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EPIDEMIOLOGY AND SIGNIFICANCE OF MALNUTRITION AMONG OUTPATIENTS WITH HEART FAILURE

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Abstract:

Objective: To assess the prevalence and identify markers of malnutrition in outpatients with chronic heart failure (CHF).

Materials and methods: At the first stage, the prevalence of malnutrition in patients with CHF who were on an outpatient admission was determined.

Patients were randomly included in the study, regardless of the presence of signs of malnutrition. An individual questionnaire with anthropometric parameters was filled in for each included patient.

Patients with CHF who have a body mass index (BMI) of less than 20 kg / m^2 were included in the second phase of the study. The trophological status was assessed using anthropometric, clinical, and laboratory methods, and the nutritional risk index (NRI) was investigated.

Results: A decrease in nutritional status was observed in 63.1% of outpatients with cachexia and CHF I-III Functional Class (from all patients suffering from low body weight), and was characterized by a decrease in lean body mass (LBM) / Body Fat Mass (BFM) ratio, low absolute lymphocyte count, serum albumin, and nutritional risk index (NRI).

The assessment of the trophological status in patients with CHF was carried out not only by BMI, but also by calculating the main components of body weight – Lean Body Mass and Body Fat Mass on the basis of measurements of skin and fat folds.

Conclusion: The weight deficit among outpatients made up 8% of the population, while 5% (53 patients) had CHF. Body mass index and serum albumin are currently the most commonly used indicators for clinical nutritional assessment in outpatient practice. However, the method of assessing malnutrition by the nutritional risk index is more reliable, easier to use, and makes it possible to reliably estimate the nutritional status in patients with CHF.

Key words: *chronic heart failure; malnutrition syndrome; cardiac cachexia, outpatients; body mass index.*

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INTRODUCTION:

For 16 years in the Russian Federation, the prevalence of chronic heart failure (CHF) increased significantly from 4.9% to 10.2%. At the same time, the number of patients with chronic heart failure III-IV Functional Class increased significantly: from 1.2% to 4.1%.

The overall mortality of patients with CHF is 6% per year [1]. The problem of the prevention of decompensation and the creation of a basis for a stable course of CHF is one of the main tasks of the cardiological medical community, which makes it necessary to consider this area as a priority in medicine [2, 3, 4].

Patients with chronic heart failure in some cases develop cachexia, especially in severe disease. Early studies have shown that a decrease in body mass index (BMI) shortens life expectancy [5, 6, 7].

In patients with chronic heart failure, there is an inverse relationship between BMI and mortality, which is sometimes called the obesity paradox. These results were obtained in a large-scale study of MAGGIC (n = 53,210) [7].

A meta-analysis of four more studies, including 59 263 patients, also confirms that there is a paradox of obesity in patients with chronic heart failure [5, 8, 9, 10].

At the same time, the relationship may be either U- or J-shaped and may be different between patients with a low ejection fraction (HF-rEF, EF <40%) and preserved left-ventricular EF (HF-pEF, EF ≥50%) [5].

Revealed the relationship between a moderate increase in BMI and prolongation of life expectancy. With very low body weight and significant obesity, mortality is increasing. The meta-analysis by Zhang J. et al. (2018) confirms a narrow minimum risk range for both HF-rEF and HF-pEF, with a BMI of 32-33 kg / m2, although the U-shaped ratio is more “flat” for HF- rEF [5].

A number of studies indicate the paradox of obesity in patients over the age of 50 years with established cardio-metabolic disease [11]. This was found in hypertension [12], type 2 diabetes [13, 14], atrial fibrillation [15, 16] and coronary heart disease [17], as well as in heart failure [18, 19].

The ESC guidelines for heart failure (2016) no longer recommend weight loss in moderate obesity patients [20]. The clinical recommendations for CHF (2017) indicate that in cardiac cachexia and low body weight (with an initial BMI of less than 19 kg/m^2), or with a loss of body weight by 5 kg or more, or more than 7.5% of the initial mass in a compensated state for six months, it is necessary to combine medical correction of neurohormonal disorders with nutritional support and cytokine blockade [21].

The cachexia in patients with CHF develops within the framework of the chronic inflammatory syndrome [22] and has an unfavourable prognosis regardless of the severity of the disease, the patient's age, exercise tolerance and indices of contractility of the left ventricular myocardium [23].

According to the literature, it is obvious that the use of any one anthropometric or laboratory indicator will not be an objective reflection of the nutritional status of the patient. In addition, in practical activities with a known temporary limit, the doctor needs the possibility of a quick and preferably simple assessment of nutritional status.

In this regard, integral assessment systems began to be actively introduced into clinical practice, allowing a combination of several parameters to determine the

current nutritional status of the patient. The American Nutrition Society (ASPEN) recommends for these purposes the Patient Generated Subjective Global Assessment (PGSGA, more often simply SGA) questionnaire. SGA parameters include evaluating patient weight loss, dietary restriction, signs of dyspeptic disorders, functional activity, and a number of anthropometric and clinical indicators.

