THE RELATIONSHIP BETWEEN THE INCIDENCE OF CORONARY HEART DISEASE AND ETHNIC MINORITIES

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ABSTRACT

The study aimed at the determination of risk factors, their relationship with the development of stenosing lesions of the coronary arteries in different ethnic groups in Kazakhstan. Primary coronary angiographies of n=640 patients diagnosed with coronary heart disease (CHD) (2017-2019) have been analysed (Almaty, Kazakhstan). The patients were subdivided into: Kazakhs (n=338) and Russians (n=302). In the Russian group, the chance of arterial hypertension incidence was higher (44% and 33%, p<0.05). In the Russian group, the percentage of obstructive CHD was higher than in the Kazakhs (66% and 57%, p<0.05). There was association between obstructive CHD and risk factors such as male sex, diabetes, smoking, and diastolic blood pressure (DBP) in the Kazakhs (p<0.05). In the Russian group, the relationship between development of CHD and age, level of total cholesterol and high-density lipoprotein (HDL) was higher (p<0.05). There is an association between smoking, diabetes, sex, DBP and the development of CHD in Kazakhs. In the Russian group, CHD was associated with risk factors such as older age, dyslipidaemia and arterial hypertension. There were significant ethnic differences in the risk factors and CHD, in the Russian group the probability of development of obstructive CHD was higher. There was an association between smoking, diabetes, sex, DBP and the development of CHD in Kazakhs. In the Russian group, CHD was associated with risk factors such as older age, dyslipidaemia and arterial hypertension. These finding indicate the need to develop differentiated programmes for the screening, preventive measures for different ethnic groups.

Keywords: *Ischemic heart disease, coronary angiography, risk factors, ethnicity.*

INTRODUCTION

According to the World Health Organization (WHO), cardiovascular diseases such as CHD and strokes, are among the leading causes of death worldwide (1).

The development of CHD has been associated with a range of cardiovascular risk factors, including overweight, arterial hypertension, impaired carbohydrate metabolism, dyslipidaemia, smoking, age, male gender, heredity and physical inactivity (2-5). Taking into account the multinational composition of the inhabitants of many countries, ethnicity as a risk factor for the development of CHD remains an open question (6-9).

Up to date, there is a number of reports on the role of ethnic differences as a risk factor of CHD (10-14). For example, European descents in the United States have a less aggressive type of coronary artery disease (according to coronary angiography). It can be explained by a lower incidence of some risk factors for the development of CHD compared to nationalities from other parts of the world (for example, South Asia, India, and Bangladesh). In Israel, there is a more aggressive type of coronary artery disease among the Arab population compared to the non-Arab population. It has been associated with greater exposure of Arabs to certain risk factors and a lower social level. It was shown that some ethnic groups are vulnerable to cardiovascular diseases due to different susceptibility to various cardiovascular risk factors, which is especially important for countries with a multi-ethnic composition of the population (15-17).

Today Kazakhstan is a multi-ethnic state. According to statistical sources, more than 130 nationalities live in the territory of Kazakhstan. In the overall proportion, the main ethnic groups are represented by Central Asians (Kazakhs 61.3%) and Slavs (Russians 23.7%), while representatives of other nationalities make up a small share of residents of the Republic (13.2%) (18-20).

Up to date, a number of studies were carried out on ethnic differences in Kazakhstan for risk factors such as alcohol consumption and smoking (21, 22). It includes the research within the framework of the international study "Intrepid" conducted in Russia, Kazakhstan, and Kyrgyzstan (23). This study encompasses the investigation of risk factors such as arterial hypertension, smoking and overweight. However, these studies did not consider the influence of factors such as dyslipidaemia, the presence of type 2 diabetes mellitus and the state of the coronary arteries that play a critical role in the pathogenesis of CHD (24).

Apart from that, it must be noted that the influence of gender on the development of cardiovascular diseases has been widely discussed in the scientific literature as well (25). Thus, the study of these aspects can provide an insight into the vulnerability of representatives of different ethnic groups to certain risk factors for CHD. In fact, many risk factors for cardiovascular diseases are modifiable (23). So the study of the risk factors, including ethnicity, might help in the early detection and prevention of stenosing coronary lesions.

