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The Profile of Drug Treatment in Subjects Aged Over 50 Years with Hypertension in an Urban Russian Population

Objective — To analyze a profile of hypotensive drug therapy in patients with arterial hypertension (AH) aged 55–84 in a sample of urban population at a current period of time (2015–2017).

Materials and Methods — AH is a leader among risk factors of cardiovascular diseases (CVD) due to its high prevalence and serious prognosis. Despite the availability of effective hypotensive drugs and guidelines on AH treatment, 50% of patients do not achieve blood pressure (BP) goals. Knowledge about drug correction of AH in the Russian population is limited to clinical studies. Taking into account changing approaches in management of patients with AH, the population-based evaluation of hypotensive treatment if relevant. A random population sample of males and females aged 55-84 (n=3.898) was evaluated in Novosibirsk in 2015-2017 (international project, Health, Alcohol and Psychosocial Factors in Eastern Europe (HAPIEE)). AH was diagnosed in presence of systolic BP ≥140 mm Hg or diastolic BP ≥90 mm Hg and/or treatment with hypotensive drugs within the recent two weeks. Regular intake of medication for 12 months was evaluated with coding according to the Anatomic Therapeutic Chemical Classification System (ATX/ATC).

Results — In the population sample aged 55–84, AH prevalence was 80.9%, and 21.1% of persons with AH did not receive drug therapy. Hypotensive medicines included (total/as a part of combination therapy) angiotensin-converting enzyme (ACE) inhibitors (42.3%/25.3%), angiotensin II receptor blockers (ARBs) (30.3%/18.9%), diuretics (22.6%/20.4%), calcium channel blockers (20.2%/16.1%), and beta-blockers (34.7%/27.6%). 45.7% of people with AH received a combination therapy. Effective BP control was achieved in 23.4% of AH patients and in 29.6% of patients receiving a hypotensive therapy. In the group of ineffective BP control, the proportion of females was lower, AH duration was longer, and blood glucose was higher than in the group of effective control.

Conclusion — In the sample of urban population aged 55–84 in 2015–2017, each fourth participant with AH and each third participant using hypotensive drugs achieved effective BP control. The therapy profile in AH patients included recommended drug classes. However, combination therapy was used insufficiently (50% of AH patients). By frequency of use, ACE inhibitors were on the first place, beta-blockers were on the second place, ARBs were on the third place, diuretics were on the fourth place, and calcium channel blockers were on the fifth place, which differed from the guidelines (the difference from the recommended priority ranking is that the drugs taking the first places in the guidelines were in fact on the 3rd and 4th places in their actual frequency of use). 20% of persons with AH did not receive hypotensive therapy, which significantly contributed to the insufficient BP control in the population.

Keywords — Arterial hypertension; hypotensive therapy; medicinal products; population; cohort of the HAPIEE project

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Hypertension is a leading risk factor for cardiovascular diseases (CVDs) due to its high prevalence and prognostic significance [1]. As of 2015, about 1.13 billion people worldwide suffered hypertension [2], the complications of which cause 10 million deaths a year [3]. Increasing life expectancy in the global population is accompanied by its aging and higher susceptibility to the development of CVDs [4]. The prevalence of hypertension also increases with age [5]; the total number of patients with hypertension is predicted to reach 1.5 billion people by 2025 [6].

The independent relationship between increased blood pressure (BP) and the risk of myocardial infarction (MI), cerebral stroke, sudden death, heart failure, peripheral atherosclerosis, and chronic kidney disease [7] has been shown in epidemiological and clinical studies and meta-analyses in patients across a wide age range and different ethnic groups [8, 9]. At the same time, reducing BP showed a demonstrated favorable effect on the incidence of cardiovascular complications.

