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Risk Factors of Ischaemic Heart Disease in 419 385 Outpatients: a Long-term Comparative Study

Aim	To determine the incidence rate of risk factors in patients who visited polyclinics at their place of residence.
Material and methods	The study included 419,385 patients who visited polyclinics in 2018–2023, in whom the most easily measurable risk factors for ischemic heart disease (IHD) were identified: arterial hypertension, total cholesterol (TC) and blood plasma glucose.
Results	During 4 years of follow-up, the proportion of patients with blood pressure (BP) higher than 140/90 mm Hg decreased (35.9%). The proportion of patients with blood glucose higher than 6.1 mmol/l (4.2%) also significantly decreased. The proportion of patients with a TC level higher than 5.2 mmol/l as well as of patients with a body mass index higher than 30 kg/m^2 did not significantly change (67.4% and 23.9%, respectively). An analysis of 274 deaths during the follow-up period showed that the main causes for death in patients with arterial hypertension were IHD (69.6%) and cerebrovascular diseases (30.3%).
Conclusion	People who visited polyclinics at their place of residence retained a high incidence of easily measurable risk factors for IHD, including arterial hypertension, high TC and blood glucose. The proportion of patients with blood pressure higher than 140 and 90 mm Hg was 49.7%, the proportion of patients with TC higher than 5.2 mmol/l was 63.1%, and the proportion of patients with blood glucose higher than 6.1 mmol/l exceeded 10%.

Keywords	Risk factors; blood pressure; ischemic heart disease
For citations	Galyavich A.S., Khairullin R.N., Baleeva L.V., Sabirzyanova A.A., Sluter M., Akimova S.V. et al. Risk Factors of Ischaemic Heart Disease in 419 385 Outpatients: a Long-term Comparative Study. Kardiologiia. 2024;64(1):63–66. [Russian: Галявич А.С., Хайруллин Р.Н., Балеева Л.В., Сабирзянова А.А., Слютер М., Акимова С.В. и др. Факторы риска ишемической болезни сердца у 419 385 амбулаторных пациентов: многолетнее сравнительное исследование. Кардиология. 2024;64(1):63–66].

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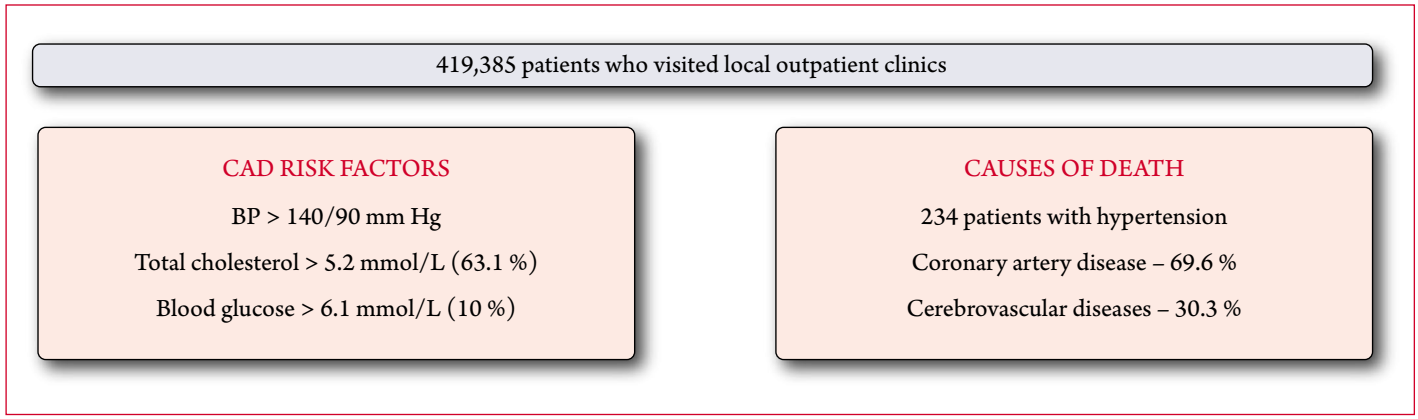
Introduction

Modifiable risk factors (RFs) of coronary artery disease (CAD) include hypertension, elevated cholesterol and high plasma glucose [1]. The same CAD RFs can be called "changing", since they can change for a certain time depending on the nature of nutrition (cholesterol and glucose levels, body

Central Illustration. Risk Factors of Ischaemic Heart Disease in 419 385 Outpatients: a Long-term Comparative Study



mass index), physical activity (glucose, cholesterol, blood pressure, body mass index). There are data on significant variations in the levels of total cholesterol and low-density lipoprotein cholesterol in winter and summer [2].

Finding out the prevalence of CAD RFs over a long period of time (several years) is of significant clinical, social, and economic interest since it allows assessing the trends in the incidence of CAD and the mortality of the population (increase or decrease). The incidence of outpatient visits (local outpatient clinics) is one of the most accessible ways in Russia to assess the prevalence of CAD RFs. This study is devoted to this topic.

