Отчет подобия

Метаданные

Название организации
National Scientific Center of Surgery named after A.N. Syzganov
Название
SOCIAL EFFICIENCY OF INTRODUCTION OF ATHEROSCLEROSIS SCREENING PROGRAM IN KAZAKHSTAN. SYSTEMATIC REVIEW
Автор
Bekbossynova Makhabbat
Подразделение
National Scientific Center of Surgery named after A.N. Syzganov

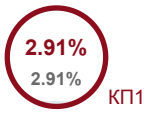
Тревога

В этом разделе вы найдете информацию, касающуюся текстовых искажений. Эти искажения в тексте могут говорить о ВОЗМОЖНЫХ манипуляциях в тексте. Искажения в тексте могут носить преднамеренный характер, но чаще, характер технических ошибок при конвертации документа и его сохранении, поэтому мы рекомендуем вам подходить к анализу этого модуля со всей долей ответственности. В случае возникновения вопросов, просим обращаться в нашу службу поддержки.

Замена букв	ß	0
Интервалы	A→	0
Микропробелы	·	0
Белые знаки	ß	0
Парафразы (SmartMarks)	a	12

Объем найденных подобий

КП-ия определяют, какой процент текста по отношению к общему объему текста был найден в различных источниках.. Обратите внимание!Высокие значения коэффициентов не означают плагиат. Отчет должен быть проанализирован экспертом.



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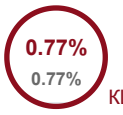

КЦ

25
Длина фразы для коэффициента подобия 2

7055
Количество слов

48128
Количество символов

Подобия по списку источников

Ниже представлен список источников. В этом списке представлены источники из различных баз данных. Цвет текста означает в каком источнике он был найден. Эти источники и значения Коэффициента Подобия не отражают прямого плагиата. Необходимо открыть каждый источник и проанализировать сожержание и правильность оформления источника.

10 самых длинных фраз — Цвет текста

ПОРЯДКОВЫЙ НОМЕР	НАЗВАНИЕ И АДРЕС ИСТОЧНИКА URL (НАЗВАНИЕ БАЗЫ)	КОЛИЧЕСТВО ИДЕНТИЧНЫХ СЛОВ (ФРАГМЕНТОВ)
1	Determination of the geographical coordinates of the aboveground nuclear tests epicenters Natalya Larionova, Mariya Abisheva, Pavel Krivitskiy, Sergey Lukashenko,Valeriy Monayenko;	23 0.33 %
2	https://journals.plos.org/plosone/article?id=10.1371/journal.pone.0190568	16 0.23 %
3	https://academic.oup.com/eurheartj/article/41/1/111/5556353	15 0.21 %

4	Study of the influence among 7-β-hydroxy-γ-aryloxypropylxanthinyl-8-thioalkanic acid derivatives on the lipid metabolism in experiment [redacted] 8/4/2020 Zaporozhye State Medical University (ZSMU) (Редакційно-видавничий відділ)	15 0.21 %
5	https://cyberleninka.ru/article/n/the-importance-of-conceptual-metaphors-and-modern-problems-in-cognitive-linguistics-1	13 0.18 %
6	Fallow Deer (Dama dama) as a Reservoir of Shiga Toxin-Producing Escherichia coli (STEC) Anna Szczerba-Turek, Bernard Kordas;	13 0.18 %
7	https://www.mdpi.com/2072-6643/11/2/335/htm	11 0.16 %
8	Текст статьи, Текст тезиса Аяжан 09.02.2024 (1).docx [redacted] 7/24/2024 Astana Medical University (Кафедра ОЗ и гигиены)	11 0.16 %
9	Study of the influence among 7-β-hydroxy-γ-aryloxypropylxanthinyl-8-thioalkanic acid derivatives on the lipid metabolism in experiment [redacted] 8/4/2020 Zaporozhye State Medical University (ZSMU) (Редакційно-видавничий відділ)	11 0.16 %
10	Integrated_Project_GHGL_13.pdf [redacted] 12/14/2024 Universiteit Gent (Ufora)	10 0.14 %

из базы данных RefBooks (0.79 %)

