The Prevalence and Structure of Arterial Hypertension and the Role of Apolipoproteins in its Development

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Abstract

The analysis of the inspection of the employees of Uzagrotehmash JSC was performed. A total of 1495 people aged 25-75 years have been examined (average age 46.3±0.3 years). The frequency of hypertension was 598 people. High blood pressure was recorded more often in women (25.9%) than in men (16%), hypertension is much more common at the age of 44-60 years and older, and hypertension has been found to be common in overweight people (31, 6%), a large proportion was found in the structure of hypertensive patients with hypodynamia (50.2%). Among the protesters, 26.9% of people know about high blood pressure, but do not treat it, and in 20.0%, high blood pressure was detected for the first time. The role of serum lipoproteins in the hypertension development was confirmed, which allows patients to be assigned to a high-risk group for the formation of cardiovascular diseases in subsequent life periods.

Keywords: *Blood pressure, risk factors, hypertension, dyslipidemia, prevention, risk, apolipoproteins A1 and B.*

Introduction

Arterial hypertension is a serious public health problem due to a further increase in its prevalence, as well as a lack of adequate control[1]. The prevalence of arterial hypertension in economically developed countries is 20-50% and is one of the main factors of disability and mortality in the population[2]. At the same time, the continuing increase in the incidence rate and the defeat of people of an increasingly young age makes cardiovascular diseases a major medical and social problem.[3]

Arterial hypertension leads to myocardial infarction and stroke, hear and renal failure[4]. Blood pressure at the preclinical stage in most cases is increased moderately, which is accidentally detected during preventive examinations[5].

Official statistics in assessing the disease prevalence are based specifically on the reversibility analysis, when the fact of the disease has already happened, and preventive measures are not so effective[6]. The registered incidence rate in the adult population is 2.3 times lower than the actual prevalence of this pathology. Thus, the appealability analysis does not allow us to evaluate the entire scope of the problem facing practical healthcare[7]. The most complete picture of the disease prevalence, its structure, severity can be given by epidemiological studies, and new preventive technologies development suitable for a specific age group can be realized only by analyzing a real existing epidemiological situation[8].

The situation is complicated by inadequate hypertension control in the population. At the same time, it is known that effective control of high blood

pressure reduces cardiovascular morbidity and mortality in patients with arterial hypertension. However, other factors influence the prognosis of the disease, which is reflected in the classification of arterial hypertension[6].

Epidemiological studies conducted in various countries showed the presence of ethnic characteristics in the prevalence of cardiovascular diseases[1]. The presence of these features, in addition to lifestyle, culture, environmental factors, etc., is determined, among other things, by genetics, whose role in the formation of cardiovascular pathology has been convincingly proved[4]. An important place in the development of cardiovascular diseases is occupied by overweight and metabolic disorders associated with it, smoking, stress, lack of exercise[2,5].

According to statistics, in Uzbekistan, among the causative factors of disability and mortality are diseases that occur with an increase in blood pressure[6].

Serum lipid values are the main tools for risk stratification in dyslipidemia. Serum cholesterol concentrations of low-density lipoproteins (LDL cholesterol) and high density (HDL cholesterol) are the most used lipid classes for this purpose[7]. Meanwhile, the quantitative indicators of LDL and HDL particles - apolipoproteins B (ApoV) and A1 (ApoA1), may be better risk markers than their cholesterol concentrations - LDL cholesterol and HDL cholesterol and the atherogenicity index (AI) traditionally used in domestic medicine[8].

Based on the foregoing, the study of the arterial hypertension prevalence and its risk factors, the creation of an adequate system for the prevention of cardiovascular diseases seems relevant for public health of the Republic of Uzbekistan.

The Aim of Research: To study the prevalence of arterial hypertension and risk factors for its development, using the example of Uzagrotehmash JSC employees examination, as well as assess the possibility of different classes of serum lipids in predicting its development.

Materials and Method

A total of 1,495 people aged 25-75 years have been examined (average age 46.3±0.3 years). The response was 63% (942 people) for men and 37% (553 people) for women. The quality control of the received information was carried out. Only representative data were selected for the analysis. Data is standardized by age structure.

