale. When taking into account variables including gender, age, smoking status, systolic blood pressure, and non-high-density lipid cholesterol (non-HDL-C), the scale is advised for use in individuals over the age of 40 to assess their cardiovascular risk. A scale for calculating relative risk rather than absolute risk was developed for people under the age of 40, and it included considered conventional risk factors such arterial hypertension, smoking, and cholesterol levels.

This method of risk classification for young people is still up for debate, nevertheless, as it does not account for all the factors and causes that can contribute to the onset of CVD in young people.

One of the deadliest types of coronary heart disease, myocardial infarction (MI), typically develops in young people and is associated with a poor prognosis in this population of patients. According to several reports, young people made up 4–10% of all MI patients [3]. The American Heart Association [9] showed that cardiovascular diseases (CVD) affected 25% of the young population between the ages of 20 and 39 at the same period. According to the most recent statistics, if there was a trend towards a decline in CVD mortality in the older age group, such a trend was not seen in the younger age group. Contrary to the general population, the rate of mortality from acute CAD in this age group (defined as those under 44 according to the WHO classification) has grown by 15% during the past 20 years [10].

Accordingly, it can be assumed that disability and loss of working capacity after myocardial infarction among patients of this age group can bring great social and economic damage.

Types of myocardial infarction: a new look at the pathogenesis.

The same traditional risk factors (RF) for CAD, such as male gender, hypertension, obesity, dyslipidemia, diabetes, and smoking, have been shown to have an impact on young individuals as well as older people in several foreign and Russian research [11-14]. The data of Choudhury L were first published in the 1990s and clearly linked male sex, smoking, family history, hyperlipidemia, and obesity to MI in patients under 44 years old. These findings have not lost their significance today [15]. Young MI patients' levels of cardiovascular risk (as measured by the SCORE scale) and the number of changed coronary arteries were all discovered to be directly moderately correlated by domestic researchers Zhussupbekova L. et al. [16].

Numerous studies have demonstrated the impact of these factors on the early onset of atherosclerosis, and their effect is age independent. The identification of novel risk factors, such as genetic polymorphisms linked to processes of hypercoagulation, homocysteine, and different inflammatory agents that cause endothelial dysfunction, should, however, receive special attention, claim other authors [17]. Although there is no notion that shows nonspecific inflammation causes the development of coronary heart disease, many researchers continue to believe it is a catalyst for the growth of atherosclerosis, which is, in our opinion, quite appropriate for further research.

The ischemic imbalance, or mismatch between myocardial oxygen demand and its delivery, which can occur not only with atherothrombosis of the coronary vessels but also with some concurrent CAD, was confirmed by convincing data from clinical observations at the beginning of the twenty-first century. Meanwhile, if earlier cases of heart attack in young people seemed quite rare, and the reasons for which it could occur were considered such uncommon conditions as abnormalities in the development of the coronary arteries, hypercoagulation with the formation of blood clots and subsequent thromboembolism, coronaritis against the background of systemic connective tissue diseases, idiopathic coronary vessel dissection, drug and drug abuse, depression, etc. [18], today, pathogenetic mechanisms of the development of the disease should be considered in a new way and diagnostic and treatment tactics should be optimized depending on the type of MI. The Fourth Universal Definition of MI (2017) [19] distinguishes 5 kinds of MI, each of which has a unique developmental etiology. A mismatch in myocardial oxygen demand can be caused by a number of factors, both cardiac and extracardiac, and can result in both an increase in myocardial demand for oxygen and a decrease in the supply of myocardial oxygen. In particular, types 1 and 3 are directly

related to atherosclerosis, types 4 and 5 are periprocedural, and type 2 implies a mismatch in myocardial oxygen demand. The frequency of occurrence of type 2 MI has become comparable to the occurrence of type 1, according to Claire E Raphael et al. [20]. In general, estimates of the prevalence of type 1 and 2 MI vary, because of the clinical profile of atherosclerotic and non-atherosclerotic phenotypes is not defined well. Especially true this for patients with MINOCA, or non-obstructive coronary artery MI, due to intracoronary differentiation and visualization difficulties, that has led to poor identification of non-plaque mechanisms.

