ASSESSMENT OF THE LEVEL OF HEALTH AND PHYSICAL PERFORMANCE IN PEOPLE WITH ALIMENTARY OBESITY AND HIGH CARDIOVASCULAR RISK

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ABSTRACT

Objective: to evaluate the indicators of psychological status, level of health and physical performance in people with alimentary obesity (AO) and high cardiovascular risk (CVR).

Material and methods. 99 individuals with high and very high cardiovascular risk according to SCORE2 with a body mass index (BMI) of more than 25 kg/m2 aged 40-70 years were examined: the first group consisted of 13 overweight individuals (BMI=27.5±1.5 kg/m2), the second group – 45 individuals with 1 degree of AO (BMI=32.55± 1.46 kg/m2); the third group – 29 persons with the 2nd degree of AO (BMI=37.0± 1.52 kg/m2), the fourth group – 12 persons with the 3rd degree of AO (BMI=42.5± 2.69 kg/m2). All were carried out: measurement of body weight, height, waist volume (WV) and hips volume (HV), WV/ HV, BMI (body weight = kg/ height, m2), hemodynamic parameters: systolic and diastolic blood pressure (SAD and DAD), heart rate (HR), determination of peak exhalation rate with the help of peak flowmetry; bioimpedance analysis with the assessment of metabolic parameters by Tanita analyzer scales.

The assessment of physical performance (PhP) was carried out using: a six-minute walk test (SMWT), the Borg scale for assessing the intensity of shortness of breath, a sample with Rufier squats, a mass test for determining the physical condition of E.A.Pirogov, 1984). The Reeder L. questionnaire was used to determine the stress level. with the determination of the average score - the stress index (SI). The assessment of health and quality of life was carried out using the EQ-5D questionnaire, designed to assess an individual's health status by 5 components reflecting mobility (movement in space), self-care, activity in everyday life, the presence of pain/discomfort and anxiety/depression.

The results of the study. Evaluation of exercise tolerance indicators depending on the degree of obesity in the group of patients with high and very high CVR showed a significant decrease in the tolerance to physical activity with a decrease in the distance of a SMWT, an increase in the index of the Rufier-Dixon test, reflecting the heart rate after relatively small physical exertion and a decrease in the level of physical condition according to the E.A. Pirogov test, an increase in the indicator of the Borg scale, reflecting the degree of shortness of breath that he experiences after performing physical activity (PhA). The data obtained indicate a decrease in exercise tolerance and an increase in the degree of shortness of breath on the physical activity with an increase in the degree of obesity. The tests and samples used in our study: the 6-minute walking test (recommended by ACSM, 2006), the Rufier-Dixon test, the Pirogov E.A. test are simple and non-invasive methods for assessing the functional capabilities of patients, especially with cardiological or bronchopulmonary diseases. Analysis of stress indicators of the Reeder L. questionnaire. and health indicators according to the EQ-5D questionnaire showed that there was an increase in the stress index and a deterioration in the health indicator in the group with high and very high CVR.

Keywords: alimentary obesity, physical performance, cardiovascular risk.

INTRODUCTION

Cardiovascular diseases (CVD) remain the leading cause of death worldwide; experts of the World Health Organization (WHO) predict a further increase in cardiovascular morbidity and mortality, both in developed and developing countries, due to the aging of the population and lifestyle features (2017) and according to WHO estimates, by 2030 from CVD will kill about 23.6 million people annually, that is, the only major cause of death will still be CVD [5]. In the prevention of CVD, it is important to monitor risk factors such as high blood pressure, obesity, cholesterol levels, diabetes and others [7]. The main control of a person consists of choosing the right diet, abstaining from tobacco products, and regular physical activity. Being overweight not only increases the risk of CVD, but also has an extremely negative effect on the development of an existing disease. Being overweight increases the risk of coronary heart disease (CHD) and other diseases associated with atherosclerosis. It is noteworthy that more than 12% of the population does not know their weight at all [4]. The prevalence of overweight increases with age. To estimate your weight, use a simple formula for determining body mass index (BMI = weight (kg) / height (m2). Obese people are characterized by a special psychotype, a certain behavior, a critical attitude towards themselves and their condition. The psychological state actively influences the effectiveness of treatment, the further prognosis of the course of the disease and the maintenance of long-term results [8]. People with obesity are often diagnosed with depression from subclinical to pronounced clinical form, psychological and social maladaptation at different stages of the disease. In patients of the Caucasian race, to assess the risk of complications associated with obesity, it is recommended in clinical practice to use the BMI classification of obesity (WHO, 1997): grade I obesity with a BMI of ≥30 kg/m2, grade II obesity with a BMI of ≥35 kg/m2 and grade III obesity with a BMI of ≥40 kg/m2). The values of