Material and Methods

The study was conducted following the Good Clinical Practice and the Declaration of Helsinki. The study protocol was approved by the local ethics committee. CAD RFs were assessed in 419,385 people above the age of 18 who visited local outpatient clinics for various reasons in 2018–2023. The adapted original Portavita system was used to collect and process data [3]. Primary care physicians collected and entered information into the system during outpatient visits. The program was implemented in 68 outpatient clinics with the involvement of 1,601 primary care physicians. Individual data were used: sex, age, systolic and diastolic blood pressure (BP), total cholesterol (TC), plasma glucose, body mass index (BMI).

In a group of patients with BP >140/90 mm Hg, circulatory disease mortality was analyzed: CAD and cerebrovascular diseases from 2019 to 2023. The analysis was carried out using several indicators, including sex, age, BMI, smoking history, presence of diabetes mellitus, systolic and diastolic BP, TC, glucose, glomerular filtration rate (GFR).

Statistical processing of data was carried out using IBM SPSS Statistics v.23.1.1. The compliance of quantitative indicators with the normal distribution was estimated using the Kolmogorov-Smirnov test. Quantitative indicators with normal distribution were presented as the mean values and standard deviations (M±σ). Non-normally distributed quantitative indicators were described using the medians and the lower and upper quartiles (Me [Q1; Q3]). The statistical significance of the differences between quantitative variables was assessed using the Student's t-test for normal distribution and the non-parametric Mann-Whitney U test for non-normal distribution, and the Pearson's χ^2 test was used for the qualitative indicators. Results were statistically significant at $p \leq 0.05$.

All patients were divided to 2 groups: Group 1 included patients who were examined twice – in 2018 and 2022 (n=27,425); Group 2 comprised patients examined in 2022–2023 (n = 391,960).

The following comparisons of the indicators of interest were made: in Group 1 – changes of the studied parameters over 4 years (2018 and 2022); the studied parameters of Group 2 (2022–2023) were compared with the 2018 data of Group 1. Several characteristics were analyzed in deceased patients with hypertension.

Results

Over the 4 years of observation, the percentage of patients with BP > 140/90 mm Hg decreased in Group 1 (35.9%). Moreover, there was a significant decrease in the percentage of patients with blood glucose > 6.1 mmol/L (4.2%). The percentage of patients with TC > 5.2 mmol/L and BMI > 30 kg/m^2 did not change significantly (67.4% and 23.9%, respectively) (Table 1).

In 2022–2023, the percentage of patients with BP >140/90 mm Hg was less than in 2018 (49.7%). Smaller percentages of individuals with TC > 5.1 mmol/L (63.1%) and blood glucose > 6.1 mmol/L (10.6%) were also identified compared to 2018. There was no significant decrease in the percentage of patients with BMI > 30 kg/m^2 (Table 2).

Outcomes of 13,994 patients (47.9% male and 52.1% female) with hypertension were analyzed. Patients with BP > 140/90 mm Hg were not obese (mean BMI 26 kg/m^2), had type 2 DM in only 4.7% of cases, low TC values (a mean of 5.1 mmol/L) and plasma glucose (a mean of 5.1 mmol/L), and preserved renal function (mean GFR 77 mL/min/1.73 m^2) (Table 3).

Two groups of cardiovascular diseases – CAD and cerebrovascular diseases – were selected of all the causes of death of patients with hypertension. During the observation period, 234 patients with a history of hypertension died. CAD was the cause of death of 163 patients, and cerebrovascular diseases – of 71 patients. Table 4 presents the characteristics of patients with hypertension who died of CAD and cerebrovascular diseases.

Discussion

We identified CAD RFs in 419,385 people who visited local outpatient clinics for various reasons in 2018–2023. All patients were divided into 2 groups.

In Group 1, changes of the indicators over 4 years were compared. In this patient group, measures were taken to modify RFs of a non-pharmacological nature (recommendations for lifestyle, physical activity, nutrition), and drug treatment in BP > 140/90 mm Hg. Non-pharmacological measures did not lead to a significant decrease in TC in this group: the percentage of patients TC > 5.2 mmol/L was 68% in 2018 and 67.4% in 2022. At the same time, the percentage of patients with blood glucose > 6.1 mmol/L decreased very significantly from 13% to 4.2%.

ISSN 0022-9040. Kardiologiia. 2024;64(1). DOI: 10.18087/cardio.2024.1.n2060

Table 1. Incidence of cardiovascular risk factors in Group 1 during the follow-up period (n = 27,425)

Parameter	2018	2022–2023
BP > 140/90 mm Hg	66.2 %	35.9 %
TC > 5.2 mmol/L	68 %	67.4 %
Blood glucose > 6.1 mmol/L	13 %	4.2 %
BMI > 30 kg/m²	23 %	23.9 %

BP, blood pressure; BMI, body mass index; TC, total cholesterol.