Despite the availability of guidelines on treating hypertension [5, 10, 11] and effective and safe antihypertensive drugs, the control of hypertension is very complicated. About 50% of patients, on average, do not reach target levels of BP [5]. Compliance with recommendations for the prevention of CVDs has been assessed in the EUROASPIRE I–V [12], NHANES [13, 14], and ESSE-RF [15, 16] studies. Data on the effectiveness of pharmacological correction of hypertension in the Russian population have been obtained mainly via clinical studies. Population-based studies require evaluation in different regions and across diffeent age ranges. Continuous monitoring is also relevant as approaches to the treatment of hypertension are changing.

The objective of the study was to analyze the profile of drug therapy for hypertension in a population-based sample (Novosibirsk) of hypertensive patients aged 55–84 years in 2015–2017.

Materials and Methods

Data from the population-based cohort (Health, Alcohol, and Psychosocial factors In Eastern Europe, HAPIEE international project, Novosibirsk) were used for the study. The object of analysis was the sample of patients from the 3rd screening held during the period of 2015–2017 (n=3,898, 55–84 years old). The study was approved by the ethics committee of the Research Institute for Internal and Preventive Medicine, Siberian Branch of the Russian Academy of Sciences. All subjects signed an informed consent form

The study was cross-sectional in design. The study protocol included the epidemiological assessment of CVDs and their risk factors [17]: standardized questionnaires (history of hypertension and diabetes mellitus [DM] and their treatment, history of CVDs and other chronic diseases, smoking, alcohol consumption, social and demographic characteristics) and objective measurements (anthropometric measurements, BP, electrocardiography [ECG], levels of serum lipids and glucose) were used.

BP levels were measured three times using an OMRON M-5 tonometer on the right hand in a sitting position after a 5-minute rest, with 2-minute intervals between measurements. The mean value of three measurements of the office BP was calculated [5]. Hypertension was diagnosed by epidemiological criteria with the levels of systolic blood pressure (SBP) ≥140 mmHg or diastolic blood pressure (DBP) ≥90 mmHg and/or by the administration of antihypertensive drugs within the previous 2 weeks. The following epidemiological categories of hypertension were used:

1) effective control of BP: SBP <140 mmHg and DBP <90 mmHg during the antihypertensive therapy within the previous 2 weeks;
2) inadequate control of BP: SBP >140 mmHg and DBP ≥90 mmHg during the antihypertensive treatment within the last 2 weeks;
3) patients with hypertension not receiving antihypertensive therapy;
4) patients not aware of the presence of hypertension.

The waist-to-hip ratio (WHR) and body mass index (BMI) were calculated using this formula:

$$BMI\ (kg/m^2) = body\ weight\ (kg)/height^2\ (m).$$

A person who smoked at least one cigarette a day was classified as a smoker. The Graduated Frequency Questionnaire (GFR) was used to assess alcohol consumption [18]. Five groups were identified according to frequency of consumption: abstainer, less than once a month, 1–3 times a month, 1–4 times a week, 5 or more times a week.

A 12-lead ECG was recorded on a Cardiax device (Hungary) using the Minnesota code (MC) [19].

Blood samples were collected on an empty stomach. The serum levels of total cholesterol, triglycerides, high-density lipoproteins, and glucose were measured by the enzymatic method using a KoneLab 300 analyzer. The levels of low-density lipoproteins were calculated using the Friedewald formula. The formula of the European Association for the Study of Diabetes (EASD) (2007) was used to convert fasting serum glucose to plasma glucose (PG):

$$PG\ (mmol/L) = -\ 0.137 + 1.047 \times serum\ glucose\ levels\ (mmol/L)$$

Coronary artery disease (CAD) was established by the epidemiological criteria of a CHD-positive score on the Rose Angina Questionnaire (exertional angina or ischemic ECG changes of MC classes 1, 4, and 5) or a history of MI, acute coronary syndrome, or coronary revascularization (documented hospitalization). CVDs were established in the presence of CAD according to the specified criteria or a history of stroke/transient ischemic attack (documented hospitalization). DM was established if there was a history of treated DM and/or if levels of PG on an empty stomach were ≥7 mmol/L [20].

