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Problems And Prospects Of Prevention Of Cardiovascular Diseases: International Experience

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Abstract . Cardiovascular diseases (CVD) remain the leading cause of death in the world, accounting for a significant proportion of premature deaths and disability, despite advances in diagnosis and treatment. According to the Global Burden of Disease 2024 study, coronary heart disease and stroke consistently occupy the first positions among the causes of death, and the combined burden of CVD continues to grow, especially in low- and middle-income countries. At the same time, significant international experience in prevention has been accumulated, including population-based measures to reduce the prevalence of risk factors, clinical recommendations for primary and secondary prevention, as well as intersectoral strategies in the framework of health policy.

The purpose of the article is to analyze the key problems and prospects of CVD prevention in the context of international experience, with an emphasis on the recommendations of the World Health Organization (WHO), the European Society of Cardiology (ESC), the World Heart Federation (WHF) and the results of modern epidemiological studies. The method of analytical review of scientific literature, international guidelines and public health programs is used in the work. It has been shown that up to 80% of cases of cardiovascular events are potentially preventable if the main behavioral and metabolic risk factors are corrected, including smoking, poor nutrition, low physical activity, hypertension and dyslipidemia.

Special attention is paid to comparing population-based and individually oriented prevention strategies, assessing barriers to implementation (socio-economic inequalities, limited primary care resources, low patient commitment) and prospects for further development, including the use of digital technologies, salt reduction programs, increased coverage of cardiac rehabilitation and gender-based approaches. It is concluded that it is necessary to combine clinical and policy-management measures, taking into account the national context, while relying on the evidence base formed by international organizations.

Keywords: cardiovascular diseases, prevention, risk factors, international recommendations, World Health Organization, European Society of Cardiology; population-based interventions.

Introduction.

Over the past decades, cardiovascular diseases have been considered as a central problem of global health. According to the Global Burden of Disease 2024, CVD is the leading cause of death in all regions of the world, making a significant contribution to the rates of premature mortality and disability of the adult population [15]. At the same time, despite a noticeable decrease in mortality from CVD in a number of high-income countries associated with the improvement of medical care and the introduction of preventive programs, many low- and middle-income countries have either stabilized or increased mortality and morbidity rates.

The key paradoxical feature of the current stage is that CVD is largely preventable diseases: according to the World Heart Federation, up to 80% of myocardial infarctions and strokes could be prevented through lifestyle modification and risk factor control. At the same time, the consolidation of unhealthy behavioral patterns (smoking, excessive consumption of salt and saturated fats, low physical activity, alcohol abuse), as well as socio-economic determinants of health (income level, education, working and living conditions) continue to support a high prevalence of risk factors on a global scale [6].

In recent decades, large-scale international initiatives for the prevention of CVD have been formed. WHO has developed global strategies to combat noncommunicable diseases, including programs to reduce salt intake, eliminate tobacco, and promote healthy diets and physical activity.

In 2024, the European Society of Cardiology updated clinical guidelines for the prevention of CVD [11], offering a comprehensive approach to individual risk assessment, multifactorial correction, and organization of preventive care at all levels of the healthcare system. The World Heart Federation makes a significant contribution to the development of primary and secondary prevention concepts, emphasizing the need to strengthen measures in countries with limited resources and expand access to effective medicines and rehabilitation.

However, even with the availability of developed strategies and recommendations, the actual practice of CVD prevention faces numerous challenges. Among them are the insufficient integration of prevention into the daily activities of health systems, the lack of funding for public health programs, the difficulties of intersectoral cooperation, as well as insufficient public awareness and low commitment to prescribed interventions. These factors necessitate a critical analysis of existing international experience, identification of effective models and development of recommendations for their adaptation to different national contexts [1].

Thus, the relevance of the study is due to both the importance of CVD for the global burden of diseases and the need to systematize and critically evaluate the international experience of prevention. Using cross-country and inter-organizational data allows for a deeper understanding of the success and failure factors of prevention programs, as well as to outline promising areas of development in the coming decades.

Materials and methods of research.

This work is in the nature of an analytical review and comparative analysis of international experience in the prevention of cardiovascular diseases. The concept of evidence-based medicine and public health is chosen as the main methodological basis, which involves a critical assessment of the quality of sources, a comparison of the results of various epidemiological studies and clinical recommendations, as well as taking into account the socio-economic context.