waist size (FROM)≥80 cm in women and FROM ≥94 cm in men correspond to abdominal obesity (AbO) and an increased risk of cardiovascular events. A high OT index in individuals with a BMI of ≥25 kg/m2 is associated with the risk of developing type 2 diabetes, dyslipidemia, arterial hypertension (AH) and CVD [4,5,11]. The level of physical performance (PhP) is an important diagnostic and prognostic criterion and risk stratification factor in healthy and CVD patients. In numerous epidemiological and clinical studies, it has been found that a low level of PhP is associated with an increased risk of general and cardiovascular mortality in both healthy and CVD patients [1,9]. A low level of PhP is an independent predictor of death in people with different body weights [10]. Thus, it was calculated that a low level of PhP causes general and cardiovascular mortality in 39 and 44% of cases, respectively, in physically inactive obese patients. Researchers believe that the low level of PhP in obese patients enhances the negative effect of the excess body fat itself on the mortality of this category of patients [1,12].

Objective: to evaluate the indicators of psychological status, level of health and physical performance in people with alimentary obesity (AO) and high cardiovascular risk (CVR).

MATERIALS AND METHODS

99 individuals with high and very high cardiovascular risk SCORE2 with a BMI of more than 25 kg/m2 aged 40-70 years were examined: the first group consisted of 13 overweight individuals (BMI=27.5±1.5 kg/m2), the second group – 45 individuals with 1 degree of AO (BMI=32.55±1.46 kg/m2); the third group – 29 persons with the 2nd degree of AO (BMI = 37.0± 1.52 kg/m2), the fourth group – 12 persons with the 3rd degree of AO (BMI=42.5± 2.69 kg/m2). The updated SCORE algorithm — SCORE2 - evaluates the 10-year risk of death and fatal cases of CVD (documented coronary artery disease, stroke, etc.) in practically healthy people aged 40-69 years with risk factors that have not been treated or have been stable for several years [7]. All were carried out: measurement of body weight, height, waist and hips volume (WV and HV), WV/ HV BMI (according to the Quetelet formula: body weight (kg)/height (m2)), hemodynamic parameters: systolic and diastolic blood pressure (SBP and DBP), heart rate (HR), determination of peak expiratory flow (PEF) using peak flowmetry; bioimpedance analysis with an assessment of metabolic parameters by Tanita analyzer scales (determination of the percentage of visceral and total adipose tissue, percentage of muscle mass, basal basal metabolic rate, metabolic age). Assessment of physical performance (PhP) using: the six-minute walk test (SMWT) (American College of Sports Medicine, ACSM, 2006), the Borg scale for assessing the intensity of shortness of breath [6], the Rufier squat test, the mass test for determining the physical condition of E.A.Pirogov, 1984). a SMWT proposed in 1985 is based on the determination of the distance that a patient, after preliminary acquaintance with the test conditions, can pass in 6 minutes [3]. The test measures the distance that a patient can quickly walk on a flat, hard surface within 6 minutes and gives an idea of the patient's PhP level. Normal proper indicators (in m) can be calculated using the formulas:

Men: (7.57 × height, cm) - (5.02 × age, years) - (1.76 – weight, kg) - 309 m

Women: (2.11 × height, cm) - (2.29 × weight, kg) - (5.78 × age, years) + 667 m.