The regular administration of antihypertensive drugs in the previous 12 months was evaluated irrespective of drug

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dosages. The drugs were coded according to the Anatomical Therapeutic Chemical Classification System (ATC) [21]. The analysis included the first-line drugs: inhibitors of angiotensin-converting enzyme (ACE), angiotensin II receptor antagonists (ARA), diuretics, calcium-channel blockers, beta-blockers and alpha-blockers, centrally acting antihypertensive drugs, and vasodilators.

Three cardiologists performed coding. The reproducibility of the drug classes was estimated in pairs by the double-blind method in the 10% random subgroup. The mean Cohen's kappa coefficient was 0.84.

At the first stage, 3,138 patients with hypertension were included in the analysis; of these, 2,476 received specific drugs (documented) or unspecified antihypertensive therapy (undifferentiated therapy). At the second stage, we excluded from the analysis 269 patients who did not specify their medications (2,207 patients were included in this stage). In the third stage, another 27 patients with technically incomplete measurements of BP were excluded; the treatment was analyzed in 2,182 patients in the groups of effective and inadequate therapy of hypertension.

Table 1. Characteristics of the study population-based sample (n=3,881, male and female patients, 55–84 years old, Novosibirsk)

Parameter	Total sample	Male	Female	p*
Examined number	3,881	1,491 (38.42)	2,390 (61.58)	—
Age, years	69.29 ± 6.89	69.02 ± 6.94	69.46 ± 6.85	0.053
SBP, mmHg	145.73 ± 21.31	146.89 ± 20.63	145.0 ± 21.69	0.007
DBP, mmHg	83.64 ± 11.38	85.81 ± 11.83	82.27 ± 10.87	<0.001
HR, bpm	71.75 ± 11.41	71.35 ± 12.15	72.01 ± 10.91	0.087
BMI, kg/m2	29.48 ± 5.49	27.78 ± 4.59	30.55 ± 5.73	<0.001
WHR	0.90 ± 0.08	0.95 ± 0.07	0.87 ± 0.07	<0.001
TC, mmol/L	5.46 ± 1.19	5.17 ± 1.14	5.65 ± 1.19	<0.001
LDL, mmol/L	3.46 ± 1.06	3.28 ± 0.99	3.58 ± 1.08	<0.001
HDL, mmol/L	1.32 ± 0.39	1.24 ± 0.38	1.38 ± 0.38	<0.001
Triglycerides, mmol/L	1.49 ± 0.92	1.44 ± 0.89	1.52 ± 0.94	<0.007
PG, mmol/L	6.33 ± 1.81	6.41 ± 1.83	6.29 ± 1.8	0.042
Hypertension, abs. (%)	3,138 (80.9)	1163 (78)	1975 (82.6)	<0.001
Treatment of hypertension (among patients with hypertension), abs. (%)	2,476 (78.9)	761 (65.4)	1715 (86.6)	<0.001
CAD, %	572 ± 14.9	260 ± 17.6	312 ± 13.2	<0.001
DM, %	800 ± 20.8	297 ± 20.1	503 ± 21.2	0.427
Treatment of DM (among patients with DM), abs. (%)	469 (58.6)	140 (47.1)	329 (65.4)	<0.001
CVDs, abs. (%)	768 (20)	336 (22.7)	432 (18.3)	<0.001
Menopause, abs. (%)	–	–	2356 (98.6)	–
Smoking, abs. (%)				
• Smokers	713 (18.6)	571 (38.7)	142 (6.0)	<0.001
• Former smokers	512 (13.4)	407 (27.6)	105 (4.5)	
• Nonsmokers	2,608 (68)	499 (33.8)	2,109 (89.5)	
Frequency of alcohol consumption, abs. (%)				
• 2–4 times a week	46 (1.2)	39 (2.6)	7 (0.3)	<0.001
• Once a week	412 (10.7)	325 (22)	87 (3.7)	
• 1–3 times a month	835 (21.8)	444 (30.1)	391 (16.6)	
• Less than once a month	1,606 (41.9)	411 (27.8)	1,195 (50.7)	
• Abstainers	934 (24.4)	258 (17.5)	676 (28.7)	
Education, abs. (%)				
• Primary	243 (6.3)	85 (5.7)	158 (6.6)	<0.001
• Vocational	1060 (27.3)	332 (22.3)	728 (30.5)	
• Secondary	1246 (32.1)	476 (31.9)	770 (32.2)	
• Higher	1332 (34.3)	598 (40.1)	734 (30.7)	
Family status, abs. (%)				
• Single	1532 (39.9)	229 (15.4)	1303 (55.2)	<0.001
• Married	2307 (60.1)	1250 (84.6)	1057 (44.8)	

