ASPECTS OF NUTRITION IN PATIENTS WITH CONGESTIVE HEART FAILURE

Gulatava N., Tabagari S., Tabagari N.

David Tvildiani Medical University, Tbilisi, Georgia

Congestive heart failure (CHF) is a pressing problem in the healthcare, and is associated with high levels of morbidity and mortality. The majority of CHF patients have poor quality of life in spite of the modern evidence-based treatment [3,9]. During the past decade, a better realization of the disease process made it clear that the pathological changes affect not only cardiovascular system, but also neuroendocrine, immune, musculoskeletal, hematological, renal and gastrointestinal systems and nutritional status.

Malnutrition is more common in patients with HF, especially at at its severe stage, and is associated with the risk of complications and high mortality [3,8,9]. Consequently, evaluation of malnutrition in patients with HF, monitoring of patients in this regard, and identifying the right assessment tools are the basis for developing an effective nutritional strategy that can have a significant impact on their treatment and management. Modern literature provides a number of nutritional indices for patients in general population and chronic diseases[5].

The Prognostic Nutritional Index (PNI)[5,9], the Geriatric Nutritional Risk Index (GNRI) [1,5,] and Controlling Nutritional Status (CONUT) [5,3] require simple objective markers (serum albumin levels, serum total cholesterol levels, total lymphocyte count and body weight), and are widely used for evaluating nutritional status in elderly patients or patients with chronic diseases. In addition, the relationship between these nutritional indices and other known important prognostic factors (inflammatory markers, renal function, hemoglobin values, cardiac function and exercise capacity) remains unclear. It is also unclear which index is more useful for estimating prognosis in patients with HF.

Accordingly, our aim was to study the prevalence of different markers of malnutrition, their association with nutrient indices, and their correlation with CHF among Georgian population.

Material and methods. This was a prospective, observational study that enrolled consecutive 96 patients relevant to the research objectives and 34 practically healthy persons. The inclusion criterion for the patients was an existence of HF diagnosis. Informed consents to participate in research were obtained from both practically healthy group and patient group. All patients and participants were treated and observed at the "New Hospitals" outpatient clinic in Tbilisi. The diagnosis was made based on the history and clinical laboratory data. Senior status cardiologist assessed the class of HF (according to NYHA); all patients underwent echocardiography. Etiology of CHF in the study group patients: ischemic genesis – 47.3%, non-ischemic – 52.7%. Patients had been on treatment for CHF for several years prior to being included in the study.

Exclusion criteria were a history of myocardial infarction, clinical signs of acute infection, autoimmune diseases, renal failure (serum creatinine level> 200 mg%) or severe liver disease within three months on either side of the study commencement. Patients with suspected malignancies were also excluded from the study.

The study protocol was written in accordance with the guidelines of the Institutional Ethics Committee. All persons involved in the study executed the informed consent documents.

Reagents and laboratory testing. Laboratory testing was performed on the peripheral venous blood samples obtained from the participants. Biochemical and immunological investigations were conducted using Vacuette's tubes with Clot Activator and gel separation. Samples for hematology testing were collected using Vacuette K2EDTA vacuum tubes and fibrinogen concentration determination from - Vacuette Citrate Solution 3.2% in the vacuum tube.

Biochemical investigations were performed on the automated Roche Cobas c 311 Chemistry Analyzer (Roche Diagnostics, Switzerland) using Roche diagnostics reagents:

Total Cholesterol (Chol2) - enzymatic method, HDL-Cholesterol (HDLC 3) - enzymatically method, LDL-Cholesterol (LDLC) - enzymatic method, Triglycerides(TRIGL) - enzymatic method, hs-CRP (CRPHS) – immunoturbidimetric method, Ferritin (Ferr4) - immunoturbidimetric method, Transferrin (TRANSF2) – immunoturbidimetric method, Transferine (TRANSF2) – immunoturbidimetric method, Urea (UreaL) – kinetic test with urease and glutamate dehydrogenase, Creatinine (CREP2) – enzymatic method, Albumin – colorimetric method, Prealnumine (PREA) – immunoturbidimetric method, Acid Glicoprotein (AAGP2) – immunoturbidimetric method. eGFR calculation performed by abbreviated MDRD equation: 186 x (Creatinine / 88.4) $^{-1.154}$ x (Age) -0.203 x (0.742 if female).