The information was searched among publications in peer-reviewed journals and official documents of leading international organizations. The review included:

– data from global epidemiological studies and projects, primarily the Global Burden of Disease Study 2024, containing estimates of mortality, morbidity and DALY indicators for the main forms of CVD in the regional and country context;
– clinical guidelines for the prevention of CVD, primarily the recommendations of the European Society of Cardiology 2024 and related information materials for practitioners;
– Strategic documents from WHO and the WHO Regional Office for Europe on salt reduction, tobacco control, promotion of a healthy diet and physical activity, as well as policy measures to combat noncommunicable diseases.

Additionally, the positions of the World Heart Federation and the European Association of Preventive Cardiology regarding secondary prevention and cardiac rehabilitation, as well as special documents on the prevention of CVD in women and in different age periods, were analyzed.

The criteria for including sources were: relevance to the topic of CVD prevention, publication over the past 10-15 years, availability of clearly described methodological approaches and statistical data. Priority was given to large-scale multicenter studies, meta-analyses, systematic reviews, and official international guidelines. In case of discrepancies in the data on the same problem, the methodological quality of the research was assessed and the results were compared, taking into account differences in design and samples.

Descriptive statistics (at the level of presenting trends and relative indicators), qualitative comparative analysis (comparing the content and accents of various strategies and recommendations), as well as a structural and functional approach to assessing prevention systems at the national and international levels were used as analytical methods. This combination of methods made it possible not only to summarize quantitative indicators of the global burden of CVD, but also to identify organizational, social and political aspects that affect the success or limitations of prevention programs.

Results and discussions.

According to the Global Burden of Disease 2024, CVD remains the leading cause of death in the world, ahead of oncological and infectious diseases. Coronary heart disease and cerebrovascular diseases make the greatest contribution to the mortality structure, forming a significant proportion of all deaths and disabilities in middle-aged and older people. In some regions, there is a relative decrease in age-standardized mortality rates, which is associated with improved control of risk factors and increased access to medical care. However, the absolute number of cardiovascular events continues to increase due to the aging of the population and an increase in the number of adults at risk.

An important trend in recent decades has been the "rejuvenation" of CVD: the proportion of cases of coronary heart disease and stroke in people of working age, including young people, is growing. This is attributed to the combined effects of globalization, urbanization, changes in eating behavior, decreased levels of physical activity, and exposure to stressful factors. At the same time, in low- and middle-income countries, prevention programs are often implemented in fragments, which limits their effectiveness and contributes to maintaining high mortality rates [3].

From the point of view of the distribution of risk factors, studies demonstrate the dominant role of behavioral determinants: smoking, poor nutrition (excessive consumption of salt, sugar and saturated fats), low physical activity and harmful alcohol consumption. These factors, through the formation of arterial hypertension, dyslipidemia, obesity, and type 2 diabetes, create the basis for the development of atherosclerosis and its clinical manifestations [10].

Global experience convincingly shows that a sustained reduction in morbidity and mortality from CVD is impossible without systemic population-based interventions aimed at changing the environment and behavior of the population as a whole. In its documents, WHO highlights five key modifiable risk factors for noncommunicable diseases, including CVD: tobacco, unhealthy diet, physical inactivity, harmful alcohol consumption and air pollution.

One of the most developed areas is the policy of reducing salt intake. WHO and the WHO Regional Office for Europe have developed specific recommendations for achieving the target level of salt intake of less than 5 grams per day per person, including food reform, marketing regulation, and the introduction of information campaigns and product labeling. According to WHO/Europe estimates, a 25% reduction in salt consumption in the region can prevent up to 900 thousand deaths. deaths from CVD by 2030, which underlines the importance of this area from both a medical and an economic point of view [14].

In addition to salt policy, many countries are implementing comprehensive tobacco control programs, including excise regulation, prohibition of advertising and smoking in public places, as well as warning labeling. These measures are considered highly effective in terms of reducing the prevalence of smoking and, consequently, reducing the risk of coronary heart disease and stroke.

An important component of population prevention is the creation of conditions for the formation of healthy habits: the development of infrastructure for active mobility (bike paths, pedestrian zones), the popularization of healthy eating through school and corporate programs, as well as the formation of a regulatory environment that limits the consumption of trans fats and sweetened beverages. In a number of countries (for example, in the Nordic countries), it was this intersectoral approach that made it possible to achieve a significant reduction in mortality from CVD, demonstrating the effectiveness of a combination of legislative, economic and educational tools [12].

Clinically oriented prevention of CVD is based on an assessment of individual risk and a complex effect on several factors simultaneously. The 2024 European Recommendations on CVD prevention propose an updated risk assessment scale that takes into account age, gender, blood pressure, lipid profile, diabetes, and other parameters, and differentiate prevention approaches depending on the risk level and age of the patient.