ПОРЯДКОВЫЙ НОМЕР	НАЗВАНИЕ	КОЛИЧЕСТВО ИДЕНТИЧНЫХ СЛОВ (ФРАГМЕНТОВ)
Источник: Paperity		
1	Determination of the geographical coordinates of the aboveground nuclear tests epicenters Natalya Larionova, Mariya Abisheva, Pavel Krivitskiy, Sergey Lukashenko,Valeriy Monayenko;	23 (1) 0.33 %
2	Fallow Deer (Dama dama) as a Reservoir of Shiga Toxin-Producing Escherichia coli (STEC) Anna Szczerba-Turek, Bernard Kordas;	13 (1) 0.18 %
3	Health policy support under extreme uncertainty: the case of cervical cancer in Cambodia ;	9 (1) 0.13 %
4	Determining what constitutes an effective psychosocial ‘return to work’ intervention: a systematic review and narrative synthesis Oswald, Tassia K., Tepper, Nicci,Venning, Anthony, Stevenson, Jeremy, Azadi, Leva, Lawn, Sharon, Redpath, Paula;	6 (1) 0.09 %
5	Asymptomatic Carriers of Toxigenic <italic>C. difficile</italic> in Long-Term Care Facilities: A Meta-Analysis of Prevalence and Risk Factors Shiekh Anwar Abdullah;	5 (1) 0.07 %

из домашней базы данных (0.07 %)

ПОРЯДКОВЫЙ НОМЕР	НАЗВАНИЕ	КОЛИЧЕСТВО ИДЕНТИЧНЫХ СЛОВ (ФРАГМЕНТОВ)
1	2CORRELATION BETWEEN APOLIPOPROTEIN B_A1 AND THE RISK OF METABOLIC-RELATED FATTY LIVER DISEASE DEPENDING ON THE LIPID PROFILE (1) [redacted] 2/14/2025 National Scientific Center of Surgery named after A.N. Syzganov (National Scientific Center of Surgery named after A.N. Syzganov)	5 (1) 0.07 %

из программы обмена базами данных (0.91 %)

ПОРЯДКОВЫЙ НОМЕР	НАЗВАНИЕ	КОЛИЧЕСТВО ИДЕНТИЧНЫХ СЛОВ (ФРАГМЕНТОВ)
1	Текст статьи, Текст тезиса Аяжан 09.02.2024 (1).docx [redacted] 7/24/2024 Astana Medical University (Кафедра ОЗ и гигиены)	28 (3) 0.40 %
2	Study of the influence among 7-β-hydroxy-γ-aryloxypropylxanthinyl-8-thioalkanic acid derivatives on the lipid metabolism in experiment [redacted] 8/4/2020 Zaporozhye State Medical University (ZSMU) (Редакційно-видавничий відділ)	26 (2) 0.37 %
3	Integrated_Project_GHGL_13.pdf [redacted] 12/14/2024 Universiteit Gent (Ufora)	10 (1) 0.14 %

из интернета (1.13 %)

ПОРЯДКОВЫЙ НОМЕР	ИСТОЧНИК URL	КОЛИЧЕСТВО ИДЕНТИЧНЫХ СЛОВ (ФРАГМЕНТОВ)
1	https://journals.plos.org/plosone/article?id=10.1371/journal.pone.0190568	16 (1) 0.23 %
2	https://academic.oup.com/eurheartj/article/41/1/111/5556353	15 (1) 0.21 %
3	https://link.springer.com/article/10.1007/s00432-020-03315-6	15 (2) 0.21 %
4	https://cyberleninka.ru/article/n/the-importance-of-conceptual-metaphors-and-modern-problems-in-cognitive-linguistics-1	13 (1) 0.18 %
5	https://www.mdpi.com/2072-6643/11/2/335/htm	11 (1) 0.16 %
6	https://www.ncbi.nlm.nih.gov/pmc/articles/PMC9105747/	10 (1) 0.14 %

Список принятых фрагментов (нет принятых фрагментов)

ПОРЯДКОВЫЙ НОМЕР	СОДЕРЖАНИЕ	КОЛИЧЕСТВО ИДЕНТИЧНЫХ СЛОВ (ФРАГМЕНТОВ)

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Conflict of interest Authors declare no conflict of interest

SYSTEMATIC REVIEW
SOCIAL EFFICIENCY OF INTRODUCTION OF ATHEROSCLEROSIS SCREENING PROGRAM IN KAZAKHSTAN. SYSTEMATIC REVIEW