The average distance for healthy men is 580 m, for healthy women – 500 m.

We also used the express method of determining the physical condition (in points) based on the consideration of 7 parameters: 1. the nature of work activity (mental work is estimated at 1 point, physical – at 3 points; 2. age (20 points are awarded at the age of 20, 2 points are removed for each next five years of life); 3. physical activity – physical exercises 3 times or more a week for 30 minutes or more are rated 10 points, less than 3 times a week – 5 points; not engaged in physical exercises - 0 points); 4. body weight (with normal body weight – 10 points, the excess of MT by 6-14 kg from the norm is estimated at 6 points, by 15 kg or more – 0

points); 5. pulse at rest (with a pulse of 90 beats / min and above, 0 points are awarded, for each stroke with a pulse of <90 beats /min - 1 point, for example, with a pulse of 70 in 1 minute, 20 points are awarded, for people over 60 years old with a pulse of <60 beats /min – 0 points); 6. blood pressure (BP) (at the level of 130/80 mm Hg - 20 points; for every 10 mmHg of systolic blood pressure or diastolic blood pressure above this value, 5 points are deducted); 7. complaints: if there are complaints – 0 points; if there are no complaints, 5 points are awarded. After summing up the points received, the level of physical condition is determined on a scale: 45 or less points – low, 46-74 points – average, 75 or more points - high level of physical condition [2].

The Reeder L. questionnaire was used to determine the stress level with the determination of the average stress index score (SI), indicators 1.0-2.0 for men, 1.0-1.82 for women are regarded as high stress level, 2.01-3.0 for men, 1.83-2.82 for women – average stress level, 3.01-4.0 for men, 2.83-4.0 for women – low stress level. The assessment of health and quality of life was carried out using the EQ-5D questionnaire, designed to assess an individual's health status by 5 components reflecting mobility (movement in space), self-care, activity in everyday life, the presence of pain/discomfort and anxiety/depression. The scale for evaluating each component has three levels depending on the severity of the problem: 1) there are no violations; 2) there are moderate violations; 3) there are pronounced violations. Total score – the sum of points is calculated and evaluated: 0-5 points – no violations, 6-10 points moderate health disorders, 11-15 points pronounced health disorders.

RESULTS AND DISCUSSION

The clinical examination of patients was based on the determination of these hemodynamic parameters (SBD, DBD, heart rate, PEF ml/min), anthropometric parameters (BW, WV, HV, WV/HV, BMI) presented in Table 1.

Table 1. Indicators of objective status, hemodynamic parameters, anthropometric data (M±SD)

№ п/п	Indicators	1 group (n=13)	2 group (n=45)	3 group (n=29)	4 group (n=12)
1.	**SAP, mmHg.**	119,28±15,5	130,2±20,9*	131,7±12,8*	131,7±19,0*
2.	**DAP mmHg.**	80,3±10,3	83,8±10,3*	84,8±8,4*	85,1±10,1*
3.	**Pulse (HR) beats per minute**	78,4±15,4	75,3±9,4	77±7,25	74,58±10,9
4.	**PEF ml/min**	392,1±142,9	367,1±151,5	356,2±115,0	321,5±100,2
5.	**Body weight, kg**	77,4±9,0	88,9±9,1**	105,8±17,5***	120,4±13,7***
6.	**WV, sm**	93,5±8,57	100,6±12,1*	112,3±12,1***	116,7±12,7***
7.	**HV, sm**	106,1±7,4	112,8±6,8*	119,9±7,9***	125,7±7,3***
8.	**WV/OB**	0,88±0,096	0,91±0,075	0,94±0,087	0,85±0,129
9.	**BWI**	27,5±1,5	32,55±1,46***	37,0±1,52***	42,5±2,69***

10.	**% fat**	36,95±6,9	40,96±5,9	41,1±7,3	45.3±5,7*
11.	**Internal fat (abdominal)**	10,35±2,1	12,38±3,5*	16,44±5,04***	17,96±5,04***