The objective of this study was to determine the role of risk factors, including ethnic origin and gender in the development of stenosing lesions of the coronary arteries among the population of Kazakhstan.

MATERIALS AND METHODS

Data collection

The prospective cohort study was conducted at the clinic of JSC "Central Clinical Hospital", one of the largest multidisciplinary clinics in Almaty, Kazakhstan.

The dataset was carried out according to the CONSORT criteria [24], from 2017 to 2019. Inclusion criteria were: verified diagnosis of coronary artery disease, primary coronary angiography, and ethnicity identified as Kazakh or Russian.

Patients were diagnosed with coronary artery disease according to standard clinical criteria (26, 27). Of the total number of cases (n = 1,628), 61% (n = 988) of patients were not included in the study for the following reasons: 9% (n = 146) did not meet the criteria by nationality, 52% (n = 842) were previously implanted with a stent and/or had undergone coronary artery bypass grafting. Thus, the study included n = 640 (39%) cases, which were classified by ethnicity: Kazakhs and Russians (Figure 1).

The following demographic characteristics were determined: gender, average age and nationality. Nationality was determined by the passport data of the patients. According to age indicators, patients were divided into 5 age categories: 30-39, 40-49, 50-59, 60-69 and ≥70 years.

We also studied indicators of body mass index (BMI) and the presence of bad habits such as smoking. Smokers (at the time of coronary angiography) were defined as those who smoked at least 1 cigarette per day for at least 1 year, or who quit smoking less than 6 months before hospitalization.

In terms of BMI, a value < 25.0 was regarded as normal body weight, a BMI of 25.0-29.9 was defined as overweight, and a value ≥ 30 as obesity.

Among the comorbidities, the presence of arterial hypertension, obesity, dyslipidemia and type 2 diabetes mellitus was screened for.

Arterial hypertension was confirmed by anamnestic data and registration of systolic blood pressure (SBP) ≥140 mmHg. and/or diastolic blood pressure (DBP) ≥90 mmHg (28).

The criteria for dyslipidemia for patients with coronary artery disease were the levels of total cholesterol (TC) above 4.5 mmol/L, triglycerides (TG) above 1.7 mmol/L, low-

density lipoprotein (LDL) above 2.6 mmol/L, HDL below 1.0 mmol/L in men and 1.2 mmol/L in women (29-31).

The presence of type 2 diabetes mellitus was determined mainly by anamnestic data and the use of hypoglycemic therapy. If necessary, the diagnosis was made on the basis of fasting glucose tests (≥ 6.1 mmol/L for venous blood), glucose tolerance test (≥ 10 mmol/L for venous blood), glycated haemoglobin (HbAlc ≥ 6.5%) (32, 33).

According to the type of hospitalization, the subjects were divided into planned and emergency patients. To assess the state of the coronary vessels, during coronary angiography, the lesion of at least one epicardial coronary artery with stenosis of ≥50% was considered hemodynamically significant, which was determined by computer-digital analysis (34).

Statistical analysis

Statistical processing of results was carried out using the SPSS program, version 21.0, IBM (USA). The selected methods were chi-square for nominal values and frequency indicators, Student's t-test for comparing mean values of interval scales, and binary logistic regression analysis to determine the likelihood of developing stenosing coronary lesions. Differences were considered statistically significant at $p < 0.05$.

RESULTS

Demographic and clinical characteristics of patients with CHD

Demographic and clinical characteristics of patients with CHD were presented in Table 1. N = 640 out of 1,628 patients were included in the study, of which 338 (53%) were Kazakhs and 302 (47%) Russians. The average age of Russians was 65.6 ± 10 years, while this indicator for Kazakhs was 61 ± 1.5 years ($p = 0.001$).

Among the studied age groups in Kazakhs (n = 123; 36%) and in Russians (n = 119; 39%), the highest frequency of coronary artery disease diagnosis falls in the age group 60-69 years. However, there is no statistically significant difference ($p > 0.05$). In the age group ≥70 years, the number of ischemic heart disease cases was significantly higher in Russians (33%) in comparison with Kazakhs (22%) ($p > 0.05$).

In terms of gender, the number of males prevailed in both groups: 66% (n = 424) compared with 34% of females (n = 216) ($p = 0.001$).

