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Ethnic, gender and age differences between the prevalence of risk factors and progression of cerebrovascular disease in elderly and senile individuals with chronic cerebral ischemia

ABSTRACT

The authors have made comparative analysis of the prevalence of risk factors of cerebrovascular disease in elderly and senile persons living in the Republic Sakha (Yakutia) and suffering chronic ischemia of the brain depending on ethnicity, age and gender. It is shown that from these criteria ethnicity has great importance in the development of hypertension, atherosclerosis, coronary heart disease, diabetes and alcoholism.

Keywords: ethnicity, elderly and senile age, gender, Republic Sakha (Yakutia).

Many epidemiological studies established the risk factors for cerebrovascular disease [6,10,14,16,17,18,19,23,24,25].

According to modern concepts, risk factors are potential health hazards of behavioral, biological, ecological, genetic and social features of the environment, which increase the likelihood of developing the disease, its progression and poor outcome [11].

According to modern concepts, cerebral vascular disease, which is an important medical and social problem, have a multifactorial nature and depend on heredity [18].

Statistical reports on mortality, as well as epidemiological studies, have revealed differences in the incidence of cardiovascular disease and related deaths in different countries, and showed the importance of ethnic and racial identity. [12] Specific therapeutic and preventive measures in some regions suggest assessing the impact of various risk factors in the development of cerebrovascular diseases, while also accounting for geographical and ethnic aspects [5].

Major risk factors for cardiovascular disease, which we revealed in the Yakuts and other Siberian populations, differ from those of other groups, who were also in transition from traditional way of life and diet [1,4].

It is known, that hypertension and atherosclerosis are significant factors of morbidity, which reduces the average life expectancy [13]. As the main cause of cerebrovascular disease, these conditions [3] have largest share in mortality and disability [8, 9], and at the same time, there are significant differences in the prevalence of these conditions in different regions of Russia [7, 15, 21], but the reasons for its development and features of target organ damage in the northerners are not well understood [20,22].

Statistical processing of the results of the study were carried out using SPSS 19.0 package applications. The average value with standard deviation for qualitative data were calculated. Qualitative features are presented in the form of frequency tables containing absolute and relative values of feature fraction (percent). Accordance to the laws of the distribution of quantitative traits to meet the normal distribution we performed using the Kolmogorov-Smirnov test. The results showed that the distribution of the investigated parameters differed significantly from the normal distribution. Considering it, we performed further statistical analysis using non-parametric tests. For comparison of the mean values of the studied parameters we used Mann-Whitney paired test.

To study the conjugation of qualitative features we calculated Pearson's classic chi-square, and in cases where the expected rate in more than 20% of contingency tables cells was less than 5, we calculated Pearson's chi-square corrected by Yates continuity.

The threshold level of significance for all statistical tests was p value <0. 05.

MATERIALS AND METHODS

The study included 522 patients with chronic cerebral ischemia (CCI) with I and II stages.

We used the diagnostic criteria for CCI developed by Institute of Neurology of the Russian Academy of Medical Sciences (1985), the formulation of diagnosis was made according to the International Classification of Diseases, 10th edition. Based on the goals and objectives of this study all patients were divided into 3 groups, according to the region of residence and nationality. According to the classification E.V. Schmidt (1985), each group was further divided into subgroups depending on the stage of CCI. Subgroup A included patients with CCI stage I, and subgroup B - patients with CCI stage II (CCI I and CCI II).

Group I consisted of 174 patients of Even (indigenous population of Arctic region) nationality (subgroup A and B each consisted of 87 people) living in the Arctic zone. Group II included 177 patients of Yakut nationality (subgroup A - 90 patients, subgroup B - 87) living in Vilyuisky zone. Group III consisted of 171 patients of Russian nationality (subgroup A - 86 patients, subgroup B - 85) living in the city of Yakutsk. These areas are not identical in their environmental and ecological features, and inhabitants are different in the way of life, especially food, employment and the level of civilization.

Arctic zone is inhabited by small-numbered peoples of the North – the Evens, Evenks, Chukchi, Yukagirs. This area is more environmentally mild. The inhabitants of this region have predominantly consume traditional food, including meat and fish, rich in unsaturated fatty acids, vitamins and mineral components, and a variety of plants.

Studies conducted by E.G. Egorov and V.R. Darbasov (the Institute of Regional Economy of the North) (2008) together with the specialists from the Institute of Nutrition (Russian Academy of Medical Sciences), revealed the high content of polyunsaturated fatty acids omega-3, omega-6 and vitamin E in the meat of young Yakut breed horse, cattle and deer, which has cholesterol-lowering effect.