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Abstract

Background Atherosclerosis, a primary cause of cardiovascular diseases, significantly impacts morbidity and mortality in Kazakhstan. The rising burden of this disease, combined with a high prevalence of dyslipidemia, underscores the importance of effective screening to reduce associated health risks. This study aims to evaluate the social efficiency of implementing a nationwide atherosclerosis screening program in Kazakhstan, assessing its potential to improve public health outcomes and reduce cardiovascular disease mortality.
Methods A literature review was conducted, analyzing global screening approaches and protocols for atherosclerosis and cardiovascular diseases, were examined for their applicability in the local context.
Results Findings suggest that targeted and cascade screening programs, particularly those focused on high-risk individuals and familial hypercholesterolemia, are effective in reducing disease incidence and mortality. Introducing similar protocols in Kazakhstan could enhance early detection, allowing for preventive interventions and treatment. The study concludes that a structured, government-supported screening program would not only save lives but also offer substantial economic benefits by mitigating long-term healthcare costs associated with cardiovascular complications.
Conclusion Screening is the convenient and economically efficient way to prevent atherosclerosis, and its effectiveness is demonstrated by worldwide practices and the history of early disease prevention. It is still essential to show the effectiveness and social value of screening before incorporating it into medical practice. If established a regular practice, widespread population screening might drastically lower the number of cardiovascular diseases that are the world's leading cause of death.
Key words: atherosclerosis, dyslipidemia, cardiovascular diseases, lipid profile, screening

Introduction

According to gerontologists, a person can live up to 120 years. However, under the influence of many factors, this indicator decreases. For example, according to the National Bureau of Statistics in 2022, the expected average life expectancy of residents of the Republic of Kazakhstan was 74.44 years (National Bureau of Statistics. Life expectancy in Kazakhstan: 2022). According to UN data, in the early 1950s, the share of people living in countries with a life expectancy of more than 70 years was only 1% of the total world population. In the early 2000s, it exceeded 50% (World Population Ageing 2023). The only reason for the increase of this indicator is the early detection of various diseases, that is, the development of screening. Today, the World Health Organization (WHO) recognizes that one of the primary operational functions of public health is disease prevention, including screening.

In general, the wide distribution of screening in the world begins in the 20th century. That is, mass fluorography was started after the Second World War to identify people with tuberculosis.1 According to the WHO, the United States was one of the first to introduce the concept of screening for the prevention of various diseases.2

As a result, this study aims to evaluate the social efficiency of implementing a nationwide atherosclerosis screening program in Kazakhstan, assessing its potential to improve public health outcomes and reduce cardiovascular (CVD) disease mortality.3

According to the National Bureau of Statistics, the main causes of death in Kazakhstan in 2023, which forced the introduction of this screening, were disorders of the circulatory system - 22.7%, tumors - 10.4%, diseases of the lung-respiratory system - 9.8%, accidents, poisoning and injuries - 8.4% and diseases of the digestive system - 8.0%.4

Atherosclerosis is the main cause of cardiovascular diseases here. It kills more people every year than the most common diseases, such as cancer, pneumonia, and diabetes. According to the definition of the World Health Organization, **atherosclerosis is a variable combination of changes in** the inner lining (intima) **of** arteries, including **the accumulation of** lipids, complex **carbohydrates, fibrous tissue, blood** components, calcification, and accompanying changes **in the middle layer** (media).5 And the main reason for the development of ischemic diseases of the cardiovascular system is atherosclerosis. Therefore, atherosclerosis can be said to be the main indicator of total mortality. When conducting research on the problem of atherosclerosis in Kazakhstan, the incidence is considered to be relatively young.

Atherosclerotic cardiovascular disease (ASCVD) affects more than 135 million people worldwide. More than 2 billion people are at high risk of atherosclerosis. They cause more than 85% of all deaths from cardiovascular diseases. Deaths from ASCVD account for 31% (17.9 million) of all deaths worldwide,6 including 45% (3.9 million) of all deaths in Europe,7 23 of all deaths in the US % (0.65 million) is due to this disease.8 ASCVD is also a leading cause of sudden death (6.2 million sudden deaths worldwide among people aged 30-70 years).9,10

Dyslipidemia, characterized by high levels of blood lipids, is an important global health problem associated with cardiovascular disease. As a preventive measure, screening for dyslipidemia plays a crucial role in identifying individuals at risk. According to WHO experts, 85% of cardiovascular complications are caused by a healthy lifestyle, timely examination and identification of risk factors, early prevention and treatment, including lowering the level of "bad" cholesterol in the blood.11

Blood pressure measures the force of circulating blood against artery walls. High blood pressure can damage arteries supplying blood to vital organs like the brain, heart, and kidneys. Cholesterol plays a central role in atherosclerosis-the buildup of fatty deposits in the arteries of the heart and brain. High cholesterol is responsible for an estimated 4.4 million deaths globally, or 7.9% of the total, primarily due to its impact on high blood pressure. It accounts for 18% of strokes and 56% of coronary artery disease worldwide. According to WHO, 40% of global deaths are due to just 10 major risk factors, with the remaining factors contributing less than 10%. Addressing these key risks could add 10 years to healthy life expectancy.12,13,14 Figure 1.