By BMI, normal body weight (<25) was determined only in 16% (n = 105) of cases. Overweight was found in almost half the cases (n = 313; 49 %), where this degree of BMI (25-29.9) among Kazakhs (52%) was higher in comparison with Russians (46%). However, BMI ≥30 was more often recorded in Russians (38%) in comparison with Kazakhs (31%) ($p > 0.05$).

Arterial hypertension was recorded in 38% (n = 245) of the patients studied (n = 640). In Russians, hypertension was detected in 44% (n = 133) of cases, which was significantly higher than in Kazakhs (33%; n = 133) ($p = 0.005$). The average SBP and DBP in Russians were comparatively higher (135.0 ± 17.0 and 82.0 ± 8.2 mmHg) in contrast to these indicators in Kazakhs (130.0 ± 16.7 and 80.0 ± 8.2 mmHg), respectively ($p = 0.02$).

Type 2 diabetes was registered in almost 25% of the cases (n = 152). Type 2 diabetes was found in 26% (n = 89) Kazakhs and in 21 % (n = 63) Russians ($p = 0.10$).

There were no statistically significant differences in the presence of DLP in Kazakhs and Russians with indicators equal to 89% and 87%, respectively ($p = 0.60$). According to the indices of the mean values of lipid metabolism, the level of HDL in Kazakhs (1.2 ± 0.4 mmol/L) was significantly higher than in Russians (1.0 ± 0.4 mmol/L) (p = 0.001). Significant differences between Kazakhs and Russians in the mean values of total cholesterol (4.8 ± 1.1 and 4.9 ± 1.1 mmol/L; p = 0.10), LDL (3.1 ± 1.0 and 3.2 ± 0.95 mmol/L; p = 0.19) and TG (1.6 ± 0.9 and 1.5 ± 0.9 mmol/L; p = 0.17) were not detected.

The proportion of smoking patients among Kazakhs and Russians had almost identical indicators (n = 77; 23% and n = 71; 24%; $p > 0.05$).

By the type of hospitalization, the number of planned cases was higher among Kazakhs compared to Russian (67.5% vs. 57%, $p = 0.02$).

According to the results of coronary angiography, significant stenosis of the coronary arteries (≥50%) was more often determined among Russian patients (n = 198; 66%) in comparison with Kazakhs (n = 193; 57%) ($p = 0.03$).

The results of the study of coronary arteries affected by stenosis showed that single-vessel lesions in Kazakhs amounted to 19.5% (n = 66) and in Russians 23% (n = 70) ($p > 0.05$). Two-vascular lesions in the Kazakh group amounted to 18% (n = 61), and in the Russian group 20% (n = 59) ($p > 0.05$), and three-vascular lesions in Kazakhs amounted to 19.5% (n = 66) and in the Russian group 23% (n = 69) ($p > 0.05$).

National differences of the study participants depending on clinical characteristics and gender

National differences of the patients depending on clinical characteristics and gender were indicated in Table 2. In the studied ethnic groups, according to the average age indicator, women were significantly older than men: the average age was 60.6 ± 10.7 years for Kazakh men and 63.7 ± 9.9 years for Kazakh women ($p = 0.016$), and it was 63.5 ± 9.9 years for Russian men and 68.4 ± 10 years for Russian women ($p = 0.001$) .

In terms of lipid metabolism in Kazakh women, the average level of HDL was significantly higher than in Kazakh men (1.1 ± 0.4 and 1.3 ± 0.4 mmol/L; $p = 0.005$). For the rest of the mean values of cholesterol metabolism in Kazakhs, no gender differences were found. In the Russian group, women had significantly higher average total cholesterol levels and HDL cholesterol than men: for Russian women, the total cholesterol level was 5.2 ± 1.2 mmol/L, and for men it was - 4.7 ± 1 mmol/L ($p = 0.001$); the level of HDL in women was 1.1 ± 0.5 mmol/L, and in men it was - 0.9 ± 0.3 mmol/L ($p = 0.001$). No gender differences were found in mean LDL and TG values.

In the Russian group, the average BMI in women was significantly higher than in men (30.6 ± 5.8 and 28.7 ± 4.7 kg/m^2; $p = 0.002$). In the Kazakh group, there were no significant differences in BMI between men (28.7 ± 4 kg/m^2) and women (28.9 ± 4.7 kg/m^2) ($p > 0.05$).