IL-6 were performed on the automated immunoassay analyzer Cobas e 411 (Roche Diagnostics, Switzerland) using Roche Diagnostics (Switzerland) reagents. Hemoglobin concentration, RDW SD (erythrocyte distribution space in the standard deviation) and RDW CV (coefficient of variation), lymphocyte count was measured using a 5-part cell counter differentiation automated hematology analyzer (Sysmex XT2000i, Japan). Leptin concentration was determined by Leptin Sandwich ELISA (DRG Instruments GmbH, Germany) reagent and using the automatic reader iMark (Bio-Rad).

Nutritional assessment and classification. The GNRI was calculated as follows: GNRI=14.89×serum albumin (g/dL)+41.7×body weight/ideal body weight. Ideal body weight=22×square of height in meters.

Patients with GNRI ≥98 are considered as normal, those with a GNRI of 92–97 are at mild risk of malnutrition, those with a GNRI of 82–91 are at moderate risk and those with a GNRI <82 are at severe risk

The PNI was calculated as follows: PNI=10×serum albumin (g/dL)+0.005×total lymphocyte (count per mm^3). A PNI >38 is considered as normal, thoe patients with a PNI of 35–38 are at moderate risk of malnutrition and those with a PNI <35 are at severe risk.

The Controlling Nutritional Status (CONUT) score was calculated by serum albumin score plus total cholesterol scores and total lymphocyte scores. Albumin, lymphocyte and total cholesterol scores are calculated according to the Table 1.

Patients with a CONUT score of 0–1 have a normal nutritional status, those with a CONUT score of 2 – at mild risk of malnutrition, those with a CONUT score ≥3 are at severe risk.

Nutritional status measurements. Nutritional status was also assessed using a nutrition questionnaire - MEDFICTS (Meats, Eggs, Dairy, Fried Foods, fat in baked goods, Convenience foods, Table fats, Snacks) Dietary Assessment Questionnaire. Anthropometrics measurements were done by standard methods.

Table 1. Distribution of malnutrition status by albumin, lymphocyte and total cholesterol scores

Parameters	Score			
	Norm	Mild	Moderate	Severe
Serum Albumin,(g/dL)	≥3.50	3.00–3.49	2.50–2.99	<2.50
Albumin Score	0	2	4	6
Lymphocytes(count/mm^3)	≥1600	1200–1599	800–1199	<800
Lymphocyte score	0	1	2	3
Total cholesterol (mg/dL)	≥180	140–179	100–139	<100
Score	0	1	2	3

Table 2. Demographic, laboratory and instrumental study data of partisipants

Parameters	Patient	Control Group
Quantity	96	34
Age	69.85	58.74
Gender (female/male)	43/53	20/14
HF (NYHA class) (II/III/IV)	26/54/6	0
Heart Ischemic disease	47.30%	-
Arterial Hypertension	84.40%	-
Type 2 diabetes mellitus	23.10%	3.00%
Left ventricular ejection fraction (LVEF)%	37.91	-
Body Mass Index(BMI)	42.02	37.79
Waist –Hip Ratio	1.02	1.16
Hemoglobin (g/dL)	12.70	13.75
RDW SD, fL	47.83	43.47
RDW CV,%	15.10	13.65
VLDL-Cholesterol, (mg/dL)	15.09	12.74
LDL-Cholesterol,(mg/dL)	96.08	136.7
HDL-Cholesterol,(mg/dL)	40.76	54.05
Prealbumin,(g/L)	0.14	0.31
Leptin,(ng/ml)	8.81	19.14
IL-6,(pg/ml)	20.99	3.18

Echocardiography. Echocardiography was performed using the standard techniques. The echocardiographic parameters included: left ventricular ejection fraction (LVEF); Left ventricular Diastolic Diameter (LVDD), Interventricular septum (IVS), Left ventricular posterior wall (LVPW), right ventricular (RV), pulmonary pressure (PASP max). All measurements were performed using ultrasound systems AplioXG (Toshiba, Japan).

Normally distributed descriptive date is presented as a mean ± SD and their dispersion analysis, ANOVA and t-test. For the categorical variables data and for those categorized (hemoglobin, lymphocytes, prealbumin, albumin, urea, eGFR, interleukin-6, lipid profile, hs-CRP, transferrin, haptoglobin, ferritin) were performed both univariate-frequency analysis and bivariate analysis. Pearson χ^2 test was used for comparison.

The rest of the data was dispersed according to the created PNI, GNRI, CONUT indices.

Spearman correlation analysis was conducted among the variables. A cut off criterion of $P<0.05$ was considered statistically significant. Statistical assessment of these analyses was carried out using the statistical software package (SPSS V.24.0, IBM).