In Vilyui region, home to the indigenous population - the Yakuts, in recent years gained rapid development of the diamond mining industry. The ecological balance of this region was disturbed, with irreversible changes in the environment, which negatively affected people's health. Vilyuy Dam and chemical pollutants that are used for industrial processing components of diamondiferous kimberlite consisting of aluminum silicates, calcium-manganese and iron-containing rocks, oxides of titanium, chromium, nickel, magnesium and others, significantly worsened the water quality of Vilyuy river. Multiple excess of maximum permissible concentration (MPC) of organic substances: phenol - 2-7 times higher, oil products - 4 times, nickel - 4-7 times, copper and zinc - 2 times, aluminum and manganese - 20 times, chromium, lead, iron - 7 times higher or more was found (P.G. Petrova, 2005). Analysis of the research carried out by laboratories of the Institute of Applied Ecology of the North (Academy of Sciences of Sakha (Yakutia) Republic) (2005) revealed the excess number of MPCs in the soil too.

RESULTS AND DISCUSSION

Based on the objectives of the study, risk factors of the onset and progression of cerebrovascular disease in each group was studied (Table 1).

An analysis of risk factors showed that hypertension is a leading factor in the development and progression of CCI, and occupies a leading position among all subgroups, with a statistical significance rate significantly lower in group I patients. It is well known that atherosclerosis is a major cause of premature aging, disability and mortality in older people. Dyslipidemia in our study is the second largest risk factor and often occurs with high statistical significance among representatives of Group III. Heart disease prevailed in the subgroup A in Russian - 45.1% vs 25.5% and 29.4% of patients groups I and II, and in the subgroup B Yakuts - 38% vs 26.8% and 35.2% of the patients I and III groups. However, a comparison of the results in the subgroup B had no statistical significance. Obesity, one of the risk factors, was more common in the "newcomers" in both subgroups.

However, the observed differences in subgroup B were not statistically significant. In the subgroup A of diabetes mellitus (DM) was more common in representatives of group III. In the subgroup B DM was more common in III, then II groups, and almost never found in group I, the representatives of indigenous population of the North, who has maintained a long tradition of food, which almost never included sugar. Family history of DM was observed more frequently in patients of Group II in both subgroups, increase in patients of group II in subgroup B were not statistically significant. Analysis of the socio-cultural factors indicates a high prevalence of smoking and alcohol abuse among patients in both subgroups of Group I. However, the predominance of northerners in subgroup B was not statistically significant. It is believed that smoking leads to a more rapid development of early atherosclerosis and the formation of hemodynamically significant stenoses of the extracranial arteries (318). Smoking was more prevalent in subgroup A in 54.1% vs 32.4% and 13.5% representatives II and III groups in a subgroup of B in 55.6% vs 28.9% and 15.6% respectively.

The distribution of risk factors by age group is shown in Table 2. As can be seen from the table, all the risk factors, in addition to coronary heart disease, found in both subgroups in the elderly. Heart disease in the subgroup B was dominated by the representatives of old age. Apparently, this is due to the predominance of "young" patients in our study.

Comparative analysis of risk factors for cerebrovascular disease according to age, as shown in Table 6, with the evaluation of χ^2 criteria shows statistical relationship between age and arterial hypertension (χ^2=7,473, p=0.0024), dyslipidemia (χ^2=7,473, p=0.006) , coronary heart disease (χ^2=7,473, p=0.018), obesity (χ^2=7.473, p<0.008), DM (x^2=7.473, p<0.004). Thus, the greater the age, the more pronounced these risk factors.

Non-modifiable risk factor - heredity - is more common in more "young" patients and is independent of age (χ^2=0,473, p=0,45). Perhaps it is because a person with a family history of cardiovascular system and cerebrovascular diseases, do not live to old age. Analysis of the socio-cultural factors also did not reveal connection between age and harmful factors (smoking χ^2=0,570, p=0.45 and alcohol χ^2=0,254, p=0.614).

Thus, the risk factors associated with age, the distribution of major risk factors also depend on age. Highest correlation of risk factors was found in ethnicity: hypertension (χ^2=8,066, p=0.018), coronary heart disease (χ^2=4,504, p=0.034), obesity (χ^2=6,398, p=0.041), dyslipidemia (χ^2=38,867, p=0.000), diabetes mellitus (χ^2 =14,214, p=0.001), alcohols (χ^2=16,982, p=0.000), smoking (χ^2=13,126, p=0.001), and heredity is not related to ethnic group (χ^2=5,319 p=0.070). However, when you consider the stage of CCI, with the worsening of chronic cerebrovascular insufficiency, an association between heredity and CCI was (χ^2=6,268, p=0.044). Of interest is the distribution of risk factors associated with the development of the disease, depending on the gender.

The analysis of gender-sensitive features, regardless of the ethnicity, showed a high frequency of occurrence with statistical significance (p<0.05) in women with coronary heart disease (57.2% vs. 42.8% of men, χ^2=5,928, p=0.015), obesity (72.6% vs. 27.4%, respectively, χ^2=5,215, p=0.022), diabetes (60% vs. 40% respectively), and alcoholism in men (74% vs. 26% of females, x^2 = 17.897, p=0.000). The rest of the gender differences risk of occurrence were unreliable, which included arterial hypertension (52.8% women and 47.2% in men, p>0.05) and harmful risk factors - smoking (56.1% women and 43.9% men, p>0.05) and family history of cerebrovascular disease (80% in females and 20 males, p>0.05).