Table 2. Comparison of risk factors in Group 1 and Group 2

Parameter	Group 1, n = 27,425	Group 2, n = 391,960
BP > 140/90 mm Hg	66.2 %	49.7 %
TC > 5.2 mmol/L	68 %	63.1 %
Blood glucose > 6.1 mmol/L	13 %	10.6 %
BMI > 30 kg/m²	23 %	22.7 %

BP, blood pressure; BMI, body mass index; TC, total cholesterol.

Table 3. Characteristics of patients with hypertension (n = 13,994)

Parameter	Me (Q1; Q3)
Age, years	56 (51; 59)
BMI, kg/m²	26 (24; 30)
DM type 2, %	4.7
TC, mmol/L	5.1 (4.6; 5.8)
GFR, mL/min/1.73m²	77 (68; 89)
Glucose, mmol/L	5.1 (4.6; 5.5)

BMI, body mass index; TC, total cholesterol;
DM, diabetes mellitus; GFR, glomerular filtration rate.

Table 4. Characteristics of patients with hypertension who died of CAD and cerebrovascular disease

Characteristics	CAD (n = 163), Me (Q1; Q3)	Cerebrovascular disease (n = 71), Me (Q1; Q3)	p
Male Female	147 16	60 11	0.21
Age, years	59 (55; 62)	58 (54; 61)	0.17
BMI, kg/m²	27 (24; 30)	27 (24; 31)	0.75
Smoking, %	18.4	16.9	0.78
DM type 2, %	8	8.5	0.9
SBP, mm Hg	140 (130; 145)	140 (130; 145.75)	0.99
DBP, mm Hg	80 (80; 90)	83.5 (80; 90)	0.15
TC, mmol/L	5.2 (4.8; 5.9)	5.05 (4.4; 5.5)	0.09
GFR, mL/min/1.73m²	83.5 (78.25; 93.75)	87 (72.5; 98.75)	0.81
Glucose, mmol/L	5.2 (4.55; 5.9)	5.0 (4.5; 5.85)	0.48

DBP, diastolic blood pressure; BMI, body mass index;
TC, total cholesterol; SBP, systolic blood pressure;
DM, diabetes mellitus; GFR, glomerular filtration rate.

Recommendations on weight loss did not have a significant effect: the percentages of patients with BMI > 30 kg/m² were approximately the same in 2018 and 2022–23% and 22.7%, respectively. In Group 1, antihypertensive treatment for 4 years led to a significant decrease in the percentage of patients with BP > 140/90 mm Hg from 66.2% to 35.9%.

The comparison of the percentages of risk factors in Group 1 (2018) and Group 2 (2022–2023) showed that there was a significant decrease in the percentage of patients with BP > 140/90 mm Hg in 2022–2023 compared to 2018 (49.7% versus 66.2%).

An analysis of lethal outcomes was conducted in the group of patients with BP > 140/90 mm Hg. With low mean levels of TC, the 4-year mortality was 1.6% (234 of 13,944 people). A cardiovascular cause of death was CAD in 69.7%, cerebrovascular diseases in 30.3%. Comparison of the characteristics of patients who died of CAD and cerebrovascular disease did not show a significant difference in any of the indicators of interest (sex, age, BMI, presence of type 2 DM, systolic and diastolic BP, TC, plasma glucose, GFR).

Conclusion

The analysis of data of 419,385 people who visited local outpatient clinics within 4 years showed that:

1) the percentage of patients with BP > 140/90 mm Hg remains high – 49.7%;
2) the percentage of patients with TC > 5.2 mmol/L is 63.1%;
3) the percentage of patients with blood glucose >6.1 mmol/L exceeds 10%.

By targeting primarily on high blood pressure, the most rapid reduction in the effects of common CAD risk factors, including hypertension, dyslipidemia, and obesity, can be achieved. The decrease in the percentage of patients with BP > 140/90 mm Hg from 66.2% to 35.9% over 4 years due to non-drug and drug interventions confirms this thesis.

It should be noted that the database continues to be fed with the examination results of new patients and repeated examinations, which will allow analyzing risk factors and outcomes for several years in a large number of patients.

Funding

No funding was received for this study.

Conflict of interest

A conflict of interest occurred for the employees of OOO PortavitaHealth, Slyuter P., Akimov S. V., and Volsky A. S. Galyavich A. S., Khayrullin R. N., Baleeva L. V., Sabirzyanova A. A., and Galimzyanov A. F. did not declare a conflict of interest.

The article was received 26/09/2023

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ISSN 0022-9040. Kardiologiia. 2024;64(1). DOI: 10.18087/cardio.2024.1.n2060