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FEATURES OF THE DAILY PROFILE OF ARTERIAL BLOOD PRESSURE AT MIGRANTS OF FAR NORTH DEPENDING ON ACCOMMODATION TERMS IN NEW KLIMATOGEOGRAPHIC CONDITIONS

The aim of the study was to study features of the daily blood pressure profile of migrants in the Far North, depending on the period of residence in the new climatic and geographical conditions. Materials and methods: 267 patients of both sexes with hypertension, who arrived from the regions of the Far North for permanent residence in Central Siberia, the average age of 64,0 years, were examined. Indicators of the daily blood pressure profile were studied by the method of daily blood pressure monitoring using the BPLab MnSDP-2 device for 24 hours. Results: high frequency of the daily non-dipper profile was noted in both migrants and permanent residents of Krasnoyarsk. The non-dipper profile was more common among migrants who lived for six or more years after moving, which may indicate a more severe course of arterial hypertension during this period. Discussion: the prevalence of persons with non-dipper and night-piker profiles among migrants in the Far North indicates a more pronounced lesion of target organs and a more severe course of hypertension. Conclusions: Among migrants with longer periods of residence after moving (more than 10 years), there was an increase of indicators of the daily blood pressure profile, but the largest number of persons with the changed daily profile was found in migrants in the first 5 years after moving from the Far North. This may be due to increased adaptation processes (readaptation) to new living conditions, due to a high level of neuroticism and stress during this period.

Keywords: migrants, Far North, arterial hypertension, daily blood pressure profile.

Introduction. Arterial hypertension (AH) remains one of the most pressing modern problems, due to the high population frequency of AH, its negative impact on the state of health, working capacity and life expectancy of the population [5, 8]. The study of the characteristics of AH among the population living in harsh conditions of the North and Siberia is [3, 4, 6, 9, 10]. In harsh climatic conditions, the cardiovascular system (as highly reactive) is one ofof great importance the first to be included in adaptive reactions [3, 11]. This cause certainly affects productivity and ability to work [2, 11]. In regions with extreme climatic conditions, this can cause a negative migration flow and destabilization of the population, in particular in the regions of the Far North [10]. Climatic conditions can also play a role in the re-adaptation of the human body in the new living conditions [10].

Currently, 24-h ambulatory BP monitoring (ABPM) is a valuable diagnostic

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method that allows identifying individual features of daily BP profile [1, 7]. The studies made it possible to distinguish the "northern" variant of AH [5], characterized by disruption of circadian of the daily rhythm, consistency of the daily profile of BP, increased weather stability, tougher current and earlier damage to target organs: left ventricular myocardial hypertrophy, trophic changes of the vascular wall [5, 11]. In this regard, it is interesting to study the features of the daily BP profile in migrants of the Far North with AH during their stay in new climatic conditions, for a personalized assessment of cardiovascular risk and to decide on the need for prescribing and correcting antihypertensive therapy.

Aim. The aim of the study was to study features of the daily blood pressure profile of migrants in the Far North, depending on the period of residence in the new climatic and geographical conditions.

Materials and methods. The research included 267 patients of arrived population (Caucasians) of both sexes with stage AH II-III (according to the recommendations of ESH/ESC, 2013) [8], arrived from regions of Far North for the permanent residence to the Central Siberia (Krasnoyarsk, Minusinsk), average age of 64,0 [59,0;73,0] years. According to research goals and objectives the migrants were divided into groups depending on accommodation terms in new the climatic and geographic conditions after moving from the region of Far North: the 1st group – with staying for 5 years, the 2nd group – staying from 6 to 10 years and the 3rd group – about 10 years . The group of comparison was comprised of 267 patients with arterial hypertension of similar age range (65,0 [59,0;74,0] years) constantly living in Krasnoyarsk. All patients gave the written informed consent. The research was conducted according to ethical principles of the Helsinki declaration and approved by local ethical committee.

Indicators of the daily BP profile were revealed by a method of ABPM with use of the BPLab MnSDP-2 ("Pyotr Telegin", Russia) within 24 hours. The average values of systolic and diastolic arterial blood pressure (SBP and DBP), the time index of high BP, the variability of BP for three periods of monitoring (day, day, night) were estimated as well as indicators of the BP daily index and the morning BP. Depending on the size of nocturnal BP fall, patients were categorized into four groups: dippers, non-dippers, over-dippers and night-peaker.