From the point of view of prevention levels in international practice, there are traditionally several directions [9]:

– primary prevention, aimed at people without clinically manifested CVD, but with the presence of risk factors;

– secondary prevention aimed at patients with previous cardiovascular events (heart attack, stroke, revascularization, chronic coronary heart disease, etc.);

– tertiary prevention, which involves preventing the progression of the disease and reducing the risk of recurrent complications, including through cardio-rehabilitation programs.

Primary prevention interventions in clinical practice include individualized lifestyle recommendations, correction of blood pressure, lipids and glycemia, as well as, if necessary, the appointment of drug therapy (statins, antihypertensive agents, etc.) in accordance with the risk level. Special attention is paid to the stratification of patients by age, gender, presence of concomitant conditions and social factors, which makes it possible to adapt the intensity of interventions [2].

Secondary prevention is considered as one of the most cost-effective directions, as it significantly reduces the risk of recurrent cardiovascular events in patients who have already become ill. The World Heart Federation emphasizes the importance of standardized discharge protocols, including prescribing basic medication (antithrombotic, statins, ACE inhibitors/ARBs, beta-blockers), lifestyle recommendations, and mandatory referral to cardiac rehabilitation programs.

However, in many countries, there is insufficient coverage of patients with secondary prevention and rehabilitation programs, low adherence to prescribed therapy, and significant social differences in access to these services. This limits the potential of secondary prevention, especially in countries with limited resources and uneven distribution of medical infrastructure.

Table 1. Main risk factors for CVD and directions of international preventive measures

The risk factor	Examples of population measures	Примеры клинических мер
Tobacco smoking	Excise taxes, prohibition of advertising, prohibition of smoking in public places, warning signs	Smoking screening, brief counseling, Tobacco withdrawal pharmacotherapy
Excessive intake of salt and saturated fats	Product reformulation, trans fat restriction, labeling, information campaigns	Dietary counseling, individual nutrition plans
Low physical activity	Development of urban infrastructure for active mobility, programs in schools and workplaces	Recommendations on metered physical activity, referral to rehabilitation programs
Arterial hypertension	National screening programs, simplified routes in primary care	Selection of antihypertensive therapy, control of target blood pressure levels
Dyslipidemia and obesity	Restriction of marketing of high-calorie food, tax on sugar-containing beverages	Prescribing statins and other lipid-lowering drugs, weight loss programs
Type 2 diabetes mellitus	Early detection programs, measures to combat obesity	Individualized hypoglycemic therapy, monitoring of complications

The presented data illustrate the need to combine population-based and clinical approaches: effective reduction of the prevalence of risk factors requires simultaneous impact on both the environment (legislative and economic measures) and individual behavior.

Modern research highlights the importance of taking gender and age into account when planning prevention programs. Systematic reviews on the prevention of CVD in women indicate an underrepresentation of women in clinical trials, specific patterns of risk factors (gestational diabetes, preeclampsia, autoimmune diseases), and often a later diagnosis of CVD, which worsens the prognosis [5].

In response to these challenges, international organizations offer a life-based approach to prevention that takes into account the key stages of the life cycle: adolescence, the reproductive period, perimenopause, and old age. Priorities are formulated for each stage: formation of healthy behavior among young people, control of risk factors in women with pregnancy complications, active prevention in middle-aged people with risk factors, and maintenance of functional activity in the elderly.

A similar approach is applied to age groups outside the gender context: the emphasis is on early prevention in childhood and adolescence, when eating and exercise habits are formed, and on aggressive correction of risk factors in middle-aged people, especially those with a combination of hypertension, dyslipidemia and abdominal obesity. This lifestyle approach increases the effectiveness of preventive measures, allowing not only to reduce the likelihood of developing CVD, but also to delay their manifestation to a later age [8].

Despite the existence of an evidence base and developed international recommendations, the practice of CVD prevention faces a number of persistent problems. First, in most countries there is a discrepancy between the declared priority of prevention and the actual amount of funding for public health programs. A significant part of the resources is still being allocated to high-tech medical care, while primary care and preventive services are experiencing personnel and organizational shortages.

Secondly, socio-economic inequalities significantly affect the availability and effectiveness of prevention. Studies show that people with low income and education are more likely to be exposed to adverse environmental factors (poor nutrition, unsafe areas for physical activity), have limited access to medical care, and show less commitment to long-term therapy. This enhances differentiation in terms of mortality and morbidity, forming a "social gradient" of CVD.