Determination of nutritional status on the scale of "nutritive risk Assessment" (Nutritional Risk Screening (NRS) 2002 is based on the gradual exclusion from the entire population of patients without trophic disorders. At the first stage (initial assessment), patients are screened for only three parameters.
If there is a positive result in the initial assessment, then we should proceed to the second evaluation block. The age-related nutritional risk index (Geriatric Nutritional Risk Index) is one of the most commonly used indicators in the elderly population. One of the easiest to use and fairly objective evaluation scale is the index of Nutritional Risk Index (NRI), which takes into account plasma albumin and body weight [24].
The question is : what is the best system for assessing nutritional status?

Based on the evaluation of the literature data, it should be noted that today there are several systems for assessing nutritional status in the mono version or combined, which is quite acceptable for research. However, for clinical practice there are no reliable, reasoned, easy-to-use and statistically reliable markers of identification of malnutrition in adults.

Aim

The aim of this article was to assess the prevalence and identify reliable markers of diagnosis of malnutrition in outpatients with chronic heart failure.
Investigation task:
1.Analysis of the prevalence of malnutrition in outpatients with CHF.
2.Isolation and detection of markers of malnutrition syndrome in outpatients with chronic heart failure.

MATERIALS AND METHODS:

At the first stage, to determine the prevalence of malnutrition, a study of 1050 patients was conducted. Primary care physicians and cardiologists from February to may of 2018, visited polyclinic №8 of the city of Belgorod. Patients were randomly included in the study, regardless of the presence of signs of malnutrition. An individual questionnaire with anthropometric parameters was filled in for each included patient. The exclusion criteria was the presence of malignant neoplasm, liver cirrhosis, systemic connective tissue diseases. 84 patients with BMI less than 20 kg/m2 were identified from this cohort, among them 53 patients had CHF.

The second stage of the study included all 53 patients with CHF with BMI less than 20 kg / m2. Trophological status was assessed using anthropometric and laboratory methods. In addition, age, sex, functional class (FC) of CHF according to NYHA, blood pressure level and concomitant pathology were taken into account, exercise tolerance was assessed according to the results of a 6-minute test, EF according to echocardiography [25]. While collecting anamnesis in patients, the level of daily physical activity was clarified, how quickly their weight decreased, whether the diet and doctor's recommendations were followed, and awareness of the disease.

Laboratory parameters included a study of the total blood count, which evaluated the absolute number of lymphocytes, biochemical parameters: albumin, total protein, fasting blood glucose, cholesterol spectrum, potassium, sodium and serum creatinine. The degree of malnutrition according to laboratory criteria was assessed in table 1.

Table 1:Laboratory criteria for malnutrition

Indicator	Normal value	Degree of malnutrition		
		I	II	III
Albumin, g/l	>35	35-30	30-25	<25
Lymphocytes, 10^6/l	>1800	1800-1500	1500-900	<900

It should be noticed that dehydration increases the concentration of proteins and hyperhydration – reduces.

Anthropometric parameters were estimated: height (cm), weight (kg), thickness of the skin-fat fold. The ideal body mass index was also calculated.

BMI = m / h^2, where m is weight in kg, h is height in meters.

In accordance with who recommendations, age-appropriate BMI indicators were interpreted as follows.

Reduced power: BMI-19,0-19,9.
Malnutrition I degree: BMI-17.5-18.9.
Malnutrition II degree: BMI is 15.5 and 17.4.
Malnutrition III degree: BMI below 15.5.
Determination of lean body mass (LBM) and body fat mass (LMC) was carried out by method of durnin –Womersley. This made the calculation of the thickness of the skin and fat of the amount of folds (BHC), after getting measurement for 4 standard points (mm), calculation of logarithm (log), amount (S) BHC, the density of the body (L g/ml) according to the following formulas:

For men >50 years D = 1,1715-0,0779 x (magazines)

For women>50 years D = 1,1339-0,0645 x (magazines),

The thickness of the skin fold (CSF) was determined at the level of the lower angle of the shoulder blade, in the paraumbilical region on the side of the rectus abdominis, at the level of the middle third of the shoulder above the biceps and above the triceps in millimeters (mm) with the help of a caliper. The sum of the thickness of all 4 skinfolds was calculated and the table was used to determine the body fat mass [26]. Lean body mass was calculated by subtracting body fat mass from the total body mass :

Lean body mass = Total body mass –Body fat mass.

Lean body mass was evaluated in comparison with due Lean body mass, which was conditionally taken equal to 70% or more of the recommended body weight (RMT).

To calculate the Recommended body mass, it is most appropriate to use the formulas proposed by the European Association of nutritionists:

Male Recommended body mass = P-100 - [(P – 152) × 0.2]

Women's Recommended body mass = P-100 - [(P – 152) × 0.4]

Where P is the height of a person in cm.

The calculation of the nutritive risk index (NRI) was calculated by the formula:

NRI =1.519×plasma albumin (g/l)+0.417×(body weight 1 (kg) / body weight 2 (kg) ×100)

where body weight 1-body weight at the time of examination, body weight 2-normal body weight.