The data are given as M ± SD or n (%). p*, comparison between two sexes. The Mann–Whitney nonparametric test was used for the means.
SBP, systolic blood pressure; DBP, diastolic blood pressure; HR, heart rate; BMI, body mass index; WHR, waist-hip ratio; TC, total cholesterol; LDL, low-density lipoproteins; HDL, high-density lipoproteins; PG, plasma glucose; CAD, coronary disease; DM, diabetes mellitus; CVDs, cardiovascular diseases.

Statistical analysis of data obtained was carried out using the SPSS v.13.0 software package. Data are presented as the mean and standard deviation (M ± SD) and as proportions (%). The odds ratio in the groups was compared using the Pearson's chi-squared test and the Cochran-Mantel-Haenszel test. Quantitative comparisons were made using the analysis of variance (ANOVA) method. The Mann-Whitney test was used for abnormal distribution. Cohen's kappa coefficient was used to estimate the reproducibility of coding of the drug classes by two experts. The differences were considered to be statistically significant with two-tailed p<0.05.

Results

The study sample (patients 55–84 years old) is presented in Table 1.

The mean age was 69.3 years and did not differ significantly between male and female patients. The 10-year distribution was uniform in the 55–64 and 65–74 decades, with a smaller proportion of examined patients aged 75 years old or older (15%). Male patients had higher levels of SBP and DBP (p=0.007, p<0.001, respectively), WHR, PG levels, higher rates of CHD and CVDs, smoking, and alcohol consumption than female patients (p<0.001 in all cases). Female patients had higher BMI, blood lipid levels, and a higher rate of hypertension and antihypertensive therapy than male patients; had a comparable prevalence of DM (about 20%) with a greater frequency of blood glucose-lowering therapy; and more often had low levels of education and were single (p<0.001 in all cases).

The prevalence of hypertension in the sample was 80.9% and was higher in female patients than male patients (82.6% vs. 78%, respectively; p<0.001). Antihypertensive therapy was administered to 78.9% of patients with hypertension, female patients more often than male patients (86.8% vs. 65.4%, respectively; p<0.001); 21.1% of patients with hypertension did not receive drug therapy. The target levels of BP (<140/90 mmHg) were obtained with the effective control of BP in 23.4% of patients with hypertension, in female patients more often than in male patients (28.4% vs. 15%, respectively; p<0.001; Table 2).

Patients with hypertension took the following antihypertensive agents (total/part of combination therapy): ACE inhibitors, 42.3%/25.3% of examined patients; ARA, 30.3%/18.9%; diuretics, 22.6%/20.4%; calcium-channel blockers, 20.2%/16.1%; beta-blockers, 34.7%/27.6%; and other classes, 0.1% – 1.5%. About 11% of patients reported receiving antihypertensive agents without specifying.

