
MEDICINE

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UDC 159.91(075.8)

STRATIFICATION OF RISK FACTORS OF STRESS-INDUCED CONDITIONS OF TYUMEN RESIDENTS

ABSTRACT. Stratification of risk factors of stress induced conditions has defined a high share of specific changes in the activity of the cardiovascular system depending on the gender stereotype of behaviour and psychological sex. The price of adaptation of the system of blood circulation to long-term psycho-emotional stress is higher for all men and women with highly masculine manner of behavior. Smokers regardless the character of dysfunction and non-smokers suffering from arterial hypertension and border psychic disorders have an equal 10-year risk of death from cardiovascular diseases according to «SCORE». Women with a highly masculine manner of behavior are characterized by evident signs of structurally-metabolic homeostasis – arterial hypertension and adiposity. Women suffering from border psychic disorders demonstrate optimum biosocial mechanisms of adaptation with irregularities of the heart rhythm and arterial pressure. The vegetative homeostasis and androgynous psychological sex guarantee optimum adaptation of the heart to stress.

KEY WORDS. Adaptation, stress, risk factors.

Over the last decades there has been considerable health deterioration of working age people in many regions of Russia, which is reflected in the growth of sickness rate and death rate from cardio-vascular diseases (CVD). Tyumen region compares favorably to the others in terms of the high living standard – in 2008 the potential human development index was 0.878. In spite of the effective solution of the tasks of economic development in Tyumen and Tyumen region, the problems of health preservation make it necessary to work out regional criteria for the estimation and control of the current health conditions of the people of high social-biological value living in the hypocomfortable environment [1-3].

Functional disorders of the cardio-vascular system are recurrent and the earliest signs of disadaptation conditions development. Numerous publications of Russian and foreign scientists are devoted to the issues of estimation of the provoking role of chronic stress in the development of a cardiovascular pathology [4-8]. It is known

that chronic stress as the most adequate compensatory-adjusting reaction of the human body towards weak and medium stimuli manifests itself through the changes in the vegetative homeostasis. But it is rather difficult to define the role of the specific morpho-functional changes in the heart and participation of the higher nervous activity (HNA) in this process [9-10].

The aim of the research was to carry out stratification of risk factors of stress-induced conditions among the residents of Tyumen in order to define specific changes in the activity of the cardio-vascular system depending on the individual HNA differences, character of the dysfunction and gender.

Materials and methods of the research. The main criteria for formation of the test group were: stable base social characteristics, low individual stress resistance according to T.H. Holmes and R.H. Rahe's scale and a high level of self-actualization. 1345 persons from the test group underwent a clinical neuropsychological examination, standard complex clinical-laboratory examination, cardiac ultrasound, 24-hour arterial blood pressure monitoring and ECG with the apparatus "Kardiotekhnika-4000". Variability of the heart rate (VHR) was estimated with the help of the data from the diagnostic system "Valenta". The research was carried out with the observation of all the rules for conducting biomedical investigations.

Research findings. At the first stage of the research we excluded the influence of the main risk factors (RF) on the development of stress-induced conditions: age, low level of education and impact of work load. At the second stage we estimated the value of the widely-spread RF according to "SCORE" tables. At the third stage we analyzed the role of the secondary RF (psychosocial and psychoemotional) among men and women in the development of morphofunctional changes in the heart under long-lasting psychoemotional strain (tables 1, 2).

Disturbances of vegetative functions are the usual and earliest signs of development of psychoemotional stress (PES). The majority of men and women under PES had objective signs of vegetative dysfunction according to the data of the biofunctional blood pressure and heart rate monitoring and VHR analysis. Herewith we did not reveal any correlation between the change in the heart rate regulation level and blood pressure variability.

Table 1

Stratification of risk factors of stress-induced conditions among men

Indicators	Dysfunction		
	Arterial hypertension (AH) (n=443)	Borderline mental disorder (BMD) (n=72)	Asthenic syndrome (AS) (n=153)
Age	38,57±0,43	37,21±1,01	33,48±0,47
Body mass index	26,74±0,19	25,84±0,43	25,64±0,48
Systolic blood pressure amb.	146,89±0,47	121,47±1,40	123,05±0,86
Diastolic blood pressure amb.	93,94±0,59	80,14±1,19	81,79±0,71