With the worsening of the CCI stage the frequency of risk factors of cerebrovascular disease in patients with this pathology increases. This is evidenced by a comparative analysis of risk factors, depending on the stage of cerebrovascular disease of this disease with the use of the Mantel-Hentzel criterion of conditional independence. Thus, as can be seen from Table 3, the chance of transition from the first to the second stage, is very high in patients with hypertension, dyslipidemia, coronary heart disease. Obesity, diabetes, bad habits and heredity do not depend on the severity of CCI.

An interesting fact is that the distribution pattern on the number of risk factors, depending on gender, ethnicity, age is as follows: one woman has an average of 2.0 risk factors, male - 2.04, Even - 1.69; Yakut -2.06; Russian - 2.28, senior - 2.04 and elderly - 1.97.

CONCLUSIONS

Thus, in our study, we concluded that a CCI is mainly result of factors such as atherosclerosis and hypertension.

Each ethnic group has its own unique risk factors. The high incidence of coronary heart disease and hypertension in the Russians may be attributed to poor adaptability of the organism to the harsh climatic conditions of Yakutia. The high incidence of cardiovascular diseases among the Yakuts may be associated with urbanization and the departure from the traditional way of life.

And behavioral risk factors such as alcohol and smoking have been found in the Evens, the indigenous population of the North, which may indicate a lack of explanatory and preventive activities.

Family history of cardiovascular disease was recorded mainly in the Yakuts. In addition, it traces the relationship of the main risk factors with age. The analysis of conjugation showed that gender identity influenced as well at the prevalence of major risk factors.

Table 1.

Indicators of risk factors for cerebrovascular disease in groups and subgroups of observations

Comparison groups		CCI stage I				CCI stage II			
		I	II	III	Total	I	II	III	Total
Hypertension	n	47*	52*	57*	156	62	63	73*	198
	%	30,1	33,3	36,5	100	31,3	31,8	36,9*	100
CHD	n	13	15	23*	51	19	27	25	71
	%	25,5	29,4	45,1*	100	26,8	38,0	35,2	100
Obesity	n	14	17	25*	56	20	21	27	68
	%	25,0	30,4	44,6*	100	29,4	30,9	39,7	100
Dyslipidemia	n	12*	45*	49*	106	36*	66*	68*	170
	%	11,3*	42,5*	46,2*	100	21,2*	38,8*	40,0*	100
DM	n	2	2	10*	14	2*	8	11*	21
	%	14,3	14,3	71,4*	100	9,5*	38,1	52,4*	100
Alcohol	n	7	5	0	12	11*	3	1*	15
	%	58,3	41,7	0,0	100	73,3*	20,0	6,7*	100
Smoking	n	20*	12	5	37	25*	13	7*	45
	%	54,1*	32,4	13,5*	100	55,6*	28,9	15,6*	100
Heredity	n	1*	8	5	14	4	8	4	16
	%	7,1*	57,1	35,7	100	25,0	50,0	25,0	100

Note: in the Tabl. 1 and 2 asterix is $p<0.05$, at the analysis of contingency pairwise comparisons with Bonferroni correction frequencies, $p>0.05$ in the remainder

CHD – coronary heart disease, DM – diabetes mellitus

Table 2.

Distribution of cerebrovascular disease risk factors by age

Comparison groups		Hypertension		CHD		Obesity		Dyslipidemia		DM		Alcohol		Smoking		Heredity	
		n	%	n	%	n	%	n	%	n	%	n	%	n	%	n	%
CCI I	60-74	93	59,6	26	51	42*	75*	67	63,2	12*	85,7*	8	66,7	20	54,1	8	57,1
	75-89	63	40,4	25	49	14*	25*	39	36,8	2*	14,3*	4	33,3	17	45,9	6	42,9
	Total	156	100	51	100	56*	100*	106	100	14	100	12	100	37	100	14	100
CCI II	60-74	105	53,0	33	46,5	45*	66,2*	97	57,1	13	61,9	8	53,3	23	51,1	13*	81,3*
	75-89	93	47,0	38	53,5	23*	33,8*	73	42,9	8	38,1	7	46,7	22	48,9	3*	18,8*
	Total	198	100	71	100	68*	100*	170	100	21	100	15	100	45	100	16	100

Table 3.

Mantel-Hanzel criterion in CCI

Risk factor	M-H	Likelihood ratio	Odds ratio	X^2	*p*
Hypertension	16,740	17,722	1,526-3,279	17,549	0,000
CHD	4,249	4,704	1,042-2,305	4,688	0,03
Dyslipidemia	32,537	33,990	1,982-4,034	3,609	0,000
Obesity	1,508	-	0,878-1,972	1,774	1,83
DM	1,201	-	0,78-3,158	1,618	2,03
Smoking	0,84	-	0,8-2,062	1,077	0,2
Alcohol	0,19	-	0,59-2,803	1,402	0,52
Heredity	0,053	-	0,559-2,451	0,776	0,675

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