Table 2. Rate of antihypertensive therapy and the distribution of the main antihypertensive drug classes in patients with hypertension (population-based sample, 55–84 years old; n=3,881)

Parameter	Total	Male	Female	p
Examined number	3,881	1,491	2,390	
Hypertension, abs. (%)	3,138 (80.9)	1,163 (780)	1,975 (82.6)	<0.001
Antihypertensive therapy in patients with hypertension (total), abs. (%)	2,476 (78.9)	761 (65.4)	1,715 (86.8)	<0.001
No antihypertensive therapy, abs. (%)	662 (21.1)	402 (34.6)	260 (13.2)	<0.001
Proportion of the specified antihypertensive therapy, abs. (%)	2,207 (89.1)	659 (86.6)	1,548 (90.3)	0.007
Proportion of undifferentiated antihypertensive therapy, abs. (%)	269 (10.9)	102 (13.4)	167 (9.7)	0.007
Antihypertensive therapy with effective control (in patients with hypertension, total), abs. (%)	734 (23.4)	174 (15.0)	560 (28.4)	<0.001
Antihypertensive therapy with effective control (in treated patients), abs. (%)	734 (29.6)	174 (22.9)	560 (32.7)	<0.001
Classes of the general group of antihypertensive drugs, n=2,476				
Combination antihypertensive therapy, abs. (%)	1,132 (45.7)	282 (37.1)	850 (49.6)	<0.001
ACE inhibitors, abs. (%)	1,048 (42.3)	329 (43.2)	719 (41.9)	0.440
Part of combination therapy, abs. (%)	626 (25.3)	166 (21.8)	460 (26.8)	0.010
Angiotensin II receptor antagonists, abs. (%)	750 (30.3)	164 (21.6)	586 (34.2)	0.000
Part of combination therapy, abs. (%)	468 (18.9)	84 (11.0)	384 (22.4)	<0.001
Calcium-channel blockers, abs. (%)	501 (20.2)	134 (17.6)	367 (21.4)	0.037
Part of combination therapy, abs. (%)	399 (16.1)	103 (13.5)	296 (17.3)	0.024
Beta-blockers, abs. (%)	860 (34.7)	261 (34.3)	599 (34.9)	0.861
Part of combination therapy, abs. (%)	681 (27.6)	183 (24.0)	498 (29.0)	0.013
Diuretics, abs. (%)	559 (22.6)	130 (17.1)	430 (25.1)	<0.001
Part of combination therapy, abs. (%)	505 (20.4)	113 (14.8)	392 (23.6)	<0.001
Centrally acting antihypertensives, abs. (%)	36 (1.5)	5 (0.7)	31 (1.8)	0.029
Alpha-blockers, abs. (%)	3 (0.1)	3 (0.4)	0	0.009
Vasodilators, abs. (%)	7 (0.3)	1 (0.1)	6 (0.3)	0.349

p, comparison between sexes, the Pearson's chi-squared test; BP, blood pressure; ACE, angiotensin-converting enzyme.

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Combined antihypertensive therapy was administered to 45.7% of patients with hypertension and 52.5% of patients who specified the medication (Figure 1). Two drugs (maximum five) prevailed; the most common combinations were ACE inhibitor + beta-blocker (22.0%), ARA + beta-blocker (16.2%), and ACE inhibitor + diuretics (15.2%). Female patients received combination therapy more often than male patients (p<0.001).

In Table 3, the main classes of antihypertensive drugs in groups with effective and inadequate control of BP are compared.

The rate of administration of ACE inhibitors (p=0.003) and calcium-channel blockers (p=0.035) was higher in the group with ineffective control of BP; the rate of administration of combination therapy in the two groups did not differ. In the group with effective control of BP, the rate of administration of beta-blockers, including as part of combination therapies (p=0.009), was to the contrary, higher, and there was a trend to a higher rate of administration of ARA (p=0.087). The groups with effective control versus inadequate control of BP did not differ in the frequency of administration of diuretics, total combination therapy, mean number of drugs, or the rate of undifferentiated therapy. In the assessment of factors potentially affecting the effectiveness of BP control, the groups did not significantly differ by age, anthropometric characteristics, levels of blood lipids, or the incidence of CAD, DM, and CVDs. However, in the group of inadequately controlled hypertension, there was a significantly smaller proportion of female patients (67% vs. 76%, respectively; p<0.001), a longer history of hypertension (>12 years in 82%; p<0.001), and higher levels of blood glucose (p=0.049).

