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FEATURES OF CIRCULATORY PARAMETERS IN DOMESTIC AND INTERNATIONAL SECOND-YEAR MEDICAL UNIVERSITY STUDENTS WITH DIFFERENT CHRONOTYPES

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Introduction. It is considered that circadian fluctuations in autonomic nervous system activity underlie diurnal changes in cardiovascular function [1]. Multigenic character of master clock functioning significantly complicates understanding the nature of these differences [2]. Besides, data on changes in heart rate and blood pressure in individuals of distinct chronotypes vary significantly across number of scientific papers [3, 4].

Aim. To study the parameters of blood pressure, pulse rate and Kerdo index (KI) in domestic and international second-year medical university students with different chronotypes.

Methods. 228 2nd year students (n=169, female, n=59, male) of GrSMU, aged 17 to 24 participated in the study. Domestic group consisted of 127 2nd year students (n=107, female, n=20, male). International group comprised 101 2nd year students (n=62, female, n=39, male). The group of foreign volunteers included students from Sri Lanka (71%), India (16%), Nigeria (9%), and the Maldives (5%). The chronotype was assessed using Horne-Östberg Morningness/Eveningness questionnaire (adaptation by S.I. Stepanova for domestic participants). Quantitative anthropometric data, heart rate, systolic and diastolic blood pressures were determined, and the KI was calculated. All measurements were taking in the morning at 8.00-10.00 a.m. STATISTICA software for experimental data processing was used. Results are presented as the median, 25th and 75th percentiles: Mdn (P25‰-75‰).

Results and discussion. The distribution of chronotypes in domestic and international students differed significantly. In domestic group there were 14% morning (n=18), 45% evening (n=57), and 41% arrhythmic (n=52). In international group there were 18% morning (n=18), 58% evening (n=58), and 25% arrhythmic (n=25). Interestingly enough, among international students there were 61% less students with an arrhythmic chronotype ($p<0,05$).

Heart rate (HR) at rest was lower in international students: 72 (68-79) b.p.m. compared to domestic: 77 (72-84) b.p.m., $p<0,05$. There were no significant differences in HR in international students with different diurnal preference. In domestic students HR of morning type: 80 (74-88) b.p.m. was higher than in

evening type: 75 (70-80) b.p.m., p<0,05. Significant differences in HR were observed between the morning type groups in Russian-speaking individuals: 80 (74-88) b.p.m. and English-speaking students: 72 (68-78) b.p.m., p<0,01.

No significant differences were found in systolic blood pressure between the study groups. However, a consistent trend toward increased systolic blood pressure was observed in those with the evening chronotype. Lower diastolic pressure was noted in international students: 70 (65-80) b.p.m., compared to domestic: 75 (70-80) b.p.m., p<0,05. Diastolic pressure in Russian-speaking students: 73 (65-79) mmHg was lower compared to the evening type: 80 (70-80) mmHg, p<0,05. Foreign students also showed a tendency for diastolic pressure to increase in the evening type, but the changes were not statistically significant.

In both compared groups, normotonics predominated according to the KI. In domestic students KI was: 4.76 (-6.67-12.5). In international students KI was: 0 (-7.69-11.39). Morning type of Russian-speaking students was characterized by an increase in the sympathetic division tone and positive KI values: 10.8 (5.41-27.66). The evening chronotype was associated with an increase in the parasympathetic division tone and negative KI values: -2.56 (-13.3-11.98), p<0,05. No such pattern was observed among English-speaking students. The morning and evening types of international students had negative KI values.

Significant gender differences were found in the studied parameters, both within and between the groups. Russian-speaking men of arrhythmic type had significantly higher HR: 86 (66-90) b.p.m., compared to similar types of English-speaking men: 72 (70-82) b.p.m., p<0,01. In arrhythmic type women of both groups similar but less pronounced differences were observed. Domestic female students with the morning type had a higher HR of 80 (74-88) b.p.m compared to the arrhythmic: 78 (72-84) b.p.m and evening types: 75 (70-80) b.p.m. The median KI in Russian-speaking women of the morning type was 12.50 (6.67-27.66), of the arrhythmic type: -3.47 (-2.56-12.50), p<0,01, of the evening type: -3.85 (-8.11- 19.54), p<0,01. In addition, among the Russian-speaking women of the morning type there were no vagotonics (0%), among the arrhythmic type there were 10%, and among the evening type – 23%. In Russian-speaking men the median systolic pressure of the morning type was: 125.5 (122.5-128) mmHg, compared to the arrhythmic: 126 (122-130) mmHg, evening type: 138 (130-140) mmHg, and the reliability of differences was noted between the evening and two other chronotypes, respectively (p=0.037 and p=0.030). The median diastolic pressure in foreign female students of the morning type was: 70 (68-78) mmHg, of arrhythmic type: 70 (60-70) mmHg, (p=0,034). The median diastolic pressure of English-speaking women of the evening chronotype was 70 (67-77) mmHg and was significantly different from arrhythmic (p=0,048). In addition, among English-speaking women of the morning type there were 15% vagotonics, and the arrhythmic type had only 3%, p<0,05. Systolic pressure of foreign male students with arrhythmic type: 122 (120-125) mmHg was significantly different from the evening: 125 (125-134) mmHg (p=0,031). The median KI in Russian-speaking male students of the morning type was: 1.98 (-3.92-20.00), in arrhythmic type: -5.26 (-23.08-18.60), in evening type –

-9.59 (-14.10–-5.88). However, the differences between chronotypes were significant only between the morning and evening types (p=0.025). In addition, among male students of the morning type, as well as among females, there were no vagotonics (0%), among the arrhythmic type there were 43%, and among the evening type – 44%. On the contrary, among the Russian-speaking male students of the evening type there was no sympathotonic person (0%), among the morning type there were 25% of them, and among the evening type: 29%.

Conclusions. During the study of blood pressure, pulse rate and KI in domestic and international second-year medical university students at 8.00-10.00, morning type demonstrated higher HR and KI compared to evening type. That is, the morning type developed a more pronounced activation reaction, and the evening type showed more elements of dysregulation of the cardiovascular system in the morning hours (an increase in systolic and diastolic pressure against the background of a decrease in heart rate and a vagotonic reaction). Statistically reliable gender and ethnic differences in cardiovascular parameters and autonomic tone of second-year medical university students with different chronotypes were reviled. Despite these differences, both sexes demonstrate a predominance of sympathetic tone in students with the morning chronotype before noon. Since all measurements were carried out at 8.00-10.00 a.m., we consider it appropriate to carry out further 24-Hour ambulatory blood pressure and pulse monitoring in students with different chronotypes.

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BIOMARKERS OF OXIDATIVE STRESS AND ITS IMPACT ON THE DEVELOPMENT OF CARDIOVASCULAR DISEASES

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Relevance. Oxidative stress (OS) is a central pathophysiological mechanism underlying endothelial damage and the development of cardiovascular diseases (CVDs) such as atherosclerosis, hypertension, heart failure, and ischemic heart