Therefore, time dictates the necessity to differentiate between different myocardial infarction types to pinpoint the root causes and stop recurring cardiovascular occurrences in a group, especially young people. When Swedish researchers [21] compared the prevalence of myocardial infarction types 1 and 2, a relatively high rate—88.5% and 7.1% of cases, respectively—was found. In contrast to type 1 MI, the second group had significantly higher 1-year mortality (24.7% vs. 13.5%), was less likely to undergo invasive treatment, and was associated with female sex, high comorbidity, decreased renal filtration, anemia, less myocardial necrosis, and intact coronary arteries (42.4% vs. 7.4%). Among other things, according to the national registry of Great Britain and Wales (2013-2014), it was found that 2/3 of young patients had ST elevation MI (STEMI) [22], despite the predominance of non-ST elevation MI (NSTEMI) in the general population, in a ratio of approximately 61% (NSTEMI) and 39% (STEMI) [23]. It should be noted that the identified trend is directly related to age, which can be interpreted as a prerequisite for predicting the outcome in people of this age group. So, ST-segment elevation MI is a characteristic debut (in the absence of a coronary anamnesis) in a group of young patients.

The absence of obstructive CAD, along with a poor prognosis for recurrent cardiovascular events, prompted researchers to study additional risk factors, comorbidity patterns, clinical features, and the incidence of MI.

Non-atherogenic and pro-atherogenic causes of myocardial infarction in young people: Subclinical inflammation and homocysteine.

Over the past decade, many researchers have addressed the topic of myocardial infarction in young people, studying the prognostic value of additional risk factors and their interaction, leading to likely changes in the generally accepted basis of pathogenesis. E.A. Shishkina published information on the influence of various factors associated with subclinical inflammation, such as: tumor necrosis factor (TNF), hyperhomocysteinemia (HHcy), the value of hematological indices, for example, the neutrophil-lymphocyte index, the mid-regional region of the proadrenomedullin molecule, growth factor-stimulating protein ST2, myeloperoxidase, hyperlipoproteinemia(a), calcium index of coronary arteries, influence of polymorphism of genes involved in lipid metabolism (ApoB, ApoE, PCSK), thrombus formation (F5,F2), endothelial dysfunction -TNF-α (G4682A) and eNOS (Glu298Asp), the rs4762 T174M polymorphism of the angiotensinogen gene for atherogenesis and the development of endothelial dysfunction (ED). These factors are associated with the risk of MI in young and middle-aged patients. The author shared the results of the study, establishing the relationship of high levels of homocysteine in the group of patients with MI with ST elevation, to a greater extent in men. Also, a combined effect of hyperhomocysteinemia and high levels of TNF-α (>6.0 pg/ml) on persistent left ventricular dysfunction, increasing up to 4 times during hospitalization of young patients with MI, was revealed. TNF-α, which is a pro-inflammatory cytokine, not only determined the expression of other inflammatory cytokines, but was also independently associated with the extent of myocardial damage in patients with MI, as it indirectly potentiated the progression of atherosclerosis and damage to atherosclerotic plaque [24]. A little while ago, Lyusov V.A. et al. reported on the idea of hyperhomocysteinemia as a marker of the beginning and progression of CAD. This idea was developed based on numerous studies that demonstrated its harmful effect on the vascular endothelium, in the form of a violation of endothelium-dependent vasodilation. LDL and VLDL, atherogenic lipid fractions, consequently accumulated in cell membranes, resulting in a reduction in vascular flexibility [25]. In turn, chronic kidney disease (CKD), vitamin B9 and B12 insufficiency, genetic metabolic abnormalities, oncological pathology and hypothyroidism are just a few causes of hyperhemocysteinemia. When comparing the levels of homocysteine in patients with low and high levels of the vitamins B12 and B9 in their blood, Vasiliev A. G. et al. discovered that if the plasma folic acid level was less than 4.4 ng / ml, the homocysteine levels were more than 1.5 times higher than in patients with a folic acid content of more than 7.9 ng / ml [26]. Plasma homocysteine and vitamin B12 concentrations were also found to be related. If neither vitamin was present in sufficient amounts in the blood, homocysteine levels were nearly three times higher than normal. The scientists also noted the shortcomings of laboratory diagnostics, such as the determination of total serum vitamin B12 in routine practice, and not its active form, through the determination of holotranscobalamin, which gives us an idea of the amount of active vitamin.

