Blood Pressure and Obesity among Rural Indigenous Population of Yakutia

V.I. Fedorova, T.M. Klimova, M.E. Baltakhinova, V.G. Krivoshapkin

ABSTRACT

The frequency of hypertension and obesity in a sample of the rural indigenous population (457 people aged 20 years and older) of the Republic Sakha (Yakutia) was studied. It was found that 40% of the surveyed population had arterial hypertension. Obesity was revealed in 14% of males and 19% of females, abdominal obesity in 42 and 55%, respectively. Blood pressure level positively correlates with body mass index and the waist circumference. Information content of these indicators at identifying individuals with high risk of hypertension did not differ. The prevalence of abdominal type of obesity requires the study of its contribution to morbidity and mortality from chronic non-communicable diseases, constitutional features of a given population and the subsequent possible development of specific ethnic criteria for obesity.

Keywords: blood pressure, indigenous population, body mass index, waist circumference, obesity.

INTRODUCTION

Hypertension (HP) in the Republic of Sakha (Yakutia), as in the whole of the Russian Federation, is one of the main causes of cardiovascular diseases and their complications. According to Statistical data taken in the Republic of Sakha (Yakutia) for the period from 2000 to 2012, the prevalence of cardiovascular diseases increased from 102,7 to 256,0, including diseases associated with high blood pressure from 30,2 to 109,5 by 1000 the adult population [3]. This is due both to improved diagnosis and prevention of health, aging and the deterioration of his health.

Obesity is the major risk factor of hypertension. In the Framingham study, it was shown that the levels of systolic (SBP) and diastolic blood pressure (DBP) increased with growing body mass index, and in the follow-up period, 70% of new cases of hypertension occurred against the background of obesity [9].

In this context, the aim of the study was to examine the levels of blood pressure among indigenous rural population of Yakutia and it is relationship with obesity.

MATERIALS AND METHODS

Cross-sectional epidemiological study was carried out among rural indigenous population of Yakutia (p. Berdigestjah, Gorny district). In fact 457 people aged 20 years and older (248 women and 209 men) indigenous ethnic groups of Yakutia (yakuts, evens, evenks) were examined. The average age of the population studied was 44,9±14,7 years: women - 44,4±13,7 years, men - 45,6±15,7 years (p=0,328).

The research project approved by the local Committee for Bioethics at the Yakutsk Scientific Center complex medical problems SB RAMS (extract from the report №23 of 25/5-2010).

According to the research program double measurement of blood pressure (BP) was conducted on the right arm in a sitting position with an accuracy of 2 mm Hg. To exclude the impact of physical and emotional factors on blood pressure prior to the measurement for 5 min surveyed were in a state of rest. Taken were the average results of the two measurements of blood pressure.

Hight was measured to the nearest 0,1 cm, body mass using bioimpedance analyzer «Tanita SSC 330» (Japan) - up to 0,1 kg. Waist circumference (WC) was measured in the standing position in the middle of the distance from the bottom edge of the costal arch to the iliac

crest, up to 0,1 cm; body mass index (BMI) was calculated using the formula: BMI = body weight (kg) / height $(m)^2$.

The criteria for the study:

1. Hypertension criteria were established by VNOK in 2008 [1]. The group of persons with hypertension also included people who were taking antihypertensive medications during the survey period or stop taking them within less than 2 weeks before the survey, regardless of the measured blood pressure.

2. For the criterion of overweight BMI values taken corresponding to 25,0-29,9 kg/m^2, obesity - ≥30 kg/m^2, abdominal obesity - the IDF criteria for Asian populations (waist circumference greater than 80 inches in women and 90 cm in men).

Statistical analysis of the material was performed using the package IBM SPSS Statistics 19. A statistical test criterion was applied to verify the correct distribution of quantitative traits using the Kolmogorov-Smirnov adjusted Lilliefors and Shapiro-Wilks test in each subgroup analysis, compared to the sub-groups - the test for equality of variances. During scanning it was decided to use the comparison of independent groups nonparametric Mann-Whitney and Kruskal-Wallis tests. Comparison of groups was carried out by attributes using the four-field tables with calculation criterion χ^2. Descriptive statistics is presented as the median (Me) and interquartile distribution (Q25-Q75). The critical level of significance (p) was assumed to be 5%.