Discussion

The prevalence of hypertension in the population-based sample of male and female patients aged 55–84 years old (Novosibirsk) was 80.9%. Drug therapy was not administered in 20% of patients with hypertension. The target levels of BP (<140/90 mmHg) were obtained with the effective control of BP in every fourth patient with hypertension and every third patient receiving antihypertensive therapy. Female patients effectively controlled BP more often than male patients.

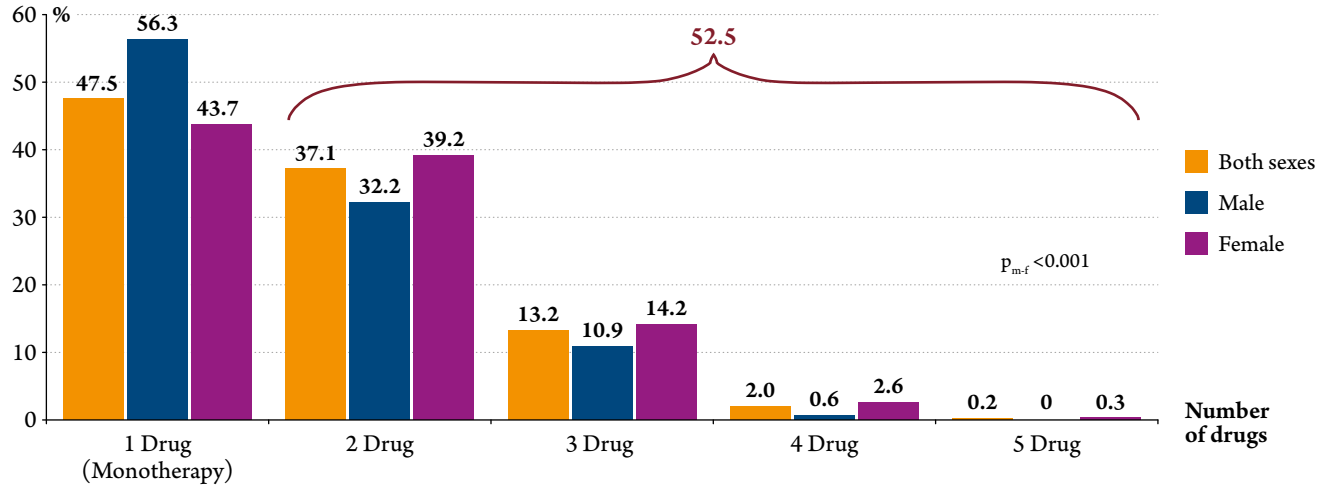
In the fifth stage of the EUROASPIRE study of secondary prevention of CVDs in Europe (2016/2017) [12], 15% of patients with recent coronary events who had hypertension did not receive treatment, and only 54% achieved the target levels of BP. In the population-based Tromso

Table 3. Rate of the use of the main classes of antihypertensive drugs in groups with effective and inadequate control of blood pressure (population-based sample, 55–84 years old)

Parameter	Effective control of BP	Inadequate control of BP	p
Antihypertensive therapy in general, abs.	734	1,715	–
Specified antihypertensive drug, abs. (%)	653 (89)	1,529 (89.2)	0.890
Undifferentiated antihypertensive therapy, abs. (%)	81 (11)	186 (10.8)	0.890
Classes of drugs in patients who specified the drugs, abs. (%)			
	n=653	n=1,529	
ACE inhibitors	278 (42.6)	758 (49.6)	0.003
Part of combination therapy	179 (27.4)	439 (28.3)	0.537
Angiotensin II receptor antagonists	240 (36.8)	504 (33.0)	0.087
Part of combination therapy	144 (22.1)	322 (21.1)	0.604
Calcium-channel blockers	129 (19.8)	365 (23.9)	0.035
Part of combination therapy	107 (16.4)	287 (18.8)	0.189
Beta-blockers	282 (43.2)	569 (37.2)	0.009
Part of combination therapy	228 (34.9)	447 (29.2)	0.009
Diuretics	181 (27.7)	376 (24.6)	0.125
Part of combination therapy	157 (24.0)	346 (22.6)	0.473
Centrally acting antihypertensive drugs	13 (2.0)	23 (1.5)	0.414
Alpha-blockers	1 (0.2)	2 (0.1)	0.897
Vasodilators	1 (0.2)	6 (0.4)	0.365
Combination antihypertensive therapy	344 (52.7)	777 (50.8)	0.425
Number of antihypertensive drugs administered, M ± SD	1.58 ± 0.86	1.59 ± 0.90	0.809