Thus, MI in young persons with both atherogenic and non-atherogenic origins can be predicted by HHcy and other non-specific inflammatory indicators, which are crucial steps in the pathophysiology of endothelial dysfunction.

Lipoprotein (a) as an independent predictor of MI.

Recently, foreign authors have actively studied the effect of lipoprotein-a (LP(a)) on cardiovascular diseases, which is designated as an independent predictor of MI, ischemic stroke, and aortic valve calcification according to available sources. In 20% of the population, LPA-mediated lipoprotein-a was found to be the most common factor in the inheritance of dyslipidemia. Cut-offs were considered Lp(a) levels ≥50 mg/dL (≈125 nmol/L). During the YOUNG-MI Registry study, 352 young patients had Lp(A) determined, 29% (101 patients) had Lp(a) levels greater than 50 mg/dL, although 71% of them had a low or borderline risk of cardiovascular events on a scale SCORE (which once again confirms the importance of studying additional risk factors, as well as the imperfection of risk stratification methods in this group of patients). In addition,

ethnic differences were observed between the risk of MI and elevated levels of Lp(a). Lp(a) concentrations greater than 50 mg/dL (≈125 nmol/L) were associated with a clear increase in the risk of MI in all populations, except for groups of Arab and African origin [27]. The European Society of Cardiology noted a direct association of LP(a) with cardiovascular events as early as 2010 [28]. Although the study of LP(a) in general practice is not common, it should be noted that most researchers agree that screening for Lipoprotein-a is recommended to be done at least once in a lifetime, especially in patients with high and intermediate cardiovascular risk, since this indicator correlates with premature development of cardiovascular diseases. Also, this analysis is indicated for patients in case of insufficiently adequate response to statin therapy.

Therefore, the introduction of LP(a) into the study protocols for patients with MI can improve the differentiated approach in the treatment and prevention of MI.

Chronic kidney disease.

Chronic kidney disease (CKD) was regarded by foreign researchers yet another important component in cardiovascular risk. Cardiovascular events are 40% more likely to occur in patients with impaired renal function (GFR 45 to 60 ml/min per 1.73 m2) compared to individuals with normal renal function, and the risk was double in patients with GFR 30 ml/min per 1.73 m2 [29]. CKD directly causes high blood pressure and is a pro-atherogenic disease, especially for triglycerides. According to Palmer SC, Hayen A, Macaskill P et al. [30], these patients also have poor calcium phosphate metabolism, and excessive blood phosphate levels are linked to an increased cardiovascular risk of roughly 10% for every 0.3 mmol/l.

The increased cardiovascular risk of both atherosclerosis-related conditions and non-atherosclerosis-related vascular diseases is explained by the association between mineral metabolism disorders associated with CKD and accelerated calcification of the vascular intima and an increase in the stiffness of the vascular wall [31].

Early menopause and hormone replacement therapy.