Figure 1. A representation of genetic types and damage types of dyslipidemia

Materials and methods

This systematic review was conducted to assess the social efficiency of implementing a nationwide atherosclerosis screening program in Kazakhstan. **A comprehensive literature search was performed across multiple databases to** ensure a broad and relevant selection of studies. The databases included PubMed, MEDLINE, Scopus, Web of Science, and the Cochrane Library. Search terms encompassed combinations of keywords such as "atherosclerosis screening," "cardiovascular disease," "dyslipidemia," "public health," "screening programs," and "Kazakhstan." Studies were included based on their relevance to atherosclerosis screening programs, particularly in the context of public health outcomes and economic efficiency. To avoid bias, studies from various geographical regions were considered, focusing on screening models and their effectiveness in countries similar in healthcare infrastructure and demographics to Kazakhstan. Inclusion criteria emphasized studies from the past 15 years, systematic reviews, meta-analyses, and original research articles. All retrieved articles **were screened by title and abstract,** with relevant **studies reviewed in full text. The Preferred Reporting Items for Systematic Reviews and Meta-Analyses** (PRISMA) guidelines were adhered to throughout the review process, ensuring a structured and transparent approach.

Results

The results of the study selection process: at the initial stage of study selection 1187 studies were identified. After the **removal of duplicate studies, titles and abstracts** of 974 studies were **screened** for relevance. **After title and abstract screening,** 54 studies were selected for full-text review. Finally, 20 papers that met inclusion criteria were included into the final systematic review as presented in Figure 2.

Figure 2. Flow chart showing selection of studies for review

1. Screening programs for atherosclerosis and cardiovascular diseases

Atherosclerosis and cardiovascular disease screening programs are implemented in various countries, with significant differences in their development. For example:

The U.S. tracks atherosclerosis statistics through the Centers for Disease Control and Prevention (CDC) database, which is the leading data-driven public health service. The "National Survey of Ambulatory Care: 2019 Summary Tables by Country" reports the annual number of outpatient visits by diagnostic group, with over 12,000 visits for coronary atherosclerosis and other chronic ischemic heart diseases.15 The overall comparison of screening programs are illustrated in Table 1.

Table 1. Screening Programs for Atherosclerosis and Cardiovascular Diseases

Country / Region Program / Organization Screening Methods / Key Features Notable Outcomes and Comments

USA CDC Database Tracks outpatient visits for conditions like coronary atherosclerosis Over 12,000 outpatient visits for coronary atherosclerosis annually. 15

UK National Health Service (NHC), England CVD screening includes cholesterol and blood pressure checks Provides lifestyle recommendations alongside screenings.16,17

Canada Provincial Programs CVD screenings at the provincial and territorial levels Screening recommendations vary by province/territory.16,17

France National/Regional Levels Screening programs vary by inclusion criteria and age groups Implements a combination of national, regional, and local-level screenings.16,17

Russia National Cardiology Center Led by Marat Vladislavovich Yezhov; focuses on familial hypercholesterolemia (FHC) Highlights that 20% of myocardial infarction cases involve undiagnosed FHC.14

Switzerland Novartis Uses innovative medicines for treatment and management Focuses on improving patient outcomes and extending life expectancy.18

Europe (General) European Atherosclerosis Society (EAS) Provides guidelines, consensus documents, and public education resources Established lipid modification guidelines and consensus documents since 2007.18

Uzbekistan Tashkent Cardiology Center Cascade screening for FHC Approximately 1 in 200 people are affected by FHC, with cascade screening aiding diagnosis.19

In the UK, the NHS runs cardiovascular screening programs, including cholesterol and blood pressure measurements, with lifestyle recommendations. Canada has provincial and territorial-level CVD screening programs and recommendations. France has introduced screening programs for atherosclerosis and other cardiovascular diseases, varying by scope, inclusion criteria, and age groups, and implemented at national, regional, and local levels. In Russia the National Medical Cardiology Research Center, is a key figure in the field of atherosclerosis. In Switzerland, Novartis, an international company, focuses on improving and extending lives through innovative medicines like Zolgensma, Cosentyx, and Incliziran.15

In Europe, the European Atherosclerosis Society (European Atherosclerosis Society) works actively. The EAS was founded in 1964 as a forum for the exchange of ideas among researchers on the study of atherosclerosis, and scientific meetings have been held throughout Europe for many years.16 Since 2007, the Society has produced Atherosclerosis Guidelines, and since 2010, consensus documents, and in 2012, a public resource Academy as a collection of online lectures, presentations, and talks recorded at congresses, courses, and webinars.