Statistical processing of the research results was carried out by means of the Statistica 6,1 software package. The obtained data were presented in the form of the median (Me) and the interquartile interval [Q_1; Q_3]. Two independent groups were compared my means of the U-criterion of Mann-Whitney. The analysis of different frequencies in two independent groups was carried out by means of criterion χ^2 with Yates's amendment. There were significant distinctions $p < 0,05$.

Results and discussion. The analysis of BP indicators during the ABPM showed that among migrants and residents of Krasnoyarsk, the average daily indicators of SBP and the values of SBP in the daytime corresponded to the breakpoints (≥130 mm Hg per day and ≥135 mm Hg per day, respectively). For migrants, the values of SBP during night hours corresponded to increased values (≥125 mmHg), in contrast to the breakpoints of similar indicators (≥120 mmHg) for residents of Krasnoyarsk (table 1).

Considering the variability of both systolic, and diastolic BP at daily monitoring, it is established that these indicators in both groups corresponded to normal values both in the afternoon, and at night at least no any of their four critical values were revealed. At the same time, values of variability at night and per day in general were higher among residents of Krasnoyarsk (table 1) but at the same time had no statistical significance.

To assess the dynamics of BP in the morning, MSBP and the rate of morning BR rise were calculated. Importance of assessment of these indicators was caused by high risk of emergence of the events leading to sudden death (strokes, myocardial infarctions, heart rhythm disorder). In both groups, the values of rise BP indicators corresponded to normal values, since they did not exceed 56 mmHg for SBP and 36 mmHg for DBP, respectively. But the speed of rise BP indicators among migrants exceeded the standard values and were higher in comparison with residents of Krasnoyarsk, both for SBP (> 10 mmHg) and for DBP (> 6 mmHg) (table 1).

For the purpose of quantitative assessment of episodes of increase BP indicators "loadings by pressure" analyzed that more precisely, than average AH values, characterize load of target organs (table. 1). It was shown that values of the average daily index of time both for the SBP and for DBP in both groups exceeded referents values (> 30%). Indicators of index of time was higher in-group of migrants in the afternoon and corresponded to the increased values, however these distinctions had statistically no importance. Indicators of the time index in both groups did not exceed at night the referents of values and were higher among migrants, but had no significant distinctions.

The frequency of various options of the daily BP profile among the examined persons (figure. 1) was analyzed. It was established that there was prevalence of insufficient night decrease BP (non-dipper) and significant amount of persons in each group with the daily night-piker profile – 20,7% and 23,4%. among both migrants (49,4%), and residents of Krasnoyarsk (42,6%). Change of the daily BP profile was revealed in 74,7% of the examined migrants and 71,3% – (figure 1) constantly living in Krasnoyarsk ($p=0,731$). According to data of the literature, insufficient decrease of night BP at patients with AH can cause a risk of organ defeats and mortality [1, 2, 11]. Owing to the reduced extent of night, the decrease of BP increased afterload of left ventricle is noted, it affected by actual increase in myocardial mass of left ventricle, in comparison with patients with normal decrease BP [11] at night.

The results about the frequency of the adverse daily AD profiles at migrants will be coordinated with data of the researches conducted earlier [1, 2, 3]. So, according to Zapesochnaya I. L. et al. (2015) patients from AG living in Khanty-Mansi Autonomous Okrug (KhMAO – Ugra), had the following frequency of the AD profiles: dipper – 19,1%, non-dipper – 57,3%, over-dipper – 7,4%, night-peaker – 16,2% [2]. According results to Polyakov's V. Ya. et al. (2011) [3], among the sick AH living in North conditions the broken daily non-dipper profile – 48% prevailed. The daily dipper profile was noted at 43% examined and the over-dipper profile – at 9%. According to Gapon L. I. et al. (2014) [1] only 1/3 of all patients (25,6% native and 28% alien) were registered with a normal degree of reduction in night BP. The predominance of individuals with non-dipper and night-piker profiles, both among indigenous and newcomers, indicates a more pronounced lesion of target organs and a more severe course of hypertension [11].