*Note: where * is the reliability of p<0.05; ** is the reliability of p<0.01; *** is the reliability of p<0.001 in relation to the indicators of group 1*

Analysis of the data obtained showed that Arterial hypertension (SBD – 140 and above mmHg, DBP above 90 mmHg) was detected in 25% (n=25) of patients, high normal SBD (130-139 mmHg) in 15% of patients (n=15). Along with a significant increase in BMI, WV, HV in patients of groups 2, 3 and 4, an increase in % of adipose tissue by 10% (p>0.05), 10% (p>0.05) and 16% (p<0.05) was noted, a significant increase in internal fat by 16.4 (p<0.05), 37% (p<0.001) and 42.4% (p<0.001), respectively, compared with the indicators of group 1. The dependence of BMI with the level of SAD was revealed with a significant increase in SBD indicators with an increase in the degree of obesity. In 96% of patients, AbO was detected, WV ≥80 cm in women and WV≥94 cm in men, which correspond to AbO and an increased risk of cardiovascular events. Obesity and overweight are one of the leading causes of CVD, including coronary heart disease, cardiac arrhythmias and atrial fibrillation, and also significantly enhance the pathophysiological effects of cardiovascular risk factors - dyslipidemia, type 2 diabetes, hypertension and sleep disorders [4]. According to the results of our study, a correlation was revealed between the ratio of BMI and the index of internal fat (Tanita) with a correlation coefficient of r = 0.74.

The Framingham study showed that middle-aged obese people are 50% more likely to develop hypertension than those who are not obese. The increase in BMI was accompanied by a significant increase in SBD and DBD, and for every extra 4.5 kg of weight there was an increase in SBD by 4.4 mmHg in men and 4.2 mmHg in women. The negative correlation between the level of SBD and BMI in blood pressure dysregulation, excessive BW, can act as the risk factors of the development of hypertension [4,8,9].

According to the results of our study, the association of BMI, age, SBD and DBD indicators with the CVR indicator according to SCORE2 was revealed: a high direct correlation (r=0.76 and r=0.70, r=0.85 and r=0.70, respectively). There is a decrease in PEF in patients with an increase in the degree of obesity, without reaching reliable values. There is a significant increase in % of adipose tissue and % of internal abdominal fat with an increase in the degree of obesity according to bioimpedance analysis (Table 1).

The evaluation of exercise tolerance indicators – tolerance to physical activity was carried out using a six-minute walk test, the Borg scale, the Rufier test, the mass test for determining the physical condition of E.A.Pirogov (1984) (Table 2).

Table 2. Indicators of tolerance to physical activity(M±SD)

№ п/п	**Indicators**	**1 group**	**2 group**	**3 group**	**4 group**
1.	SHH, meters	516,3±91,0	453,2±108,7	425,6±137,6*	390,0±60.7**
2.	Borg Scale	1,5±1,3	2,5±1,07***	3,0±1,02***	3,5±0,96***

3.	Roufier-Dixon test I=(P1+P2+P3)-200/10	4,82±2,7	5,73±2,07	6,65±2,2*	7,6±2,18*
4.	Mass test for determining the physical condition of E.A.Pirogov, (score)	51,4±18,09	42,3±13,3	37,7±13,57	36,0±9,8

*Note: where * - reliability p<0.05; ** - reliability p<0.01, *** - reliability p<0.001 in relation to the control group*