In 2019, the European Society of Heart (ESC) / EAS guidelines for lipid modification to reduce cardiovascular risk for the treatment of dyslipidemia were established: The authors are the Dyslipidemia Treatment Working Group of the ESC and EAS.17

In Uzbekistan, much attention is paid to the global challenge of familial hypercholesterolemia (FHC). He notes that the prevalence of FHC is about 1 in 200 people, which translates to an estimated 165,000 individuals affected in Uzbekistan, with a population of 33 million.19

2. Activities aimed at the prevention of atherosclerosis in Kazakhstan

The "Clinical Diagnosis and Treatment Protocol for Atherogenic Disorders of Lipid Metabolism (Dyslipidemia)" was approved by the National Scientific Center for Healthcare Development named after S. Kairbekova and published on its website. Approved by the Joint Commission on Medical Services Quality (Ministry of Health, Kazakhstan, 2023), the protocol recommends targeted screening for familial hypercholesterolemia and cascade screening for first- and second-degree relatives of diagnosed FHC patients.19,20

According to statistics, over 36,000 people die from atherosclerosis annually in the Republic, and this number continues to rise. WHO experts state that 85% of cardiovascular disease complications can be prevented through a healthy lifestyle, timely screening, early prevention, and treatment, as well as reducing "bad" cholesterol. Individuals over 40 should undergo cardiovascular screenings every two years, free of charge, as part of a national program. These screenings help assess the 10-year risk of developing cardiovascular disease. If cholesterol levels are high, preventive treatment is prescribed in Kazakhstan.21

3. Review of clinical scientific works on the study of atherosclerosis and its screening

According to the study, every second person among men and women aged 30-69 who took part in the research had hypercholesterolemia, and hyperglycemia was found in every fourth man and fifth woman.22

The results of the lipid metabolism screening study for timely diagnosis and prevention of atherosclerosis showed that cardiovascular diseases, primarily caused by atherosclerosis, were identified as the leading cause of death globally.23,24 The study followed 2,000 individuals over 18, monitoring blood cholesterol, lipoproteins, triglycerides, and other factors. It was found that cholesterol levels decrease in those aged 60-69. Only 28% had normal high-density lipoproteins, 54% were at risk, and 18% had pathology. ASCVD changes were seen in one-third of patients over 40 during angiological screening. The study concluded that apolipoprotein disorders begin at age 18-29, emphasizing the importance of early screening to prevent disease.25

It is important to highlight the importance of detecting tendon and skin xanthomas, xanthelasma, or lipoid corneas in individuals under 45, as these symptoms suggest lipid metabolism disorders like familial hypercholesterolemia, a common cause of early dyslipidemia.26 The screening algorithm involves identifying risk factors and clinical signs of atherosclerosis, determining lipid profiles via blood tests, assessing cardiovascular risk using the SCORE scale, and confirming atherosclerosis with instrumental methods. Screening is recommended for men over 40 and women over 50. The SCORE scale, used in Europe, categorizes cardiovascular risk into very high, high, moderate, and low. Countries with high cardiovascular risk (death rates from CVD >350 per 100,000) include **Azerbaijan, Belarus, Bulgaria, Egypt, Georgia, Kazakhstan, Kyrgyzstan, North** Macedonia, Moldova, Russia, Syria, **Tajikistan, Turkmenistan, Ukraine, and Uzbekistan.** 27,28

According to a last study, blood lipid spectrum was taken from 95 volunteers aged 20 to 65 years. Risk factors were found in 55.6% of people. The lower limit of the risk factor is considered to be 30 years. In conclusion, the authors showed the social importance of preventive measures, especially the

effectiveness of lipoprotein testing.29

In Vienna, Austria, a pilot project combined selective screening with cascade testing for children aged 5-7, using standardized questionnaires and cholesterol measurements. Cascade screening is implemented in several countries, including Bulgaria, Denmark, Ireland, Kosovo, Latvia, Malta, Norway, Poland, Portugal, Spain, Sweden, Switzerland, and Ukraine, with some programs being institution-based and others national. The Czech Republic introduced universal newborn screening, and Estonia offers universal screening for all ages. Germany combines universal and cascade screening through the Fridolin Program (ages 2-6) and the Vroni study (ages 5-14), while Greece implemented this approach at institutions. Cascade screening is also used in Ireland, Luxembourg, the Netherlands, Norway, and Sweden.18,30,31,32 The cascade and screening programs overview are presented in Table 2.