Results and discussion. Subjects in the study were distributed by severity risk factor (NYHA II / III / IV) (26/54/6). The study involved 43 females and 53 males. The mean age of patients was 69.85 (24-96). Ischemic heart disease was determined as an etiological factor of HF in 47.3% of patients, type 2 diabetes mellitus – in 23.1% of patients. Arterial hypertension was observed in 84.4% of patients (81 patients).

The main demographic, laboratory, echocardiographic data of the study subjects are furnished in Table 2.

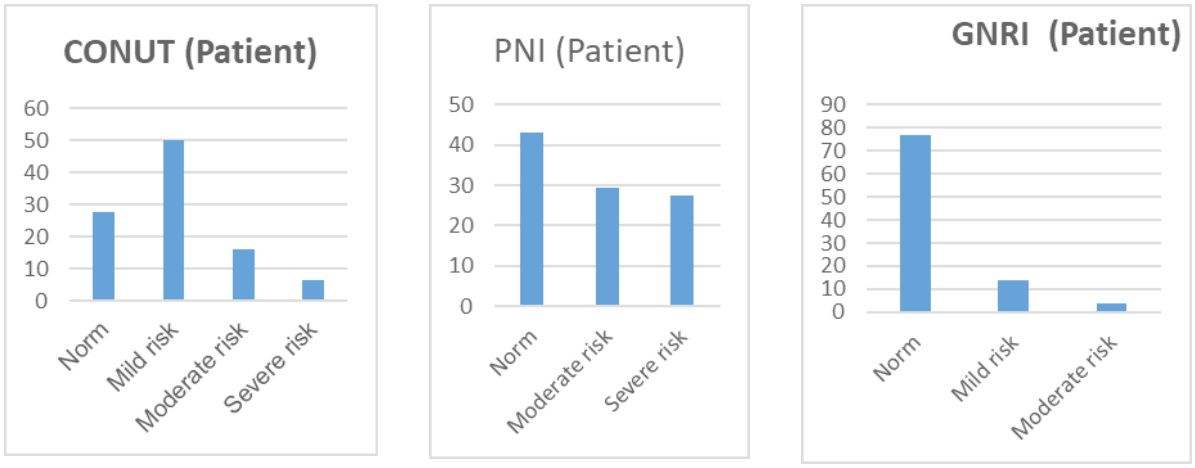

Diagram. The percentage distribution of the patient group according to the nutritional indices

Table 3.Laboratory, echocardioscopic data distribution by Conut

Parameters	Conut 0-1	Conut 2	Conut >=3	p_1	p_2	p_3
Body mass index	34,47	51,59	41,67	.263	.547	.517
Hemoglobine (HGB) , g/dl	12,99	12,85	12,45	.764	.167	.404
Lymphocyte(LYMPH),%	27,48	23,13	17,78	.062	.000	.008
Prealbumin,g/L	0,18	0,13	0,12	.063	.007	.521
Albumin, g/L	40,76	40,46	34,27	.870	.000	.000
Urea, mmol/L	7,44	7,68	7	.770	.570	.352
GFR,mL/min/1,73m^2	82,25	79,67	87,65	0,718	0,245	0,506
Interleikin-6 (IL-6), pg/mL	18,91	16,31	24,78	.725	.405	.078
Total Cholesterol (T-CHOL), mg/dL	192,44	167,05	118,83	.040	.000	.000
Triglicerede s (TG), mg/dL	179,28	139,78	106,27	.137	.004	.008
High Density Cholesterol (HDL-CHOL), mg/dL	46,59	41,34	36,86	.151	.009	.046
Low Density Cholesterol (LDL-CHOL), mg/dL	129,7	110,17	67,76	.069	.000	.000
Very Low Density Cholesterol (VLDL-CHOL), mg/dL	135,08	119,45	90,46	.259	.000	.003
Atherogenic coefficient	3,50	3,09	2,35	0,258	0.003	0,001
High sensitive C-reactive protein (hsCRP), mg/L	43,05	54,77	40,75	.670	.907	.543
Haptoglobine (Haptoglobin), g/L	2,35	1,74	2,54	.038	.883	.556
Acid Glicoproteine (Acid Glicoprotein), g/L	1,24	1,31	1,14	.611	.363	.212
Transferrine (Transferine), g/L	2,8	2,69	2,53	.609	.167	.322
Ferritine (Ferritine), g/L	176,15	313,91	168,53	.148	.886	.082
Left ventricular Diastolic Diameter (LVDD), sm	5,5	5,42	5,48	.780	.928	.822
Intraventricular septum (IVS), sm	1,2	1,21	1,51	.944	.399	.455
Left ventricular posterior wallof (LVPW), sm	1,08	1,2	1,13	.060	.266	.291
Left ventricular ejection fraction (LVEF),%	38,4	41,38	35,83	.307	.341	.059
Right ventricular (RV), sm	3,36	3,65	4,52	.041	.200	.377
Pulmonary hypertension (PASP max), mmHgP	44,32	49,71	54,24	0,2068	0.0185	0,2903

p_1 - 0-1/2; p_2 - 0-1/ >=3; p_3 - >=3/2

Low GNRI and PNI and high CONUT identify nutritional disorders.