Nutritional status of patients was classified as:

- *nutritional insufficiency (NRI>97,5);*
- *moderate malnutrition (97,5>NRI>83,5);*
- ** severe nutritional deficiency (NRI<83.5) [24].*

Statistical analysis of the data was carried out on a personal computer using the program "Statistica 6.0" and spreadsheets "Microsoft Excel" with the definition of averages and correlation.

RESULTS AND THEIR DISCUSSION:

Among 1050 outpatients who were examined by therapists and cardiologist of polyclinic no.8 in Belgorod, signs of malnutrition were observed in 8% (84 people) of patients, 5% (53 people) had CHF. Of these, 63.1% (53 people) were patients with CHF. This is below the average incidence of cachexia syndrome, which ranges from 13.3% to 16% according to the literature [27, 28]. The study "Saturn" studied the prevalence of malnutrition in therapeutic patients who are on inpatient treatment in therapeutic departments or turned to the district therapist. The study showed a high prevalence of malnutrition among patients who turned to the therapist: 53.2% of patients had signs of hypotrophy. Of these, 61% were patients with CHF. The nutritional status of patients with CHF depends on the duration of the disease and the adequacy of drug therapy [29]. The difference between the results may be due to the fact that more severe (decompensated) patients receive treatment at home or in a hospital, and more safe patients come to the clinic.

It was revealed that the average age of patients with CHF was 69 years, with the average age of women - 71.1 ± 5.8 years, men - 68.2 ± 4.6 years. Literature data indicate an increase in malnutrition with age.

Malnutrition in our study was in 58.5% of men (n=31) and 41.5% (n=22) of women. Thus, malnutrition is significantly more common in males in the outpatient fraction.

Distribution of patients in the Functional Class of CHF was the following: I – 4 (7,5%), II – 28 (53%), III – 21 (39,5%).

Signs of malnutrition on BMI: I degree-26 patients (49.1%), II degree – 16 (30.2%), III degree – 5 (9.4%). Reduced nutrition was found in 6 (11.3%). The average BMI among men was 16.9 kg / m2, in women-17.4 kg / m2.

In a number of studies, it is proved that with decline of lean body mass, muscle dysfunction and shortness of breath are seen [30, 31]. However, according to N. Vorobyov. (2009), in everyday practice, Lean body mass reduction remains unnoticed for a long time due to the pronounced fat deposits and the lack of evaluation standards [30]. When assessing malnutrition by anthropometric parameters, the proportion of patients with moderate or severe malnutrition was 29%, and, accordingly, 61% with mild malnutrition. At the same time, women had significantly less Lean body mass than men ($p<0.01$). In the study of SATURN II, the increase in Lean body mass naturally manifested itself in an increase in exercise tolerance, which was confirmed by the results of a 6-minute test, while there was a decrease in functional Class of CHF in patients with nutritional support [31].

When calculating and evaluating the nutritional risk index (NRI), the average was NRI - 91. At the same time, a correlation of low NRI results with older age, lower body mass index, higher CHF Fuctional Class, concomitant atrial fibrillation, anemia and reduced mobility was more observed.

Our study revealed a moderate correlation between malnutrition (when calculating NRI) and exercise tolerance (according to the 6-minute test) ($r = 0.42$; $p<0.05$); NRI and Functional Class of CHF ($r = -0.4$; $p<0.05$). Our data are consistent with the study of Skhirtladze M. R., Drapkina O. M. (2011), which revealed a correlation between the state of trophic status and the most important characteristics of heart function in patients with CHF [32].

In 21 (39.6%) patients there were only anthropometric criteria for malnutrition, in 13 (24.5%) - only laboratory ones, 19 (35.9%) - had both laboratory and anthropometric signs of malnutrition. The complexity of biochemical processes in the pathophysiology of CHF and cachexia suggests that one marker may not reflect all the features of the disease. Taking into account this limitation, future research should focus on the development and use of an optimal combination of several markers that better reflects all the features of the syndrome.

CONCLUSION:

1. Weight deficit among outpatients was 8% of the population, while 5% (53 people) of patients had CHF.
2. Decrease in nutritional status was observed in 63.1% of outpatients with cachexia and CHF I-III of Functional Class (all patients with low body weight), and was characterized by a decrease in the ratio of Lean body mass/BMI, low levels of absolute number of lymphocytes, serum albumin and nutritional risk index (NRI).
3. Evaluation of trophic status in patients with CHF should be carried out not only by BMI, but also by calculating the main components of body weight-lean body mass and BMI on the basis of measurements of skin-fat folds.
4. Mandatory parameters include anthropometric, clinical and laboratory data. These parameters can and should be used by a doctor of any specialty to determine the current nutritional status.
5. Body mass index and serum albumin levels are currently the most commonly used indicators for clinical evaluation of nutrition in outpatient practice. Nevertheless, the method of assessment of malnutrition on the index of nutritional risk is more reliable, easy to use and makes it possible to reliably assess the nutritional status in patients with CHF.

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