Table 2. Cascade and Familial Screening Programs

Country / Program Target Population / Method Results Significance

Vienna, Austria 18 Children aged 5-7; cascade screening Cascade screening detected familial hypercholesterolemia cases effectively Demonstrates the success of selective screening in early childhood

Germany: Fridolin and Vroni Programs 32 Fridolin (ages 2-6); Vroni (ages 5-14) Combined universal and cascade screening approach. Integration of genetic testing improves familial screening efficiency

Czech Republic: MedPed Project 30 Universal newborn screening Significant contribution to identifying FHC Establishes universal screening as a model for effective detection

Slovenia 18 Universal FHC screening for 5-year-olds Covers 91% of pediatric population; integrated genetic testing Reduction in cardiovascular mortality through systematic screening

Groselj U. et al. work in the European Journal of Cardiology discusses successful familial hypercholesterolemia screening models in Europe. In the Netherlands began a program identifying genetically confirmed FHC patients (index cases) and conducting cascade screening for their relatives, which reduced mortality over 20 years. Slovenia introduced universal FHC screening, measuring cholesterol in 5-year-olds during primary care visits. The program now covers 91% of the pediatric population and integrates genetic testing. Cascade screening has also been implemented in Norway, the Czech Republic, Spain, and the UK, with the Czech Republic's MedPed project significantly contributing to FHC identification.17,33

An epidemiological, cross-sectional study was conducted to assess the prevalence of dyslipidemia in adolescents from Montes Claros, Minas Gerais, and compare the results with a study of the Brazilian population.34,35 A total of 77,833 students from 63 schools across four geographical areas participated, and data from 635 adolescents aged 10 to 16 years were evaluated. Blood samples were collected to measure total cholesterol, triglycerides, **low-density lipoprotein (LDL) cholesterol, and High-density lipoprotein (HDL) cholesterol.** The study found that 26.8% of adolescents had high total cholesterol, 15.7% had high triglycerides, 6.5% had high LDL cholesterol, and 40.8% had low HDL levels. The authors concluded that the prevalence and mean values of dyslipidemia, except for HDL cholesterol, were higher in adolescents from Montes Claros compared to the Brazilian population study used for comparison.35

A study devoted to the study of the method for estimating the cumulative cardiovascular death risk in women aged 25-64 and the creation an algorithm incorporating both traditional and socio-economic risk factors.36 The research included 1,000 women in an epidemiological study and concluded that the developed algorithm, which considers economic risk factors, provides an effective means to assess individual cardiovascular death risk at the local level.37 This and other regional studies are summarized in Table 3.

Table 3. Regional Studies on Atherosclerosis Risk and Screening

Study/Region Methodology Findings Recommendations

Lakunchykova, O. et al.36 SCORE-based risk algorithm for women aged 25-64 Developed an algorithm incorporating socioeconomic risk factors Provides a localized tool for assessing 10-year cardiovascular death risk

Collins, D. et al.38 Risk factor assessment in Vankal'a village 44.5% overweight, 37.6% hypertensive, 25.8% hyperglycemic Highlights need for community-focused health promotion

Serebryakova et al.39 Screening among 483 female teachers High prevalence of lipid and carbohydrate metabolism disorders Workplace screening is effective for identifying metabolic risk factors

The method of computed tomography (CT) angiography remains the "gold" standard for diagnosing vascular pathology. The next advancement was the use of intravascular ultrasound, an invasive technique, which revolutionized our understanding of atherosclerosis and enabled early detection of pathological changes in vessel walls. Today, comprehensive diagnostic information for identifying atherosclerosis includes blood serum lipid levels, HS CRP, coronary risk factors, ultrasound of brachiocephalic vessels, and CT angiography. In cases with clinical manifestations of atherosclerosis, invasive methods like intravascular ultrasound should also be used for specific arterial regions.13,33

In a study familial hypercholesterolemia as a leading cause of early cardiovascular diseases and a frequent disorder of lipid metabolism in children. Cascade screening on the "child-parent" path for the diagnosis of familial hypercholesterolemia. As a result, 34 children diagnosed with "heterozygous familial hypercholesterolemia" with an average age of 8.7 years were identified during the indicated period. After screening relatives, 33 parents, 15 siblings, and 56 second relatives were diagnosed with FHC. Most of the parents diagnosed with FHC also had cardiovascular disease. In conclusion: "child-parent" cascade screening led to the detection of three new cases of FHC per child-proband, which highlights the importance of early diagnosis and control of this disease in a family context.40-42

The high value of determining early cardiovascular disease risk in both children and adults using Electrocardiography (ECG) Dispersion Mapping Method for Screening the Risk of Cardiovascular Diseases is evident. Screening methods are vital in this process, but issues with accessibility and efficiency remain. The study explores the use of ECG dispersion mapping for cardiac screening to identify individuals at high risk of CVD. The study involved 500 adults and 300 children, with informed consent and ethics committee approval. Results demonstrated the effectiveness of ECG dispersion mapping in identifying at-risk patients, highlighting its potential to improve early detection, prognosis, and prevention of cardiovascular diseases when integrated into medical practice.34 The advances in diagnostic methods are thoroughly described in Table 4.