One of the categories at risk of MI at a young age are women receiving combined hormonal contraceptives. According to a Cochrane review, the risk of thrombosis was 1.6 times higher in women receiving contraceptives than in those who did not. Moreover, there was a dependence with large doses of estrogen [32]. According to D. V. Seliverstova et al., who studied MI in women, oral contraceptives were used in 6 out of 38 in the subgroup with STEMI and 3 out of 22 with NSTEMI in women of reproductive age, respectively. STEMI was more common as the onset of coronary heart disease [33]. The discussion about the current trend towards higher mortality in young women from myocardial infarction, in contrast to older women, was conducted earlier. Kajenny Srivaratharajah links this phenomenon with a later diagnosis of CAD and less «aggressive» treatment tactics [34]. Foreign scientist Khalil RA., at the beginning of the 21st century, noted the importance of multifactorial causes of increased risk of MI in women of this age group. Although the predisposition of women to cardiovascular diseases in reproductive age is significantly lower than that of men in the same age category, due to the protective effect of circulating endogenous estrogens on the vascular endothelium, through the vasodilating effect of released nitric oxide [35]. However, recently, according to the results of European studies, it has been established that estrogen replacement therapy is not a prevention of CAD and is associated with a tendency to thrombosis. Early menopause, according to foreign scientists Yoshida Y, Chen Z, Baudier RL, may be an independent factor in CVR [36]. Accordingly, the above information indicates the expediency of taking them into account when we process the data, both from the literature review and from the experimental group of the study.

Retrospective data from the American College of Obstetricians and Gynecologists (ACOG) allow us to reasonably recommend a thorough study of the gynecological history in women of reproductive age as a method of preventing CVD, alerting us to early menopause and its complications [37]. Attention also should be paid to the search for causes of ovarian failure, such as adrenal insufficiency, hypoparathyroidism, a family autoimmune history, including diseases such as rheumatoid arthritis, Sjögren's syndrome, systemic lupus erythematosus [38], according to Bartlett J, Keith M, Sudharshan L, et al. Observational experience suggests that women suffering from polycystic ovaries, as part of the metabolic syndrome, in combination with obesity, insulin resistance, arterial hypertension, should be classified as a high-risk group for cardiovascular events, which once again confirmed the need to consider the pathogenetic mechanisms of MI in young people from the «comorbidity» angle.

Primary thrombophilia.

A significant proportion of young patients with thrombosis, including myocardial infarction, stroke, are patients with defects in the coagulation system, united by the term thrombophilia. Arterial thrombosis is the cause of 95% of large-focal myocardial infarctions, 85% of ischemic strokes, limb gangrene, and infarctions of other organs [39]. Hereditary thrombophilias are characterized by various disorders of hemostasis, such as deficiency of coagulation factors, including dysfibrinogenemia, mutation of the Leiden factor, deficiency of factors of the anticoagulant system, deficiency of antithrombin III, proteins C and S, heparin cofactor II, defect of the fibrinolytic system, (deficiency of tissue plasminogen activator [tPA], a defect in platelet receptor glycoprotein (GPI) genes, secondary disorders of the hemostasis system due to other genetic breakdowns, such as hyperhomocysteinemia [40]. According to M. A. Kiselev, M. Yu. angiographically confirmed MI, primary thrombophilia was detected in 17% of cases. It should be noted that the average age of patients was 33.8 years. The incidence of thrombophilia associated with various types of factors was represented by protein C deficiency - 9 (34.6%) deficiency of protein S - 6 (23%); homozygous mutation of factor and V Leiden - 7 (26.9%); mutation in the prothrombin gene - 4 (15.4%); hyperhomocysteinemia - 8 (30.7%) [41].

We therefore believe that it is prudent to do a more extensive molecular genetic analysis in patients with non-atherothrombogenic MI if primary thrombophilia is suspected, considering the relatively high frequency. With this addition, continuing secondary prevention at the PHC level would be considerably improved.

Psycho-emotional and social status.