The carried-out analysis of indicators BP at migrants depending on terms of accommodation at new the climatic and geographic conditions (table 2) showed that the SBP among migrants the faces of the 3rd group had the greatest average daily, day and night indicators, and corresponded to boundary values.

The patients of 1st and 2nd of groups had similar indicators normal. The values of night SBP exceeded the standard indicators in groups 1st and 3rd, and in the second group corresponded

Table1

Comparative characteristics of the daily blood pressure profile in the surveyed migrants and residents of Krasnoyarsk with hypertension

	Indicators	Migrants (n=87)	Krasnoyarsk (n=94)	*p*
Day	SBP, mmHg	131 [122;142.6]	132.0 [121.8;139.3]	p=0.743
	DBP, mmHg	82 [73.8;87]	79.3 [73.2;84.3]	p=0.060
	VSBP, mmHg	12.8 [10.9;15.5]	14.6 [11.6;17]	p=0.012
	VDBP, mmHg	10.5 [8.7;12.8]	11.7 [9.6;13.7]	p=0.004
	TI SBP, %	38 [14.9;66]	39.9 [20.7;67.7]	p=0.647
	TI DBP, %	38 [17;61.4]	38.9 [16.9;52.5]	p=0.570
Daytime	SBP, mmHg	134 [124;143]	133.0 [123.3;142]	p=0.848
	DBP, mmHg	84 [77;89.6]	81.7 [75.1;87]	p=0.087
	VSBP, mmHg	13 [11;16]	12.9 [11;17.2]	p=0.607
	VDBP, mmHg	10.1 [9;13.1]	11.1 [8.9;14.2]	p=0.327
	TI SBP, %	31.8 [7.7;65]	24.8 [5.9;57.5]	p=0.658
	TI DBP, %	24.5 [6;51]	19.0 [5.91;37.2]	p=0.207
Night	SBP, mmHg	125 [115;136]	124.4 [117;135]	p=0.767
	DBP, mmHg	77 [70;83]	72.7 [68.6;80]	p=0.077
	VSBP, mmHg	11 [9;14]	12.6 [10.2;14.9]	p=0.008
	VDBP, mmHg	9 [7;11]	9.9 [8.2;12]	p=0.029
	TI SBP, %	52 [17;90]	59.6 [34.8;90.1]	p=0.269
	TI DBP, %	63.5 [22.1;90]	59.6 [39.2;79.4]	p=0.924
DND SBP, %		5.9 [0;13.3]	5.6 [0.1;11.7]	p=0.939
DND DBP, %		8.8 [3.6;15.9]	9.5 [4.3;16.9]	p=0.838
VMR SBP, mmHg		39.5 [31;55]	40.5 [21;53]	p=0.602
VMR DBP, mmHg		31 [22.2;42]	32.5 [15;40]	p=0.302
SMR SBP, mmHg/hour		11.9 [7;18.6]	8.4 [3.7;11.9]	p=0.004
SMR DBP, mmHg/hour		8 [4;16]	6.7 [2.7;9.6]	p=0.034

to breakpoints. The day indicators of DBP in all groups corresponded to normal amounts while DBP in the first and second were at night boundary, and in the third group corresponded to the increased values. In spite of the fact that the variabilities SBP and variabilities DBP values in all examined groups corresponded to normal values both in the afternoon, and at night (table 2), the highest values of the specified variability indicators BP were noted among the persons who lived after moving> 10 years.

The analysis of indicators of BP morning dynamics showed that the values of rise BP values both for SBP and DBP in the compared groups had no distinctions (table 2). However, the largest values of rise SBP were noted in the third group and values of rise DBP in the second group. In the analysis of indicators the speed of rise BP it is established that among migrants in the 2nd and 3rd groups both for SBP, and DBP the studied values exceeded standard values, and the highest parameters were in the 3rd group for the SBP and in the 2nd group for DBP respectively.