The percentage distribution of the patients study group according to the nutritional indices is shown on diagram.

This distribution shows that different calculators in this group show different data: by nutritional status only 27.7% of patients are normally identified by Conut, 43.2% by PNI and 77% by GNRI.

Within each calculator (CONUT, PNI, and GNRI) a comparative analysis of the clinical-laboratory data of patients according to nutritional status (norm, mild, moderate, severe risk) was performed, which showed that (i) CONUT (Table 3)

provides a protein reserve, estimation of calorie expenditure and immunodeficiency. With albumin reserve, the amount of prealbumin decreases (0.18 g/L vs 0.12 g/L p>0.007). A decrease in total cholesterol along with a decrease in all lipid spectrum indices reflects a decrease in the overall energy balance. Prealbumin depletion as a sensitive marker of early stage malnutrition "correctly" reflects the difference between norm-mild group and severe quality status (Conut's view) (Table 3) patients.

Notably, patients with malnutrition (Conut) include patients with increased right ventricular size and pulmonary hypertension (Table # 3).

(ii) GNRI (Table 4) assessment of patients' malnutrition status also shows a decrease in overall energy balance (by lowering total and low-density cholesterol and triglycerides), a decrease in transferrin concentration (iron transfer protein). Because of its smaller body pool and shorter half-life, it has been considered a better index of changes in protein status compared to albumin. Possibly, the diagnostic value of this index (GNRI-s) [1] is significant for determining a poor prognosis for hospitalized and elderly patients and can be detected with transferrin levels decrease in high-risk patients (the protein-depth status / provision) (by GNRI).

(iii) Comparative analysis of data according to PNI (Table 5) shows that the calculator assesses protein reserve, calorie expenditure, and immunodeficiency. Along with albumin, the risk groups significantly decrease in hemoglobin and prealbumin concentrations, decrease in total cholesterol and its fractions, triglycerides, but also increase in proinflammation-protein IL-6 concentrations.

Table 4 Distribution of Laboratory and Echocardiographic Data by GNRI

GNRI						
Parameter	**Normal**	**Mild risk**	**Moderate risk**	**p_1**	**p_2**	**p_3**
Body mass index	46,434	24,300	22,500	.163	.419	.433
RBC (RBC) x10^{12}/L	4,386	4,280	3,753	.575	.068	.000
Hemoglobine (HGB) , g/dL	12,750	12,786	11,450	.944	.156	.105
Lymphocytes (LYMPH),%	21,951	22,414	17,300	.855	.298	.315
Fibrinogene, g/L	4,774	4,801	3,355	.942	.038	.0007
Prealbumine, g/L	0,146	0,112	0,083	.133	.125	.433
Albumine, g/L	39,016	32,786	29,025	.001	.004	.181
Urea, mmol/L	7,450	7,100	5,725	.690	.258	.417
GFR, mL /min/1,73m^2	82,072	95,184	88,646	0,145	0,629	0,681
Interleikine-6 (IL-6),pg/mL	20,847	18,709	31,700	.774	.423	.327
Total Choleterole (T-CHOL), mg/dL	157,614	138,803	88,513	.203	.007	.033
Trigliceredies (TG), mg/dL	144,398	100,188	87,500	.000	.192	.374
High Density Cholesterol (HDL-CHOL), mg/dL	41,273	41,037	29,923	.947	.073	.109
Low Density Cholesterol (LDL-CHOL), mg/dL	100,877	84,528	44,112	.176	.010	.042
Very Low Density Cholesterol (VLDL-CHOL), mg/dL	114,371	95,973	86,004	.655	.817	.993
Atherogenic coefficient	2,962	2,487	2,255	0,174	0,663	0,273
High sensitive C-reactive protein (hsCRP), mg/L	43,970	48,530	51,245	.861	.871	.959
Haptoglobine (Haptoglobin), g/L	1,847	1,773	14,770	.809	.428	.426
Acid Glicoproteine (Acid Glicoprotein), g/L	1,217	1,121	1,345	.518	.641	.314
Transferine (Transferine), g/L	2,732	2,264	2,310	.027	.258	.888
Ferritine (Ferritine),mg/L	213,847	204,929	92,500	.919	.447	.309
Left ventricular Diastolic Diameter (LVDD), sm	5,473	5,415	5,667	.841	.736	.685
Intraventricular septum (IVS), sm	1,380	1,231	1,133	.701	.760	.538
Left ventricular posterior wall of (LVPW), sm	1,135	1,138	1,000	.956	.314	.248
Left ventricular ejection fraction (LVEF),%	39,100	34,615	29,000	.155	.102	.414
Right ventricular (RV), sm	4,043	3,646	3,800	.681	.904	.626
Pulmonary hypertension (PASP max), mmHgP	48,886	54,923	61,000	.208	.199	.590