The survey included: a survey on a standard questionnaire to identify passport data, level of education, profession, information about physical activity, the presence of bad habits, chronic noncommunicable diseases and their treatment, blood pressure measurements, anthropometry, it was found out whether a person knows about his blood pressure and if it is increased - is treated or not.

Blood pressure was measured twice on the right hand in a sitting position after 5 minutes of rest. The average of 2 measurements was analyzed as the level of systolic and diastolic blood pressure (SBP and DBP). The following criteria for arterial hypertension were used: SBP is equal to or greater than 140 mm Hg. Art. and/or DBP is equal to or greater than 90 mm Hg. Art., or the patient receives antihypertensive therapy.

The list of factors that were taken into account when assessing the risk of developing cardiovascular complications in patients with arterial hypertension included: age over 55 for men and 65 for women, smoking, obesity, low physical activity (NPA), lower-secondary education associated with low social status. Active smokers included people who smoked more than 100 cigarettes during their life and who currently smoke every day or sometimes, as well as people who smoke now less than once a week. Passive smoking was recorded in the presence of smoking relatives living with respondents. Overweight was recorded with a body mass index (BMI)> 25.0 kg/m2, including obesity - with a BMI> 30.0 kg/m2.

The level of total cholesterol (TC), high density lipoprotein cholesterol (HDL cholesterol) and triglycerides (TG) were determined in blood serum taken in the morning on an empty stomach after 12-14 hours of hunger on the EPOLL-20 semi-automatic analyzer (Austria). Reagents of the Human company (Germany) were used. The study included 111 people, 62 of them - the main group, 49 patients - the control group. The average age of the patients of the main group was 42.0±2.0 years, the age of the control group was 41.3±2.0 years. Criteria for inclusion of patients in the main group: the presence of arterial hypertension.

Statistical analysis of the results was performed using method of variation statistics. The significance of differences in the means was estimated based on Student's test at a 95% confidence interval ($p < 0.05$).

Results and Discussion

A comparative analysis of the arterial hypertension prevalence revealed a high prevalence of arterial hypertension among both men and women in all age periods.

The frequency of hypertension was 598 people, which corresponds to 67.7% for women (405 people) and 32.3% for men (193 people). Among them, 26.9% of people (161 people) are aware of high blood pressure, but are not treated, and 20.0% (120 people) were diagnosed with high blood pressure for the first time.

When studying the structure of arterial hypertension, it draws attention that increased blood pressure was recorded more often in women (25.9%) than in men (16%) ($p < 0.05$).

Age gradation was performed according to the classification of the World Health Organization (2012), the following age groups were identified: 18-44 years (youth); 44-60 years (average age) and 60-75 years (old age).

A comparative analysis of the frequency of hypertension occurrence depending on age is presented in table 1.

Table 1: The hypertension prevalence (in %) and the age of people in the studied groups

Age	Men		Women		Total	
	Abs.	%	Abs.	%	Abs.	%
Youth	32	16,6	53	13,1	85	14,2
Average age	68	35,2*	136	33,6*	204	34,1*
Elderly age	93	48,2*	216	53,3*	309	51,7*
Total	193	32,3	405	67,7	598	100,0

Note: *Reliability of data by a young age (P<0,05)

As can be seen from the data presented, most patients with hypertension are in advanced age (60-75 years). With increasing age, both among women and among men, the incidence of hypertension increases ($r = 0.569$ and $r = 0.609$, respectively).

The study revealed that arterial hypertension is often found in overweight people - 189 (31.6%) (Table 2). Hypodynamia was observed in almost half of the examined patients with hypertension (50.2%). Among patients with hypertension, the frequency of stressful situations occurrence is 54.5%, with women being more likely than men (62.5% and 37.8%, respectively). Dyslipidemia as one of the risk factors was noted in 41.5% of cases. Smoking was recorded in 37.5% of cases, in men in 95.3% of cases. A similar picture is observed in the analysis of alcohol abuse cases (9.4% and 29.5%, respectively).