RESULTS AND DISCUSSION

To characterize the distribution of blood pressure among 457 surveyed those who took antihypertensive medications (119 people) were excluded. In the study of population, and the median interquartile swings in blood pressure corresponded to the category "normal" and "high normal" (Table 1). SBP was significantly higher in men (p=0,03), diastolic blood pressure differences did not reach statistical significance (p=0,07). In both gender groups, SBP and DBP in older age groups were significantly higher than in the young subjects (p <0,001). Women ages above of 40 the median waist circumference met criteria for abdominal obesity. There were no gender differences in the values of body mass index (p=0,84) in both groups from the age of 40 years, the median figure was in the category of "overweight."

In a comparative analysis with other northern populations, it was found that the average blood pressure and anthropometric indicators of the rural population of Yakutia, the data are similar to those of other indigenous northern territories (Alaska, Greenland, Canada, Sweden) [4, 5, 9, 10, 11,13, 14, 16]..

Table 1

25 (14%) of 177 and 28 women (20%) of the 142 men who were not taking antihypertensive medications had higher blood pressure (p=0,149). The frequency of hypertension including those receiving antihypertensive medications was (n=119), 39,5% (Table 2). Obese (body mass index) is set at 19% of women and 14% of men (p=0,202). Attention is drawn to the high frequency of abdominal obesity, even among young people.

Table 2

Previous studies have shown that waist circumference and body mass index are associated with an increased risk of cardiovascular diseases [2, 15].

To assess the strength and direction of the relationship of blood pressure with a waist circumference and body mass index rank was held by Spearman correlation analysis. Direct correlation between the studied variables was revealed (Table 3). Along with this, each of these features are also positively correlated with the age of the patients (p <0,001). In order to mitigate the effect of age on the relationship studied partial correlation analysis (controlled variable - age)

was held. It was found that the correction does not change the direction of the age of communication, but the strength of association between these variables to some extent is due to the influence of age of patients.

Table 3

According to the results of the study it was found that the frequency of hypertension was significantly dependent on body weight category of persons surveyed (Fig. 1). For example, elevated levels of blood pressure were observed in 51% of men with a body mass index over 25 kg/m^2 and 37% of low and normal birth weight (p=0,04), in women the corresponding figures were 53 and 18%, respectively (p<0,001).

Fig. 1. Frequency of hypertension in different categories of body mass index (kg/m^2)

Elevated blood pressure was observed in 53% of men with abdominal obesity and 36% - with a waist circumference of less than 90 cm (p=0,07) among women of hypertension was significantly more frequent among those with central type of obesity (51 and 19%, respectively, p<0,001).

Several studies have shown that the waist circumference is a more informative measure for the risk of hypertension and cardiovascular complications than BMI [6, 7]. To answer the question of which of these indicators can be used in this population to highlight the risk for hypertension, ROC-curves were constructed. It was classified as a variable passed the presence or absence of hypertension. As a result the analysis showed that the area under the curve was 0,62 for BMI in men and 0,71 in women for the waist – 0,65 and 0,73 respectively (Fig. 2). In addition, no statistically significant differences between the areas under the curves in both gender groups were found (p>0,05).Therefore, for a given sample values of waist circumference and BMI one observes the same information content in the allocation of risk for hypertension.

Fig. 2. ROC-curves for the identification of individuals with hypertension

CONCLUSIONS

The study showed a high incidence of hypertension among rural indigenous population of Yakutia. One of the factors contributing to the development of hypertension in this population is obese. Revealed prevalence of abdominal type of obesity requires the study of constitutional features of the above population, its contribution to morbidity and mortality from chronic non-communicable diseases, and the subsequent possible development of ethnic-specific criteria for obesity.

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Information about authors:
Fedorova Valentina Ivanovna, Ph.D., Senior Scientist of group monitoring and prevention of cardiovascular disease Institute of Health of Northeastrn Federal University after named MK Ammosov, Yakutsk, Russia
Contact: 677010, Sergelyakhskoe Shosse 4, C-2, tel. 84112353275, e-mail: vifedorova@rambler.ru
Klimova Tatiana Mikhailovna, Ph.D., Head of group monitoring and prevention of cardiovascular diseases Institute of Health of Northeastrn Federal University after named MK Ammosov, Yakutsk, Russia
Contact: 677010, Sergelyakhskoe Shosse 4, C-2, tel. 84112353275, e-mail: tklimova@rambler.ru
Baltakhinova Marina Yegorovna, Head of department Functional diagnostics Institute of Health of Northeastrn Federal University after named MK Ammosov, Yakutsk, Russia
Contact: 677010, Sergelyakhskoe Shosse 4, C-2, tel. 84112353275, e-mail: bmeg@mail.ru
Krivoshapkin Vadim Grigorievich, M.D., professor, Director Institute of Health of Northeastrn Federal University after named MK Ammosov, Yakutsk, Russia
Contact: 677010, Sergelyakhskoe Shosse 4, C-2, tel. 84112353275, e-mail: vgr.krivoshapkin@s-vfu.ru