Mean blood pressure indicators did not show significant gender differences in either ethnic group ($p > 0.05$).

The relationship of risk factors with obstructive CHD

Relationship between stenosing coronary lesions and risk factors was presented in Table 3. In the Kazakh group, stenosing was related to risk factors such as male gender ($p = 0.014$), type 2 diabetes mellitus ($p = 0.001$), smoking ($p = 0.001$) and DBP ($p = 0.036$). In the Russian group, stenosing was related to age ($p = 0.011$) and average levels of total cholesterol ($p = 0.014$) and HDL ($p = 0.001$).

Table 1. Demographic and clinical characteristics of patients with CHD

Characteristics	Ethnicity		Total N=640 n (%)	*p*
	Kazakhs	Russians		
	N=338 (53) n (%)	N=302 (47) n (%)		
Age, years				
30-39	7 (2)	3 (1)	10 (1)	
40-49	43 (13)	14 (5)	57 (9)	
50-59	92 (27)	65 (22)	157 (25)	
60-69	123 (36)	119 (39)	242 (38)	
≥70	73 (22)	101 (33)	174 (27)	
Average age, SD	61.0 ± 10.5	65.6 ± 10.0		0.001
Gender				
Male	251 (74)	173 (57)	424 (66)	0.001
Female	87 (26)	129 (43)	216 (34)	
Body mass index				
<25	57 (17)	48 (16)	105 (16)	
25-29.9	175 (52)	138 (46)	313 (49)	
>30	106 (31)	116 (38)	222 (35)	
Co-morbidities				
Arterial Hypertension	112 (33)	133 (44)	245 (38)	0.005
Diabetes Mellitus type 2	89 (26)	63 (21)	152 (24)	
Dyslipidemia	300 (89)	264 (87)	564 (88)	
Smoking				
Current smokers	77 (23)	71 (24)	148 (23)	
Laboratory findings				

Characteristics	Ethnicity		Total N=640 n (%)	*p*
	Kazakhs N=338 (53) n (%)	Russians N=302 (47) n (%)		
LDL ± SD	3.1 ± 1.0	3.2 ± 1.0		
HDL ± SD	1.2 ± 0.4	1.0 ± 0.4		0.001
Cholesterol ± SD	4.8 ± 1.1	4.9 ± 1.1		
TG ± SD	1.6 ± 0.9	1.5 ± 0.9		
Blood pressure				
SBP ± SD	130.0 ± 16.7	135.0 ± 17.0		0.001
DBP ± SD	80.0 ± 8.2	82.0 ± 8.2		0.02
Type of hospitalization				
Urgent	110 (32.5)	131 (43)	241 (38)	
Elective	228 (67.5)	171 (57)	399 (62)	0.02
Stenosis of the coronary arteries				
≥50%	193 (57)	198 (66)	391 (61)	0.03
<50%	145 (43)	104 (34)	249 (39)	
Number of affected coronary vessels				
Non-obstructive disease	145 (43)	104 (34)	249 (39)	
1-vessel disease	66 (19.5)	70 (23)	136 (21)	
2-vessel disease	61 (18)	59 (20)	120 (19)	
3-vessel disease	66 (19.5)	69 (23)	135 (21)	

Table 2. National differences of the patients depending on clinical characteristics and gender

Characteristics, M ± SD	Kazakhs		p	Russians		p
	Male n=251	Female n=87		Male n=173	Female n=129	
Average age*	60.6 ±10.7	63.7 ± 9.9	0.01	63.5 ± 9.9	68.4 ±10.0	0.001
Average BMI*	28.7 ± 4.0	28.9 ± 4.7		28.7 ± 4.7	30.6 ± 5.8	0.002
LDL	3.2 ± 1.1	3.1 ± 0.8		3.1 ±1.0	3.3 ± 1.0	
HDL*	1.1 ± 0.4	1.3 ± 0.4	0.005	0.9 ± 0.3	1.1 ± 0.5	0.001
Cholesterol *	4.7 ± 1.3	4.9 ± 0.9		4.7 ± 1.0	5.2 ± 1.2	0.001
TG	1.6 ± 0.9	1.5 ± 0.7		1.5 ± 0.8	1.6 ± 1.0	
SBP	130 ± 16	131 ± 18		133.7 ± 17.0	136.0 ± 17.8	
DBP	81 ± 8	80 ± 9		81.9 ± 7.4	82.8 ± 9.2	