Table 4.Advances in Diagnostic Methods

Study/Author Method Key Outcomes Clinical Implications

Fedotova E., et al.22 Contrast enchanced CT angiography Precise quantification of vessel narrowing Gold standard for vascular surgical planning

Bulanova N. et al.43 ECG dispersion mapping Effective in identifying high-risk patients for CVD Promotes early detection and prognosis improvement

Shaw L. J. et al.44 Subclinical atherosclerosis imaging Plaque prevalence often exceeds traditional risk factors Calls for more intensive assessment to improve risk stratification
Abbott A. L. et al.45 Routine imaging for subclinical atherosclerosis Raised concerns over complications and incidental findings Routine imaging not yet recommended due to insufficient data

A study to assess how atherosclerosis impacts functional activity in elderly patients involved 99 patients aged 65 and older with atherosclerosis, treated at a hospital in Belgorod. Functional activity was evaluated using the Barthel index, and ASCVD were identified through clinical examination and history. The study found that the severity of functional impairment depended on which arteries were affected, with lower extremity atherosclerosis causing the most significant limitations in activities such as dressing, moving, and climbing stairs. Factors like previous myocardial infarction or coronary artery bypass surgery also influenced functional activity. These findings are valuable for optimizing treatment and rehabilitation strategies for elderly patients with atherosclerosis.46
In a study aimed to investigate the relationship between total cardiovascular risk and fracture risk in women without clinical signs of atherosclerosis involved 200 women aged 45-69, with cardiovascular risk assessed using the SCORE scale and fracture risk evaluated through the FRAX calculator. Bone mineral density (BMD) was measured by X-ray absorptiometry. Results showed that 36% of women had low, 62% had average, and 2% had high cardiovascular risk. Among 128 women with a SCORE ≥1, 26% had osteoporosis and 34% had osteopenia. An inverse relationship between BMD and cardiovascular risk and a positive relationship between BMD and fracture risk were found. The study suggests that assessing both CVD and fracture risk together can aid in early prevention and improve patient care.47
A survey of young people who did not visit a cardiologist and patients diagnosed with vascular atherosclerosis showed that women (53.3%) predominated among the respondents, most of them (60%) were overweight. Only 20% of respondents smoked, but 80% drank alcohol frequently. All respondents had a blood relative who had a stroke or heart attack. Most of them (73.3%) had high blood pressure, only 33.3% knew what atherosclerosis is. The vast majority (66.7%) did not visit a neurologist, only 33.3% monitored their blood sugar level. Despite this, only 33.3% were aware of atherosclerosis. The results of the study indicate the need to increase public awareness of the risk factors and prevention of atherosclerosis through educational materials and a more intensive medical dialogue with patients.48
An analysis of the effectiveness of screening for lipid metabolism disorders and obesity in health centers, analyzing data from 3,049 working-age individuals between 2015 and 2016 determined that 50.9% had health risk factors, and 49.1% were healthy. Additionally, 65.2% had body parameter abnormalities, and 34.8% had hypercholesterolemia. After attending health school, 48% of participants saw a reduction in cholesterol, and 5.5% lost weight, particularly among those aged 18-30. This underscores the importance of screening in preventing cardiovascular diseases.49
Andrew H. et al . highlight the importance of assessing vascular health in children with cardiovascular risk factors. It reviews recent research showing that these children exhibit adverse changes in vascular health indicators, such as pulse wave velocity, arterial distensibility, and carotid intima-media thickness, which may signal an increased risk for cardiovascular disease. Despite challenges in measuring vascular condition due to children's physiological differences and insufficient normative data, the authors suggest that such assessments could be valuable for risk stratification and early intervention. The article calls for future research to expand normative data, improve measurement standardization, and conduct longitudinal studies linking childhood risk factors to adult cardiovascular outcomes.50
Lozano, P. et al. reviewed evidence on childhood and adolescent lipid screening to update USPSTF recommendations. The review found no direct evidence linking screening to adult health, intermediate outcomes, harms, or treatment effects, as no randomized controlled trials were conducted. A total cholesterol level of 200 mg/dL is a strong predictor of dyslipidemia. Screening was most effective in overweight children (9-11 years) and adolescents (16-19 years), with successful results in Appalachian communities. Dietary changes showed no negative impact on growth. However, studies did not find a clear association between cholesterol levels in youth and early death, though high cholesterol in women, especially with familial hypercholesterolemia, may be linked to early death. The article concludes that while some effectiveness was found (5.8%), long-term studies are needed to assess health risks and revise cholesterol standards.51
Shaw L.J. et al. emphasizes the need to study atherosclerotic plaques and their link to cardiovascular risk. Research shows plaque prevalence often exceeds traditional risk factors, suggesting more intensive assessment is needed. The results showed even low-risk patients can have atherosclerosis, indicating the need for further evaluation. Data from SCOTT-HEART2 and ROBINSYA will help clarify the role of CTO in screening asymptomatic patients and reducing cardiovascular events.44
Abbott A.L. concluded that while imaging of "subclinical" atherosclerosis could be an independent risk factor for future complications, routine screening of asymptomatic individuals is not yet advisable. The article highlights concerns, such as potential complications from screening (e.g., cerebral ischemic events, radiation side effects in 12% of cases) and incidental findings in 36% of cases. Abbott calls for further research to assess the ability of imaging to improve risk stratification, personalize care, and determine optimal screening methods to predict complications.45
The screening methodology for FHC and pediatrics are described in Table 5.
Table 5. Familial Hypercholesterolemia and Pediatric Screening
Study / Program Methodology Key Findings Importance
Wald, D. et al.42 "Child-parent" cascade screening Diagnosed 34 children and 104 relatives with hypercholesterolemia Cascade screening significantly increases detection rates in families
Becker, M. et al.52 Targeted screening for FHC among relatives 24.1% diagnosed with FHC Early diagnosis aids prevention of cardiovascular diseases
Groselj, U. et al.33 Genetic testing and cascade screening Reduced mortality over 20 years but discontinued due to funding Demonstrates the long-term success of national FH screening programs