Table 1

Blood pressure levels* and anthropometric measures depending by sex and age (years)

Data	20-39 years old		40-59 years old		60 year and older		20 years and older	
	n	Me (Q25-Q75)	n	Me (Q25-Q75)	n	Me (Q25-Q75)	N	Me (Q25-Q75)
Women								
SBP, mm Hg	71	109 (100-111)	96	121 (110-133)	10	121 (120-124)	177	112 (106-126)
DBP, mm Hg	71	70 (62-75)	96	76 (68-83)	10	71 (68-81)	177	72 (66-80)
WC, cm	76	76 (69-86)	132	85 (78-94)	24	84 (79-89)	232	82 (74-91)
BMI (weight/height^2)	76	23 (20-28)	133	27 (23-30)	24	26 (24-26)	233	25 (22-29)
Men								
SBP, mm Hg	60	115 (110-123)	65	120 (108-137)	17	131 (114-144)	142	119 (110-131)
DBP, mm Hg	60	71 (66-80)	65	76 (70-87)	17	73 (70-81)	142	75 (68-81)
WC, cm	67	83 (76-92)	87	89 (81-97)	43	89 (82-97)	197	87 (80-96)
BMI (weight/height^2)	67	24 (21-27)	88	26 (23-29)	42	25 (23-28)	197	25 (22-28)

Note: * - among those not taking antihypertensive medications; SBP, DBP - systolic, diastolic blood pressure; WC - waist circumference, BMI - body mass index.

Table 2

The frequency of hypertension and obesity by sex and age

By age group	Hypertension		BMI≥30 кг/м2		abdominal obesity	
	N	n (%)	N	n (%)	N	n (%)
Women						
20-39 years old	76	10 (13,2)	76	10 (13,2)	76	27 (35,5)
40-59 years old	136	59 (43,4)	133	33 (24,8)	132	83 (62,9)
60 year and older	27	18 (66,7)	24	1 (4,2)	24	17 (70,8)
20 years and older	**239**	**87 (36,4)**	**233**	**44 (18,9)**	**232**	**127 (54,7)**
Men						
20-39 years old	67	13 (19,4)	66	7 (10,6)	67	19 (28,4)
40-59 years old	89	40 (44,9)	88	16 (18,2)	88	44 (50,0)
60 year and older	43	32 (74,4)	43	5 (11,6)	42	20 (47,6)
20 years and older	**199**	**85 (42,7)**	**197**	**28 (14,2)**	**197**	**83 (42,1)**

Table 3

The coefficients of correlation between the level of blood pressure and anthropometric measurements

Variables	Men			Women		
	n	r	p	n	r	p
Paired correlation analysis						
SBP& age	198	0,444	<0,001	239	0,624	<0,001
DBP & age	198	0,237	0,001	239	0,414	<0,001
BMI & age	198	0,181	0,011	235	0,347	<0,001
WC & age	198	0,242	0,001	234	0,388	<0,001
SBP & BMI	193	0,304	<0,001	230	0,420	<0,001
SBP & WC	193	0,315	<0,001	229	0,430	<0,001
DBP & BMI	193	0,321	<0,001	230	0,399	<0,001
DBP & WC	193	0,318	<0,001	229	0,381	<0,001
Partial correlation analysis (controlled variable age)						
SBP & BMI	189	0,250	<0,001	226	0,237	<0,001
DBP & BMI	189	0,307	<0,001	226	0,254	<0,001
SBP & WC	189	0,249	<0,001	226	0,233	<0,001
DBP & WC	189	0,291	<0,001	226	0,226	0,001

Note: r-correlation coefficient; SBP, DBP - systolic, diastolic blood pressure; WC - waist circumference; BMI - body mass index.