BP, blood pressure; ACE, angiotensin-converting enzyme. M + SD, mean + standard deviation.

Figure 1. Distribution of patients with hypertension according to number of administered antihypertensive drugs (among patients who specified the drugs, n=2,207)



p_{m-f} <0.001, significance of differences between male and female patients.

Study (Norway), the target levels of BP were reached in approximately 50% of patients with a history of MI [22]. According to the NHANES study (USA) [13], in 2013–2014, in the age groups comparable with our study (40–59 years old and 60 years old and older), the rate of hypertension treatment was 70.3% and 83%, respectively; effective control of BP was obtained in 56.7% and 54.4%, respectively. In the ESSE-RF study [16], in 2012–2013, the rate of effective control of BP in treated patients in the age group comparable with ours (55–64 years old) was 34.4% for female patients and 24.5% for male patients. The analysis of the NCD Risk Factor Collaboration databases (123 national studies, patient samples 40–79 years old) within the period of 2011–2017 showed the range of BP control from 26% (Ireland) to 54% (USA) in female patients and from 17% (Ireland) to 69% (Canada) in male patients [23].

Our data on the absence of antihypertensive treatment were comparable with data of large population-based studies and the Russian clinical registers PROFILE and REKVAZA [24]. The rate of effective control of BP in Novosibirsk was predictably comparable with the data of the ESSE study from 13 regions of Russia but is 1.5 times lower than in the EUROASPIRE-V and NHANES studies. This can be explained partly by the comparison of the total population and a sample of patients with a history of coronary events in the EUROASPIRE-V study.

The assessment of antihypertensive therapy of patients with hypertension in the modern Russian population showed that ACE inhibitors were administered to more than 40%; ARA and beta-blockers to every third patient; and diuretics and calcium-channel blockers to every fifth patient. Only about 50% of patients with hypertension received combination therapy. The profile of antihypertensive therapy in our sample included the five main classes of drugs defined in the guidelines for the treatment of hypertension [5, 10, 11]. However, the rate of combination therapy was insignificant and much lower than in the PROFILE and REKVAZA clinical registries [24] and included three agents in only 13% of cases versus 25–26%according to the clinics. In the population-based sample, the rate of beta-blocker use in hypertension was second to the use of ACE inhibitors (which can be attributed to concomitant CAD), and diuretics was the fourth-most prescribed class. In the ESSE study from 2012–2013, [16] ACE inhibitors were also the most commonly used agents; the rate of administration of beta-blockers and calcium-channel blockers was comparable with our data; the rate of diuretics use was higher (about 30%); and the rate of ARA use was somewhat lower (14%).

In the group of inadequate control of BP, the rate of ACE inhibitor and calcium-channel blocker use was 4–6% higher than in the group of effective control; this rate did not differ when either was a part of combination therapy. The rate of beta-blocker use, including in combination therapies, was 5–6% higher in the group with effective control of BP. In the group with effective control, the rate of single-agent administration of ARA was predictably higher. The rate of diuretics use, total combination therapy, and mean number of drugs did not differ according to the effectiveness of BP monitoring.