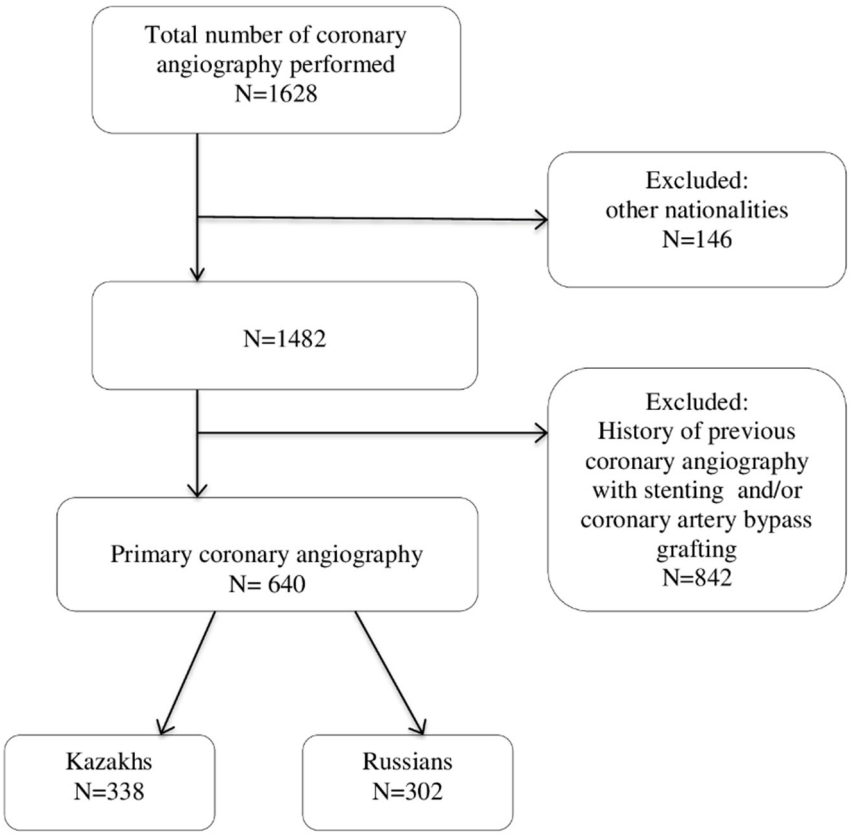
*mean ± SD

Table 3. The relationship of risk factors with obstructive CHD

Characteristics	Kazakh		p	Russians		p
	Non-obstructive (145)	Obstructive (193)		Non-obstructive (104)	Obstructive (198)	
Average age ± SD	60.5 ± 10.8	62.1 ±10.4		64.8 ±10.5	66.0 ± 10.2	0.01
Male sex	94 (65)	157 (81)	0.01	48 (46)	125 (63)	
Arterial Hypertension	47 (32)	65 (34)		40 (38)	93 (47)	
Diabetes Mellitus type 2	25 (17)	64 (33)	0.001	20 (19)	43 (22)	
Dyslipidemia	130 (90)	170 (88)		91(88)	173 (87)	
Overweight	119 (82)	162 (84)		85 (82)	167 (84)	

Characteristics	Kazakh		p	Russians		p
	Non-obstructive (145)	Obstructive (193)		Non-obstructive (104)	Obstructive (198)	
Current smokers	17 (12)	60 (31)	0.001	17 (16)	54 (27)	
Average BMI ± SD	28.9 ± 4.5	28.6 ± 4.0		29.9 ± 5.2	29.4 ± 5.4	
LDL ± SD	3.1 ± 0.9	3.2 ± 1.1		3.3 ± 0.9	3.2 ± 0.9	
HDL ± SD	1.2 ± 0.4	1.1 ± 0.4		1.3 ± 0.5	0.9 ± 0.3	0.001
Cholesterol ± SD	4.8 ± 1.2	4.7 ±1.2		4.9 ± 1.3	4.8 ± 1.1	0.01
TG ± SD	1.5 ± 0.8	1.6 ± 0.9		1.5 ± 1.0	1.5 ± 0.8	
SBP ± SD	130.0 ± 16.8	130.0 ±16.6		132.1 ± 17.2	136.2 ± 17.5	
DBP ± SD	81.5 ± 7.6	80.0 ± 8.7	0.03	82.5 ± 8.3	82.0 ± 8.2	

Fig. 1. Flow chart of study participants' recruitment.