Thirdly, the behavioral aspect plays an important role: even with recommendations and medications, many patients do not follow prescribed regimens. The reasons include a lack of understanding of risk, low levels of medical literacy, psychological barriers, and side effects of therapy. International experience shows that overcoming these obstacles requires the use of motivational counseling technologies, regular monitoring and feedback, as well as the involvement of multidisciplinary teams (doctors, nurses, psychologists, nutritionists).

In the foreseeable future, digitalization, expansion of cardiac rehabilitation programs, further improvement of population policies, and wider implementation of the integrated care concept are key areas for the development of CVD prevention.

The increased use of digital technologies (mobile applications, telemedicine, remote monitoring of indicators, electronic clinical decision support systems) opens up new opportunities to increase patient commitment and personalize prevention programs. The ESC and WHF recommendations emphasize the promise of decision support algorithms that automatically generate tips for prescribing secondary preventive therapy, risk assessment, and referral to rehabilitation programs [13].

Cardio-rehabilitation is considered as an integral element of secondary and tertiary prevention, but its coverage remains insufficient. International documents offer standardized program components: controlled physical activity, patient education, psychological support, and optimization of drug therapy. The development of the format of remote or hybrid rehabilitation, especially in the context of restrictions related to the pandemic, makes it possible to expand access to these services and increase their sustainability.

An important direction is to further strengthen population–based measures, in particular policies to reduce salt consumption. WHO/Europe emphasizes the need for a systematic approach, from the development of a regulatory framework and product reform to information and education campaigns and monitoring of salt consumption at the national level. The success of these programs largely depends on intersectoral cooperation and the involvement of the food industry, which requires political will and regulatory mechanisms [4].

Finally, it seems promising to strengthen the integration of CVD prevention into broader strategies for combating noncommunicable diseases and the "health in all strategies" policy. This approach involves taking into account the health of the population when making decisions in the fields of transport, urban planning, education and agriculture, which can create a sustainable environment that supports a healthy lifestyle.

Table 2. Key elements of international CVD prevention strategies

Organization / Document	Main Focus level	Key accents of CVD prevention
WHO (global strategy on NCDs, salt and tobacco programmes)	Population and political level	Reducing salt and tobacco consumption, promoting healthy diets and physical activity, intersectoral policy
ESC (recommendations for the prevention of CVD in 2021)	Clinical and systemic level	Individual risk assessment, multifactorial correction, standardization of primary and secondary prevention
WHF (roadmaps for secondary prevention and rehabilitation)	Secondary and tertiary prevention	Providing access to basic therapy, developing cardiac rehabilitation, focusing on countries with limited resources
WHO Regional Office for Europe (salt initiatives)	Regional population level	Support countries in developing national salt reduction and consumption monitoring programmes

EAPC and other professional associations	Specialized clinical level	Standards of cardiac rehabilitation, prevention in special groups (women, patients with obesity, diabetes, etc.)

A comparison of the strategies shows their complementary nature: WHO global and regional policies create frameworks and set guidelines for countries, professional societies form clinical standards, and organizations such as the WHF and EAPC focus on the implementation and adaptation of evidence-based approaches in clinical practice.

Conclusion.

Prevention of cardiovascular diseases is a key tool for reducing the global burden of disease and improving public health indicators. International experience reflected in the Global Burden of Disease data, WHO documents, ESC recommendations, and initiatives of the World Heart Federation attests to the high potency of preventive measures provided they are systematically and comprehensively implemented.

The analysis shows that the most significant results are achieved in countries where population-based interventions (salt and tobacco policies, the development of a healthy environment, economic and legislative measures) are combined with a well-developed system of clinical prevention at the primary level and specialized care, including secondary prevention and cardiac rehabilitation programs.

The main problems are related to insufficient financing of preventive programs, socio-economic inequalities, limited coverage of vulnerable groups of the population, as well as low commitment of patients to long-term lifestyle changes and drug therapy. International evidence highlights that without removing these barriers, prevention potential remains only partially realized, especially in low- and middle-income countries.

The prospects for the development of CVD prevention are related to the further strengthening of intersectoral policies, the expansion of digital solutions and cardiac rehabilitation programs, the introduction of life- and gender-sensitive approaches, as well as the adaptation of international recommendations to national conditions. At the same time, an important condition is a sustained political commitment that ensures long-term financing and monitoring of program effectiveness.

In general, international experience demonstrates that reducing the burden of CVD is possible with an integrated approach combining population-based and individualized measures, clinical and public health perspectives, as well as the interaction of various sectors of society. For healthcare practice, this means that it is necessary to move from episodic initiatives to a systematic preventive policy based on evidence and taking into account the social and cultural context of each country.

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