Two other factors that cause earlier occurrence of CVD among patients under the age of 44 years deserve attention. In recent years, foreign scientists have studied in detail the issues of the influence of psycho-emotional status, stress levels, as triggers for the formation of a negative background for young patients with a predisposition to CAD. For example, Garshick et al. observed that young patients with MI were under a higher level of pressure from psychological and financial factors than older patients [42]. In addition, the indirect significance of socioeconomic status on the development of cardiovascular diseases should be emphasized. Individuals with lower income status and lower levels of education had a higher risk of developing cardiovascular events [43].

Conclusion.

Thus, along with conventional risk factors including hypertension, diabetes mellitus, smoking, and obesity, the influence of some additional predictors was also established considering the findings of the analysis of the literature devoted to the study of risk factors for MI in young individuals. Additionally, a specific focus should be placed on evaluating the phenomena of comorbidity as a factor contributing to the early development of cardiovascular events on the basis of numerous researches undertaken by both foreign and local writers. Keeping in mind the differences between the existing types of MI based on their pathogenesis, the information found about the influence of additional, but no less decisive factors: nonspecific systemic inflammation, the presence of unaccounted for background diseases, genetic predisposition, a tendency to thrombophilia, the influence of psycho-emotional, social and other factors, there is a need to improve the clinical and methodological approach in the management of young patients with MI. Optimizing and implementing early preventative strategies for cardiovascular morbidity and mortality in this age group will be made possible by the creation of a novel strategy.

Conflict of interest.

Authors have no conflicts of interest to declare.

Author contributions.

Conceptualization- D.N, M.B, L.Z; Methodology- D.N, A.K; Review- D.N. M.B., L.Z; Formal analysis- S.A; Writing (original draft preparation)- D.N; Writing (review and editing)- D.N, M.B, L.Z.

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ავტორეფერატი

ავადობისა და სიკვდილიანობის თვალსაზრისით, გულ-სისხლძარღვთა დაავადებები წარმოადგენენ სიკვდილიანობის ძირითად მიზეზს მსოფლიოში. დედამიწაზე არსებულ არაინფექციურ დაავადებათა ნახევარი გამოწვეულია სწორედ მათ გამო. ყაზახეთში სისხლის მიმოქცევის დაავადებებით სიკვდილიანობის მუდმივად მზარდი სიხშირის გამო, ჩვენი რეგიონი 2021 წელს განსაზღვრულ იქნა, როგორც მაღალი კარდიო-ვისკულარული რისკის მქონედ, ამიტომაც შემუშავდა განახლებული სკალა Score 2 (სისტემატური კარდიო-ვასკულური რისკის შეფასება). ბოლო დროს საგრძნობლად გაიზარდა ამ პათოლოგიის გავრცელება ახალგაზრდებში (44 წლის ასაკამდე). ამასთან დაკავშირებით, მეცნიერთა დიდი ნაწილი აქტიურად იკვლევს ცვლადებს, რომლებიც გავლენას ახდენენ მოსახლეობის ამ ფენაში გულის იშემიური დაავადების, განსაკუთრებით კი მისი მწვავე ფორმების გაჩენაზე, რომლებიც ხშირად აღნიშნავენ დაავადების დაწყებას ამ ასაკობრივ ჯგუფში.

საერთაშორისო ექსპერტების კვლევა ადასტურებს ისეთი კლასიკური რისკ-ფაქტორების გავლენას, როგორიცაა არტერიული ჰიპერტენზია, სიგარეტის