DISCUSSION

The prevalence of major risk factors of cardiovascular disorders has geographic and ethnic variability. It has been demonstrated that the contribution of one or another risk factor to cardiovascular morbidity and/or mortality in different populations can differ significantly (35-38).

The aim of our study was to determine the differences in traditional risk factors between the two main ethnic groups living in the Republic of Kazakhstan: Russians and Kazakhs. The study analyzed the association between risk factors and the state of the coronary blood system based on angiography.

The widespread use in routine medical practice of modern methods of revascularization results in changing the initial picture of coronary arteries. In this regard, we excluded from observation patients with a known state of the coronary arteries.

In our study assessment criteria of the structure of risk factors consist of: lipid metabolism disorders (88%), overweight (83%), male sex (66.3%), arterial hypertension (38%), diabetes mellitus (23.8%) and smoking (23%).

According to our obtained results the Russian group, patients were on average older compared to Kazakhs. In the Russian group there is an association between age and the incidence of coronary artery disease (especially in women). Considering the relatively low percentage of patients aged ≥70 years in the Kazakh vs. Russian group, the higher mortality from coronary heart disease in younger age categories is not excluded.

It has been thought that the cardiovascular risk in women is less than in men. This may be due to the fact that estrogen regulates the cardiovascular inflammatory response and metabolism, as well as the survival and hypertrophy of cardiomyocytes and stem cells by activating the estrogen receptor (ER), and the pleiotropic effects of estrogen on the cardiovascular system are often beneficial (39). However, according to the international study INTERHEAT, females develop the first signs of morbidity only later than in men (on average 10 years) (3). After this, the incidence of ischemic heart disease is steadily growing among women. The results of our study indicate that the incidence of coronary artery disease among women in the Russian group is higher than in the Kazakh. According to other studies (25), this can be explained by the fact that with age, there is a certain levelling of risk factors between men and women (in our case, in the Russian group).

According to our observations, arterial hypertension is a more pathognomonic risk factor for the Russian and Kazakh group, and in average blood pressure, which are significantly higher in the Russian group than in the Kazakh group. No significant gender differences were found in average BP in either ethnic group. These findings coincide with the data of previous studies (40, 41). This circumstance is most likely complex and multicomponent. The peculiarities of the way of life (first of all, a diet with a large amount of salt) adopted by the Russian population are one of these factors, since genetically Russians living in these conditions are less adapted to such characteristics. And the degree of lifestyle acceptance and satisfaction can vary from country to country (40, 41).

Lipid metabolism disorders are similar in Kazakhs (88.8%) and Russians. According to our data, the main differences relate to the average HDL values, which are significantly higher in the Kazakh group than in the Russian group. By gender division, the highest average level of HDL is observed in Kazakh women; in Russian men this indicator is the lowest, while Russian women and Kazakh men are approximately the same. This circumstance suggests that it is the HDL level that is the decisive factor in the development of coronary artery disease. The relatively high level of HDL in Kazakhs may be associated with a nomadic cultural and historical feature (42, 43). For example, nomads ate primarily meat and much less plant-based food (44), which developed a kind of adaptation mechanism (45-47).

In terms of our observations, no ethnic differences were found for a factor like overweight. But it can be noted that in the Russian group, in terms of the average BMI, women are included in the category of obesity compared to men. In the Kazakh group, the average BMI of both men and women is almost the same and is classified as overweight. According to previous studies, overweight indicators progress with age and women are more prone to obesity than men (41), which we observe in the Russian group of our study. An earlier study examined the effect of a low-calorie diet and aerobic exercise on cardiovascular risk factors and predicting the risk of coronary heart disease among obese African Americans (48). After a 6-month program including a low-salt and fat diet and aerobic exercise, according to the Framingham risk calculator, the 10-year risk decreased from 6% to 4% in women and from 16% to 13% in men. This was achieved by improving BMI (kg/m2), waist circumference, blood pressure, LDL and HDL (48). The implementation of similar programs that take into account the cultural characteristics of minority groups can significantly improve the state of the cardiovascular system and reduce the risk of coronary heart disease in the population at risk.