Given the similar profile of antihypertensive therapy in the two groups, we analyzed other factors that can affect the effectiveness of BP monitoring. The groups with effective and inadequate control of BP did not differ significantly by age, anthropometric characteristics, levels of blood lipids, or the incidence of CAD, DM, and CVDs. In the inadequate control group less women had a prolonged history of

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hypertension and levels of blood glucose were higher. The better compliance of female patients with antihypertensive therapy in our sample is consistent with the data from several studies [14, 25]. The Tromso Study, however, showed that BP control after MI was higher in male patients [22]; in the NHANES study (2013–2014) female patients prevailed in terms of effective BP control only in patients under the age of 40 years [13]. Higher rates of effective BP control in female patients versus male patients may be associated with better care or younger age of female patients with CVDs [13]. Still, more regular monitoring of risk factors is performed in male patients after MI [22]. The effect of a long-term history of hypertension on the inadequacy of control may be associated with more severe hypertension; comorbidity, which limits the treatment in elderly patients [13, 26]; target organ diseases; and complications [27]. Thus, the new parameter TIme at TaRgEt (TITRE) shows the association with a decrease in cardiovascular risk by 70–75% [28].

The association of metabolic disorders with inadequate treatment of hypertension is well described [13, 25, 29, 30]. In our sample, inadequate treatment of hypertension was accompanied by higher levels of plasma glucose without significant association with obesity. This association can be explained by the age range of the sample (55–84 years old); the association of hypertension and obesity is found more often in young patients. For example, in the NHANES study, the risk of obesity among patients with hypertension was 2.8 times higher in young patients than in patients aged 40+ years [13].

Limitations of the study

The study had several limitations. BP was measured on one occasion only, which may affect the identification of hypertension. The standardized three-time measurement of BP and duplicate questions about treatment, however, minimizes this limitation. The self-assessment of hypertension history and treatment profile was used, which can also be a source of errors. However, 90% of patients receiving antihypertensive therapy specified the drugs in their regimen. Coding, according to ATC, was performed by three cardiologists. In the 10% of patients receiving unspecified antihypertensive therapy, a double-blind method was used (Cohen's kappa coefficient 0.84), which allows excluding significant result errors. We were not able to take into account the dosage regimen of the drugs in the population – this, however, did not affect the assessment of the drug profile. The sample's composition of mainly elderly age limits generalization of the results of our analysis; however, the predominance of elderly patients in our sample allows a clearer presentation of the antihypertensive therapy profile in this population, which is more exposed to hypertension than younger groups.

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This is a relevant and useful study. A few Russian population-based studies have assessed antihypertensive therapy in 2012–2013 [16], and our analysis continues monitoring into the subsequent period. Our analysis confirmed the lack of hypertension control in 70% of patients with hypertension aged 55–84 years. The new data showed that the profile of the main classes of antihypertensive drugs in the Russian population is consistent with the guidelines for the treatment of hypertension. However, the proportion of combination therapy is insignificant, and the drug profile differs from the recommended order of priority due to the insufficient administration of diuretics. Inadequate control is more likely in male patients, patients with a long history of hypertension, and patients with metabolic disorders.

Conclusion

In 2015–2017, in the Russian population-based sample aged 55–84 years, effective control of blood pressure was achieved in every fourth subject with arterial hypertension; every third subject received antihypertensive therapy. Inadequate control of blood pressure was more common in males, patients with a long history of hypertension, and those with metabolic disorders. The profile of the main classes of antihypertensive therapy in patients with hypertension corresponded to the current guidelines. Nevertheless, combined therapy was administered to only about 50% of patients with arterial hypertension; that is, its proportion is insignificant. Angiotensin-converting enzyme inhibitors were the most commonly administered drugs, followed by (in order of decreasing usage) beta-blockers, angiotensin II receptor antagonists, diuretics, and calcium-channel blockers. Twenty percent of patients with hypertension did not receive antihypertensive therapy, a gap that contributes significantly to inadequate control of blood pressure in the population.

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