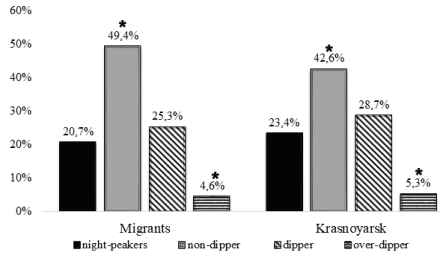

Figure. 1. Indicators of the daily blood pressure rhythm in the surveyed migrants and residents of Krasnoyarsk with hypertension. Note: * - differences within groups p<0,05

It is established that the average daily indices of time for SBP at migrants of the first and second groups did not exceed the referents of values, whereas in the third group they were raised (table 2). The average daily indices of time for DBP were increased among migrants of the first and third groups. The indicators of time index of SBP in day and night time corresponded to standard values in all three groups, except the time values of SBP in day at migrants of the 3rd group with the exceeded values. As for the indicators of time at night, in all allocated groups both for SBP and DBP, their values exceeded twice the standard both in the first and third groups. The differences between groups on all indicators of time had no statistical significance.

The frequency of various options of the daily BP profile depending on accommodation terms after moving (figure 2) was analyzed.

In all 3 groups the changes of BP daily profile due to the insufficient decrease BP at night – non-dipper as well as the daily profile from 13,6 to 36,4% patients with increase BP at night – night-piker were observed. There was change of BP daily profile in the 1st group in 81,8% of people, among surveyed the 2nd group of change of the BP profile were noted at 63,6% and in the 3rd group at 78,8% examined according to (p_{1-2}=0,284; p_{1-3}=0,678; p_{2-3}=0,332;) (figure 2).

Conclusion. According to the results of the study, it was found that migrants had higher values of nocturnal SBP, higher values of the time index in daytime, higher and exceeded standard for both SBP and DBP indicators of EMS, unlike residents of Krasnoyarsk, and along with residents of Krasnoyarsk, had a high frequency of the daily profile "non-dipper." When analyzing the ABPM indicators among the surveyed migrants, it was found that the average daily, day and

Table2

Comparative characteristics of the daily blood pressure profile in the examined migrants with hypertension depending on the period of residence in the new climate conditions