Associations of cardiovascular risk factors with the prevalence of hypertension were evaluated using logistic regression. For this, the most significant risk factors were selected that have a reliable association with the prevalence of hypertension, regardless of age and gender, namely: body mass index ($p < 0.05$), alcohol abuse ($p < 0.05$), current smoking and past ($p < 0.05$), lack of exercise ($p < 0.05$), dyslipidemia ($p < 0.05$), stress ($P < 0.05$). In multiple logistic regression, risk factors affecting the prevalence of hypertension, regardless of age and gender: present and past smoking ($p > 0.05$), dyslipidemia ($p > 0.05$) did not reach statistical significance and were excluded from the analysis. The final model of risk factors affecting the prevalence of hypertension, regardless of age and gender, was body mass index ($p < 0.05$), stress ($p < 0.05$), and physical inactivity ($p < 0.05$).

Table 2: The prevalence of risk factors (in %) in the studied groups

Leading factors	The number of patients examined					
	M (n=193)		W (n=405)		Total (n=598)	
	n	%	n	%	n	%
Smoking	184	95,3	40	9,9	224	37,5
Hypodynamia	47	24,4	253	62,5	300	50,2
Overweight	25	13,0	164	40,5	189	31,6
Dyslipidemia	82	42,5	166	41,0	248	41,5
Stress	73	37,8	253	62,5	326	54,5
Alcohol abuse	57	29,5	38	9,4	95	15,9

In the study of blood lipid parameters revealed significant differences between the studied groups (table 3).

Table 3: Indicators of the lipid spectrum of blood plasma

Lipid Profile	Main Group (n = 62)	Control Group (n = 49)
Total cholesterol (mmol/l)	5,59±1,2	3,65±0,1*
Triglycerides (mmol/L)	1,9±1,1	0,71±0,03*
LDL cholesterol (mmol/L)	3,96±1,44	1,78±1,6*

Lipid Profile	Main Group (n = 62)	Control Group (n = 49)
Apolipoprotein B, g/l	1,07±0,02	0,73±0,01*
HDL cholesterol (mmol/L)	0,767±0,21	1,78±0,26*
Apolipoprotein A1, g/l	1,31±0,06	1,7±0,02*

Note: * P<0,01

The level of total cholesterol in the main group was significantly higher than in the control group (p <0.001), mainly due to an increase in atherogenic lipid fractions. At the same time, the average level of HDL cholesterol in the main group was below the normative values (p <0.001). Levels of lipoproteins A1 and B were significantly different in groups (<0.001).

Deviations in HDL cholesterol (36%) and TG (26%) were most often recorded, which is a marker violation of lipid metabolism in hypertension. Deviations in the concentration of ApoA1 were found in 24%, only 22% had deviations in the concentration of TC, this reflects the significance and necessity of studying the full lipid spectrum in patients with obesity. Increases in the concentration of LDL cholesterol and Apo B were recorded in 14% of patients in the main group. At the same time, 17.7% of patients (11 people) had normal lipid profile, thus, more than 80% of patients with hypertension had secondary lipid metabolism disorders.

The basis of atherogenesis is subendothelial deposition of particles containing LDL cholesterol[13]. Secondary dyslipidemia in hypertension is highly atherogenic for several reasons: small dense LDL particles are not effectively captured by the liver using LDL receptors, an increased number of circulating LDL particles increases the risk of their deposition in the subendothelial matrix, and a decrease in HDL content limits the reverse transport of cholesterol from tissue to liver.

The analysis showed that the ratio of ApoB/ApoA1 is a reliable predictor of atherogenesis in patients with hypertension and can be used to predict the disease development. The highest sensitivity and specificity corresponded to the value of the ratio ApoB/ApoA1 equal to 0.45.

Thus, with values of this lipid index greater than 0.45, it can be reliably assumed that this person is at risk for the hypertension development.

Conclusion

1. Arterial hypertension is a common disease - 40%. Among men, this disease occurred with a frequency of 32.3%, among women - 67.7%.
2. In the structure of arterial hypertension, both men and women in all studied age intervals revealed the presence of risk factors - overweight, physical inactivity and stress.
3. It is necessary to perform preventive examinations among the population, which will allow to identify the initial stages of arterial hypertension, and people with overweight, with physical inactivity and who have undergone stress should be considered a risk group for the hypertension development.
4. Among individuals at risk for the hypertension development, it is necessary to conduct a full lipid screening, including an assessment of the apolipoproteins A1 and B level.

Ethical Clearance: No ethical approval is needed.

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Conflict of Interest: Nil

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