Heart rate	75,74±0,55	73,56±1,16	74,75±0,79
Cholesterol	5,76±0,05	6,49±0,12	4,78±0,06
Smoking	73%	65%	54%
SCORE	1-2% smokers 1% non-smokers	Smokers and non-smokers 1%	1% smokers
Conclusions of 24-hour blood pressure monitoring and Holter monitoring	50% men with arterial hypertension (AH) demonstrated stable arterial blood pressure (ABP) increase during the day, 40% men had a worse prognosis than women due to insufficient ABP decrease during the night. 63% men had insufficient heart rate decrease during the night. 27% men with asthenic syndrome (AS) had brachycardia at night.		
VHR	Men with AH demonstrated disorders of the miocardic-hemodynamic homeostasis and non-specific changes in the VHR spectral indices. BMD male patients demonstrated vagosympathetic balance in 52% cases, slow waves with resonance running time over 30 sec. in 48% cases. 68% males with AS had fast waves with breathing arrhythmia – age-related activity of parasympathetic nervous system		
Cardiac ultrasound	Aorta hyperechogenicity combined with left ventricular hypertrophy in 26% cases	Aorta hyperechogenicity – 48%	Hemodynamically insignificant structural heart anomalies – 45%

Table 2

Stratification of risk factors of stress-induced conditions among women

Indicators	Dysfunction		
	Arterial hypertension (AH) (n=199)	Borderline mental disorder (BMD) (n=309)	Asthenic syndrome (AS) (n=169)
Age	45,49±0,33	38,53±0,39	36,76±0,75
Body mass index	30,47±0,31	25,68±0,22	23,82±0,30
Systolic blood pressure amb.	140,21±0,70	108,45±0,69	105,59±0,81
Diastolic blood pressure amb.	88,30±0,68	70,97±0,50	71,42±0,79
Heart rate	73,12±0,71	70,65±0,50	70,54±0,59
Cholesterol	6,10±0,09	4,39±0,04	4,38±0,06
Smoking	45%	39%	56%
SCORE	smokers and non-smokers -1%	0%	0%

Conclusions of 24-hour blood pressure monitoring and Holter monitoring	Insignificant heart rate decrease during the night was registered in 21% women. All the women demonstrated higher arterial blood pressure according to 24-hour blood pressure monitoring than while office measuring ($P < 0.01^{**}$), which objectively indicates a high degree of emotional tension among the women		
VHR	Abnormalities in the structural-metabolic homeostasis were registered among women with AH. Slow waves with resonance running time over 30 sec. were recorded in 44% women with AH, 80% women with BMD and 45% women with AS. This index reflects the condition of the neurohumoral and metabolic levels of regulation and indicates prevalence of the influence of the cortical-limbic lobes on the heart rate regulation.		
Cardiac ultrasound	Aorta hyperechogenicity combined with left ventricular hypertrophy in 25% cases	Hemodynamically insignificant structural heart anomalies – 37%	Cardiac ultrasound – normal

Analysis of the conclusions of male 24-hour blood pressure monitoring and ECG showed high activity of the sympathetic nervous system (SNS) (50% men with AH had stable arterial blood pressure increase with a worse prognosis than women due to the insignificant night decrease of arterial blood pressure (in 40% cases) and insignificant heart rate decrease (in 63% cases). At that we have not registered any specific changes in the VHR wave characteristics. It should be noted that there was also no connection traced between tachycardia and arterial pressure increase. For the men with AS successful CVS adaptation towards stress loads was defined by vegetative homeostasis and prevalence of the sympathetic tone in the heart rate regulation. According to the 24-hour blood pressure monitoring (BPM) all the women regardless the nature of the dysfunction had a significantly higher blood pressure ($P < 0.01^{**}$) than while office measurements which can be evaluated as an objective evidence of a rather high degree of emotional tension among them and as a consequence widening of clinical indicators for BPM of women diagnosed with BMD, in spite of the fact that regardless the character of the dysfunction all the women demonstrated subjective symptoms of CVS disorders while optimal correlations of the daily heart rate profile.

Thus, we established that under the chronic stress of daily life there exist significant gender differences in the blood circulation system. At that women demonstrate an optimal CVS adaptation variant to lasting emotional and social loads against the background of the suprasedgmental disorders of the regulation of heart rate and arterial blood pressure. Whereas men tend to display disorders in heart rate regulation at segmental levels.

We have stated that the type of the higher nervous activity (HNA) depends on the correlation of the indicators of extraversion-introversion, neuroticism and anxiety.

There is an interrelation between the HNA type among men with AH (domination of extraverts with a high level of neuroticism) and among men and women with BMD (domination of introverts with a high degree of neuroticism and anxiety). The combination of high and very high anxiety and introversion predetermined a hypochondrical type of the course of the disease with strongly marked somatoform disorders of CVS among men and women with BMD.