Index		Time of residence after moving			*p*
		≤5 лет (1-я группа)	6-10 лет (2-я группа)	>10 лет (3-я группа)	
Day	SBP, mmHg	122.4 [117.0;138.0]	125.0 [119.5;135.0]	131.0 [125.0;142.6]	p_{1-2}=0.819; p_{1-3}=0.098; p_{2-3}=0.097
	DBP, mmHg	79.0 [73.8;87.0]	76.3 [70.0;87.0]	82.6 [77.0;86.0]	p_{1-2}=0.606; p_{1-3}=0.440; p_{2-3}=0.232
	VSBP, mmHg	11.1 [11.0;12.8]	12.0 [10.0;15.4]	13.9 [11.0;15.6]	p_{1-2}=0.954; p_{1-3}=0.238; p_{2-3}=0.260
	VDBP, mmHg	10.3 [8.5;10.9]	10.0 [9.0;12.7]	10.5 [8.9;12.8]	p_{1-2}=0.834; p_{1-3}=0.507; p_{2-3}=0.810
	TI SBP, %	22.0 [7.0;65.0]	25.4 [11.0;59.0]	38.0 [22.0;64.2]	p_{1-2}=0.924; p_{1-3}=0.416; p_{2-3}=0.239
	TI DBP, %	38.0 [9.6;50.0]	26.0 [7.0;53.0]	40.0 [23.0;57.5]	p_{1-2}=0.804; p_{1-3}=0.401; p_{2-3}=0.229
Daytime	SBP, mmHg	129.0 [119.0;137.0]	128.0 [121.2;137.0]	134.0 [127.0;143.0]	p_{1-2}=0.760; p_{1-3}=0.136; p_{2-3}=0.092
	DBP, mmHg	82.0 [75.0;87.0]	80.5 [71.0;87.0]	84.4 [80.0;89.5]	p_{1-2}=0.731; p_{1-3}=0.343; p_{2-3}=0.183
	VSBP, mmHg	12.0 [10.3;13.5]	11.5 [10.0;15.1]	14.0 [12.0;16.3]	p_{1-2}=0.879; p_{1-3}=0.071; p_{2-3}=0.094
	VDBP, mmHg	10.1 [8.1;12.4]	9.8 [8.0;13.0]	11.0 [9.0;14.0]	p_{1-2}=0.954; p_{1-3}=0.336 p_{2-3}=0.226
	TI SBP, %	12.8 [0.0;48.0]	19.7 [5.0;65.0]	32.0 [12.0;57.0]	p_{1-2}=0.492; p_{1-3}=0.184; p_{2-3}=0.419
	TI DBP, %	16.0 [1.7;35.0]	18.3 [4.0;53.0]	25.2 [7.0;48.0]	p_{1-2}=0.516; p_{1-3}=0.208; p_{2-3}=0.542
Night	SBP, mmHg	125.0 [112.4;133.0]	121.5 [111.0;129.0]	128.0 [117.0;135.0]	p_{1-2}=0.606; p_{1-3}=0.489; p_{2-3}=0.144
	DBP, mmHg	74.8 [66.1;87.0]	72.5 [65.0;79.0]	77.0 [71.0;82.0]	p_{1-2}=0.445; p_{1-3}=0.776; p_{2-3}=0.128
	VSBP, mmHg	10.9 [9.7;11.5]	9.0 [8.0;12.5]	12.0 [9.0;14.0]	p_{1-2}=0.244; p_{1-3}=0.725; p_{2-3}=0.319
	VDBP, mmHg	8.2 [7.0;11.7]	8.6 [7.0;11.8]	9.3 [7.0;11.0]	p_{1-2}=0.954; p_{1-3}=0.755; p_{2-3}=0.938
	TI SBP, %	58.0 [15.0;87.0]	36.0 [14.0;53.0]	61.0 [23.0;91.0]	p_{1-2}=0.423; p_{1-3}=0.588; p_{2-3}=0.077
	TI DBP, %	58.2 [24.3;89.0]	33.0 [9.0;80.0]	65.2 [28.0;89.0]	p_{1-2}=0.222; p_{1-3}=0.850; p_{2-3}=0.084
DND SBP, %		5.2 [-2.0;9.4]	6.1 [1.7;14.1]	6.0 [1.5;10.0]	p_{1-2}=0.302; p_{1-3}=0.473; p_{2-3}=0.797
DND DBP, %		12.5 [1.4;17.8]	12.4 [6.2;15.4]	8.3 [3.3;18.3]	p_{1-2}=0.620; p_{1-3}=0.860; p_{2-3}=0.542
VMR SBP, mmHg		32.0 [22.0;41.0]	35.0 [26.0;53.0]	40.5 [34.0;56.0]	p_{1-2}=0.311; p_{1-3}=0.069; p_{2-3}=0.272
VMR DBP, mmHg		28.0 [22.2;32.0]	36.0 [24.0;42.5]	31.0 [22.0;43.0]	p_{1-2}=0.203; p_{1-3}=0.279; p_{2-3}=0.797
SMR SBP, mmHg/hour		8.0 [3.5;15.0]	11.5 [3.7;15.9]	12.0 [10.0;22.0]	p_{1-2}=0.588; p_{1-3}=0.157; p_{2-3}=0.276
SMR DBP, mmHg/ hour		5.1 [1.0;9.0]	9.7 [2.0;16.5]	8.0 [5.0;14.0]	p_{1-2}=0.187; p_{1-3}=0.205; p_{2-3}=0.913

night indicators of SBP, DBP, the values of rise index SBP, speed of rise SBP and DBP, as well as the index of time SBP were the highest in people who lived after moving >10 years, and corresponded to the increased values. This may indicate a more severe course of arterial hypertension in this group. In all three groups, changes in the daily BP profile were observed due to insufficient reduction of BP during the night hours – non-dipper. Among migrants with longer periods of residence after moving (more than 10 years), there was an increase in the number of indicators of the daily blood pressure profile, but the largest number of persons with the changed daily profile observed in migrants in the first 5 years

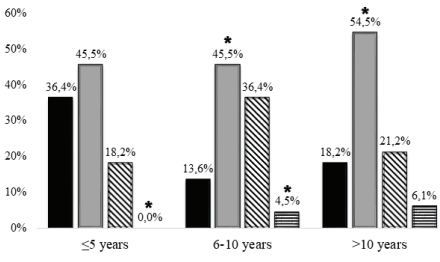

Figure. 2. Indicators of the daily blood pressure rhythm in the examined migrants with hypertension, depending on the period of residence in the new climate conditions. Note: * - differences within groups p<0,05

after moving from the Far North. This may be due to increased adaptation processes (readaptation) to new living conditions, due to a high level of neuroticism and stress during this period.

Conflict of interest. The authors declare no conflict of interest.

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