Apart from that, no ethnic differences were detected between the Kazakh and Russian groups in terms of risk factors such as diabetes mellitus and smoking. According to previously published reports, in rural areas, the Russian population smokes more than the Kazakh (21, 41). In our case, the absence of a difference may be associated with the urban conditions of the observed population.

Analysis of coronary angiography showed that representatives of Russian nationality are more susceptible to stenosing coronary lesions than Kazakhs. The results demonstrated that the non-obstructive type of CHD predominates in the Kazakh group that may be associated with damage of the microvasculature or a vasospastic variant of CHD (49, 50). Besides, it is impossible to exclude the factor of over-diagnosis in the Kazakh group.

According to the results of our study, the chance of detecting obstructive CAD in the Kazakh population is higher in males. In addition, we observed the presence of such risk factors as diabetes mellitus, smoking, and dependence on the level of DBP among Kazakhs.

For the Russian group, the chance of detecting stenosing lesions of the coronary system increases with age, depending on the level of total cholesterol and HDL cholesterol.

Considering that type 2 diabetes is a systemic, metabolic disease, the absence of obstructive lesions in persons suffering from it in any ethnic group, in our opinion, is a matter of time and depends on the duration and severity of diabetes mellitus (51).

In a study conducted in Iran, when studying the risk factors for CAD development, it was noted that the severity and risk factors of CAD vary among different ethnic groups in this country (52). Other studies also note the need for additional research to fully understand the differences in CVD risk, prevention and treatment to improve outcomes in our increasingly diversified population, with a high focus on raising awareness of practitioners on this issue (53).

To summarize, we identified ethnic differences in risk factors such as age, gender, and hypertension with mean SBP and DBP, as well as in HDL. It must be noted that in the Kazakh group patients tended to be younger. In addition, the male population dominated in the Kazakh group. Moreover, the average level of HDL was higher in Kazakhs (especially among women).

The Russian group was significantly older. The incidence of hypertension was more common for Russians. In this group, the average indicators of SBP and DBP were higher, compared with the Kazakh group. The average level of HDL was lower, particularly in men.

We hypothesize that due to climatic, geographical, social and cultural-historical conditions of Kazakhstan, both nationalities developed similar adaptive mechanisms. Therefore, the ethnic differences in this study were not clearly pronounced in comparison with previously published reports.

Nevertheless, the observed differences can make an additional contribution to the optimization and improvement in the diagnosis and treatment of CHD. It could be done through more aggressive and effective screening, treatment and controlling of risk factors.

Ethnic differences were determined by factors such as gender, age, and arterial hypertension, HDL levels. In the Russian group, in comparison with the Kazakh, the probability of detecting stenosing lesions of the coronary arteries during angiographic examination was higher. The results showed that for the Kazakh group, the following risk factors play an important role in the development of CHD: smoking, diabetes mellitus, and male sex. At the same time, age, lipid metabolism indicators (total cholesterol and HDL) and arterial hypertension are more important for the Russian group. These findings indicate the need to develop differentiated programmes for the screening, treatment and prophylactic measures for different ethnic groups of the population, thereby ensuring optimal treatment for all.

This one-time study was carried out at one medical institution. We did not consider risk factors such as heredity, physical activity, diet, level of apolypo-proteins due to incomplete information. Also, limitations include an incomplete reflection of the severity of coronary atherosclerosis, data on indicators such as lipid spectrum and blood pressure, which can dynamically change under the influence of diet and/or drug correction. Unfortunately, we did not have the possibility of long-term monitoring of these indicators, therefore, data were provided at the time of the initial angiographic examination.

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ETHICS APPROVAL AND CONSENT TO PARTICIPATE

The study was approved by the Local Ethics Committee of the S.D. Asfendiyarov Kazakh National Medical University, Almaty, Republic of Kazakhstan (No. 5 (82) of 04.24.2019). Informed consent was obtained from all patients..

CONFLICTS OF INTEREST

The authors declare no conflict of interest.

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