To subjectively assess a person's perception of the intensity of the performed physical activity, to assess the patient's general fatigue, shortness of breath and pain in the lower extremities, a ten-point Borg scale was used, while the patient chooses a score reflecting the degree of tension (shortness of breath) that he experiences after performing physical activity. According to the results of the study, there was an increase in the degree of dyspnea on the Borg scale in patients of groups 2, 3, 4 by 87% (p<0.001), 100% (p<0.001) and 133% (p<0.001), respectively, compared with the indicators of group 1. There was a significant decrease in exercise tolerance with a decrease in the SMWT distance in groups 3 and 4 by 21.3% (p<0.05) and 32.4% (p<0.01), respectively, compared with the indicators of group 1. The Rufier–Dixon test is a load complex designed to assess the performance of the heart during physical exertion. In groups 2, 3 and 4, the indicators of the Rufier test were within 5-10 points, which corresponded to the average heart performance, and in group 1 it was 4.82 ± 2.7 points, which corresponds to normal heart performance. The level of physical condition according to the results of the E.A.Pirogov test in group 2, 3, 4 corresponded to a low level, group 1 – 53.2 ± 23.36 points – the average level of physical condition, there was a decrease in the performance indicator with an increase in the degree of obesity. There is an inverse correlation of the a six-minute walk test result with BMI (r=0.78). The importance of physical inactivity as a health problem is constantly growing, since insufficient physical activity is the cause of CVD.

Indicators of the level of health and psychological status in the groups are presented in Table 3.

Table 3. Stress index indicators and health indicators according to the questionnaire EQ--5D and EQ–VAS (M±SD)

№ п/п	**Indicators**	**1 group**	**2 group**	**3 group**	**4 group**
1	Stress level SI (Reeder L.)	2,65±0,74	2,25±0,63	2,24±0,6	1,79±0,92 **
2	Health and Quality of life assessment Questionnaire EQ--5D (total score)	6,5±2,16	7,11±1,2	7,15±1,46	7,33±0,98 *

*Note: where * - reliability p<0.05; ** - reliability p<0.01, *** - reliability p<0.001 in relation to the control group*

The stress level was assessed using the Reeder L. questionnaire [13]. At the same time, the stress index was evaluated by the express method, averaged according to the results of 7 questions assessing nervous tension, physical and psychological state. According to the results of the study, the stress index in groups 1, 2, 3 and 4 was: 2.65±0.74 (average), 2.25±0.63 (average), 2.24±0.6 (average) and 1.79±0.92 (high), in group 4 the stress level is 48% higher (p<0.01) compared to with indicators of group 1.

Assessment of health and quality of life EQ-5D with the calculation of the total score, was in groups 1, 2, 3 and 4: 6,5±2,16, 7,11±1,2, 7,15±1,46 and 7.33 ± 0.98 points – which corresponds to moderate health disorders. The health-related quality of life is becoming particularly relevant in connection with the problems of population aging, the development of national strategies and programs in the social and medical sphere and the increasing prevalence of chronic diseases. A proven and reliable methodology generating reliable and comparable assessments of human functioning and health should be the basis for the measurement of the health-related quality of life [13].

The questionnaire evaluates the health status based on 5 components related to the following aspects of life: mobility, self-care, activity in everyday life, pain or discomfort, anxiety or depression. Each component is divided into 3 levels in the EQ-5D version, depending on the severity of the indicator (no problem, minor problem or significant problem). Like any complex subjective indicator, the health-related quality of life does not have an unambiguous direct method of measurement. The widespread interest in the study of health information received from the patient himself over the past few decades has led to the development of various tools for measuring the quality of life related to health.

Conclusion. Evaluation of exercise tolerance indicators depending on the degree of obesity in the group of patients with high and very high CVR showed a significant decrease in the physical performance with a decrease in the distance of SMWT the E.A. Pirogov test, an increase in the indicator of the Borg scale, reflecting the degree of shortness of breath that he experiences after performing the physical activity. The data obtained indicate a decrease in exercise tolerance and an increase in the degree of shortness of breath on the physical activity with an increase in the degree of obesity. The tests used in our study to determine: the 6-minute walking test, the Rufier-Dixon test, the Pirogov E.A. test are simple and non–invasive methods for assessing the functional capabilities of patients, especially with cardiological or bronchopulmonary diseases. Analysis of stress indicators of the Reeder L. questionnaire. and health indicators according to the EQ-5D questionnaire showed that there was an increase in the stress index and a deterioration in the health indicator in the group with high and very high CVR.

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