მოწევა, დისლიპიდემია, შაქრიანი დიაბეტი, არააქტიური და დატვირთული ანამნეზი ათეროსკლეროზის ადრეულ განვითარებაზე. მეოთხე უნივერსალური განსაზღვრება გამოყოფს მიოკარდიუმის ინფარქტის ხუთ განსხვავებულ ფორმას და თუ პირველი ტიპი პირდაპირ კავშირშია ათეროგენეზთან, მეორე ტიპი ვითარდება იშემიის დისბალანსის შედეგად, კორონარული არტერიების ობსტრუქციული დაზიანებების არარსებობის შემთხვევაში. ამჟამად არ არსებობს მკაფიო, ფართოდ აღიარებული სტანდარტები მე-2 ტიპის მიოკარდიუმის ინფარქტის გამოვლენისა და მკურნალობისთვის. ამრიგად, საჭირო გახდა დამატებითი რისკ-ფაქტორების გავლენის შესწავლა, როგორიცაა სუბკლინიკური სისტემური ანთება, ლიპიდურ ცვლაში ჩართული გენების გენეტიკური პოლიმორფიზმი, თრომბოზი და ენდოთელიუმური დისფუნქციის განვითარებაზე პასუხისმგებელი, მიოკარდიული ინფარქტის სხვადასხვა ტიპის პათოგენეტიკური მექანიზმების განსხვავებათა გათვალისწინება. ჯერ კიდევ მიმდინარეობს კამათი იმის შესახებ, მოქმედებს თუ არა თანმხლები დაავადება ახალგაზრდების პოპულაციაში ადრეული კარდიო-ვასკულური მოვლენების სიხშირეზე.

სამიზნე

შესწავლილ უნდა იქნას საერთაშორისო მიდგომა ახალგაზრდა პოპულაციაში მიოკარდიუმის ინფარქტის რისკ-ფაქტორების შეფასებისას.

მეთოდები

მიმოხილვაში კვლევის თემაზე გამოყენებული იყო კონტენტ-ანალიზი, ეროვნული სახელმძღვანელო პრინციპები, ჯანმრთელობის მსოფლიო ორგანიზაციის რეკომენდაციები. ინფორმაციის წყაროდ გამოყენებული იქნა 1999 წლიდან 2022 წლამდე პერიოდში ელექტრონული მონაცემთა ბაზები Pubmed, eLibrary. ძიება ჩატარდა საკვანძო სიტყვების დახმარებით „მიოკარდიუმის ინფარქტი“(«myocardial infarction»), ინფარქტი ახალგაზრდებში“ («infarction in young»), „რისკ-ფაქტორები“ («risk factors») და MeSH ტერმინებით „მიოკარდიუმის ინფარქტი/ეტიოლოგია“ («myocardial infarction/etiology»), "მიოკარდიუმის ინფარქტი/ახალგაზრდები", («myocardial infarction/ young»), "მიოკარდიუმის ინფარქტი/რისკ ფაქტორები" («myocardial infarction/risk factors»). ნაპოვნი 50 წყაროდან 37 შეესაბამებოდა კვლევის მოთხოვნას.

დასკვნა

სამეცნიერო კვლევის მოცემული მიმართულება ამჟამად ერთ-ერთი უმნიშვნელოვანესია არაათეროთრომბოგენური მიოკარდიუმის ინფარქტის ფორმირებისა და არადამაკმაყოფილებელი პროგნოზის გავრცელების გამო, 1 ტიპის ინფარქტებთან შედარებით. მრავალი უცხოელი და ადგილობრივი ავტორი მოტივირებული იყო, მოეპოვებინათ გულის იშემიური დაავადების ადრეული დაწყების ახალი მარკერები, შეემუშავებინათ რისკის ადეკვატური სტრატიფიკაციის ალგორითმები და შეექმნათ ეფექტური სტრატეგიები პირველადი და მეორადი პროფილაქტიკისთვის პირველადი სამედიცინო-სანიტარული დახმარების და სტაციონარების დონეზე, ამ ასაკობრივ ჯგუფში სიკვდილიანობისა და ინვალიდობის მაღალი მაჩვენებლების შედეგად, რაც მნიშვნელოვან ეკონომიკურ და სოციალურ პრობლემას წარმოადგენს.

საკვანძო სიტყვები: მიოკარდიუმის ინფარქტი, ახალგაზრდა პაციენტები, რისკის ფაქტორები