All the smoking men regardless the dysfunction character and non-smoking men with AH and BMD have equal 10-year death risk from cardiovascular diseases according to "SCORE". The men with BMD had the highest cholesterol level indices (6.49+-0.12 mmol/l); the leading clinical syndrome and main stressor was erectile dysfunction (ED). In the majority of the cases ED is of psychogenic nature and affects the mechanisms of psychic excitement. ED is a heterogeneous disease, pathogenetically close to CVD and can be a debut clinical response of cardiovascular nature. As a result of ED the physical, mental and emotional parts of life are affected; the health condition and vitality in general are ruined. Among the patients with AH only the general health component suffers. Women with AH had as high general cardiovascular risk according to "SCORE" as men basically due to hypercholesterolemia (6.10+-0.09 mmol/l).

The stressors analysis has revealed that, firstly, the men with AH and AS were very career oriented and experienced financial problems; the second most important psycho-traumatic situation was, according to the patients, sexual disharmony (ED was diagnosed in 38% cases); the third place was occupied by interpersonal communication problems at work and home and alcohol consumption. For the patients with BMD the main stressors are difficulties in the relationships with people around them, ED (84% cases) and as a consequence, financial problems and alcoholism. All the men had a level of education appropriate to their professional competence and satisfied the main demand in personal self-actualization. Practically all the respondents named problems of interpersonal relations with their colleagues, fierce competition and fear to lose the dominating role in the society and not working conditions or financial difficulties as the main stressors connected with their work. Men tend to dominate in the family as well although they do allow for equal rights and possibility for their spouses, daughters and sisters to achieve professional success and develop careers. At the same time the better social adaptation of their partner posed a threat of losing dominance in the family for men, which according to their words they compensated with extramarital affairs.

As for women, the most important psycho-traumatic situations are those connected with relationships with their partners, children, close relatives and colleagues; the second most important psycho-traumatic situation is the change in their professional orientation or working conditions, dismissal or conflicts with the boss; the third is financial difficulties and the fourth is sexual disharmony. Practically all the questioned women had some experience of extramarital relationships. Psychoemotional stress among all the females was accompanied by the typical intrapersonal conflict of the working woman, feeling of guilt and low self-esteem in comparison with their male colleagues. Evaluating their life events retrospectively these women concluded that

they did not manage to make the dreams of their youth come true and became victims of the patriarchal family relations or career; however their sacrifice was not duly appreciated by the people around them. It is necessary to point out that these women tend to blame either themselves or their close relatives for their failures. We have proved that the feeling of guilt is a subjective feeling of one's own imperfection which is provoked by one's inner circle and which emerges against the background of a conflict verbalization.

Taking into account that the higher nervous activity plays the major role in the regulatory processes of adaptation, according to I.P. Pavlov's principles, F.B. Berezin claimed that from the physiological point of view psychic adaptation is generally a restructuring of the dynamic stereotype of behavior. I.P. Pavlov defined the principle of dynamic stereotype as a stable system of internal processes in the nervous system developing under the influence of an external stereotype of repeated environmental influences and restructuring on the basis of the law of summation of the time links under the corresponding change of the stereotype of environmental influence [11-12]. In the process of study of the physiological foundations of the human psychic activity and on the basis of the analysis of the goal-directed role behavior we have shown that personal orientation towards patriarchal values brings about a gender stereotype which significantly reduces adaptive capabilities of both men and women. Displacement of the dominating gender stereotype under the influence of a new social-cultural medium of an adult necessarily leads to development of stress-induced conditions among both men and women.

In conclusion we would like to offer several practical recommendations for the objective evaluation of adaptation, which are desirable not only for the residents of Tyumen and Tyumen region.

1. In the course of examination of the persons of high social-biological value it is necessary to keep in mind that the subjective factors of preventive medical examination (denial of the symptoms by the patient and formal attitude of the medical workers) together with routine diagnostic methods are responsible for the poor detection rate of heart pathologies and BMD.

2. The authors of the research insist on the wide application of cardiac ultrasound, 24-hour blood pressure monitoring and Holter monitoring while preparation of occupational histories and employment of persons with a high risk of development of stress-induced conditions.

3. While making treatment and rehabilitation programs for the persons with a high degree of psycho-emotional tension one should consider gender peculiarities of the structural-functional characteristics of the system of blood circulation, HNA and goal-directed role behavior. Correction of the potential risk factors among women with AH should be first of all directed at the body weight loss. As for men, it should involve stabilization of the parameters of the psycho-emotional sphere.

4. While taking diagnostic, medical and preventive measures aimed at men with BMD general practitioners should remember that multiple complaints of the patients with heart rate disorders have a proved high 10-year risk of CVD death according to the "SCORE" – as compared to the smoking men with AH of the same age.

5. All women with typical intrapersonal conflicts are characterized by the highest susceptibility to psychological consulting and psychotherapeutic treatment. In connection with this it is necessary to reorganize their working activity e.g. attendance of trainings aimed at career growth, self mastering of the program of time management, etc.

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