Discussion
The findings from this systematic review emphasize the potential benefits of implementing a nationwide atherosclerosis screening program in Kazakhstan. Evidence from countries with established screening protocols, such as the United States, the UK, and Canada, demonstrates the effectiveness of targeted screenings in reducing cardiovascular disease prevalence and mortality. For example, the U.S. tracks atherosclerosis statistics through the CDC, showing a high number of outpatient visits for coronary atherosclerosis and ischemic heart diseases.13 Similarly, the UK's NHS conducts regular cardiovascular screenings, including cholesterol and blood pressure checks, which have proven effective in reducing CVD risk.14 Introducing similar programs in Kazakhstan, particularly targeting familial hypercholesterolemia and other high-risk groups, could significantly reduce the incidence of atherosclerosis and related mortality. International studies have demonstrated the effectiveness of cascade screening for FHC, which allows for early detection and treatment within families, thereby reducing the long-term health burden.3,11,21

Limitations This study has several limitations that should be considered when interpreting the findings. First, the generalizability of the results is somewhat limited due to the variability in healthcare systems between countries. Most of the studies included in the review were conducted in countries with advanced healthcare infrastructures, which may not be directly applicable to Kazakhstan's current healthcare context. Second, while the review emphasizes the economic benefits of a nationwide screening program, more region-specific economic evaluations are needed, particularly considering Kazakhstan's diverse rural and urban populations.

What is Known? Globally, it is well-established that dyslipidemia, particularly elevated cholesterol levels, is a major risk factor for cardiovascular diseases. High cholesterol is responsible for approximately 4.4 million deaths annually and contributes significantly to strokes and coronary artery disease. Early detection through screening is a proven strategy to mitigate these risks. The World Health Organization highlights that 85% of cardiovascular complications can be prevented through timely interventions such as screening for dyslipidemia and hypertension.

What is New? This review provides a unique contribution by evaluating the applicability of international atherosclerosis screening models specifically for Kazakhstan. It underscores the need for a tailored approach that considers Kazakhstan's specific demographic and healthcare needs. Unlike previous studies that focused on high-income countries, this review addresses the gap in literature regarding the implementation of cardiovascular screening programs in low- and middle-income countries, particularly in Kazakhstan, where healthcare access is more variable.

Conclusion

The general literature review emphasizes that screening is the most effective method to combat atherosclerosis, with its success evident in global practices and the history of early disease prevention. Demonstrating the social value and effectiveness of screening, and subsequently integrating it into medical practice, remains crucial. Just as early detection through screening is standard for diseases like breast cancer, cervical cancer, and tuberculosis, atherosclerosis should be similarly detected early in cardiovascular diseases. Widespread population screening, if made routine, could significantly reduce the global statistics of cardiovascular diseases as a leading cause of death. The economic efficiency of screening has also been proven.

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