p_1 - norm/mild; p_2 - norm/high; p_3 - high/moderate

Table 5. Distribution of Laboratory and Echocardiographic data by PNI

PNI						
Parameter	**Normal**	**Moderate risk**	**Severe risk**	**p_1**	**P_2**	**p_3**
Body mass index	31,70	49,43	50,42	0,172	0,206	0,958
Hemoglobine (HGB), g/dl	13,29	12,08	12,43	0,004	0,038	0,448
Lymphocyte (LYMPH), %	23,40	23,54	17,36	0,95	0,003	0,007
Prealbumin,g/L	0,18	0,12	0,09	0,001	0,000	0,138
Albumin, g/L	43,09	36,28	30,35	0,000	0,000	0,000
Urea, mmol/L	7,46	7,74	6,65	0,711	0,231	0,217
GFR,mL/min/1,73m^2	85,15	78,51	88,55	0,375	0,232	0,664
Interleikin-6 (IL-6), pg/mL	15,97	18,08	32,38	0,719	0,013	0,088
Total Cholesterol (T-CHOL), mg/dL	164,32	162,47	116,77	0,878	0,000	0,000
Trigliceredes (TG), mg/dL	147,81	147,31	102,87	0,982	0,013	0,044
High Density Cholesterol (HDL-CHOL), mg/dL	42,54	41,74	35,29	0,785	0,019	0,023
Low Density Cholesterol (LDL-CHOL), mg/dL	107,20	104,83	66,36	0,821	0,00	0,00
Very Low Density Cholesterol (VLDL-CHOL), mg/dL	115,91	117,54	95,01	0,893	0,064	0,073
Atherogenic coefficient	3,00	3,05	2,46	0,880	0,071	0,064
High sensitive C-reactive protein (hsCRP), mg/L	41,49	37,35	60,04	0,844	0,439	0,347
Haptoglobine (Haptoglobin), g/L	1,80	2,06	3,23	0,287	0,42	0,48
Acid Glycoprotein (Acid Glicoprotein), g/L	1,18	1,25	1,19	0,558	0,916	0,634
Transferrine (Transferine), g/L	2,91	2,52	2,36	0,039	0,003	0,327
Ferritine (Ferritine), g/L	217,11	215,74	184,81	0,986	0,698	0,652
Left ventricular Diastolic Diameter (LVDD), sm	5,66	5,33	5,38	0,187	0,305	0,832
Intraventricular septum (IVS), sm	1,19	1,21	1,75	0,861	0,271	0,252
Left ventricular posterior wall of (LVPW), sm	1,11	1,13	1,17	0,726	0,243	0,527
Left ventricular ejection fraction (LVEF),%	37,70	39,38	36,48	0,527	0,676	0,348
Right ventricular (RV), sm	4,37	3,51	3,88	0,356	0,623	0,031
Pulmonary hypertension (PASP max), mmHgP	48,78	48,35	54,96	0,912	0,206	0,121

p_1 - norm/moderate; p_2 - norm/high; p_3 - high/moderate

Table 6. Conut, GNRI and PNI indices correlation

Parameters		**CONUT**	**NGRI**	**PNI**
CONUT	Pearson Correlation	1	,029	-.376**
	Sig. (2-tailed)		,780	,000
	N	96	95	95
NGRI	Pearson Correlation	,029	1	,035
	Sig. (2-tailed)	,780		,739
	N	95	95	94
PNI	Pearson Correlation	-.376**	,035	1
	Sig. (2-tailed)	,000	,739	
	N	95	94	95

***. Correlation is significant at the 0.01 level (2-tailed); *. Correlation is significant at the 0.05 level (2-tailed)*

Table 7. Correlation analysis between nutrition indexes and other parameters

Parameter	CONUT	GNRI	PNI
Age	.123	-.042	-.102
CHF (NYHA class)	.187	.070	-.013
Body mass index	-.007	.806**	-.081
Hemoglobine (HGB) , g/dl	-.133	.070	.115
Lymphocyte(LYMPH),%	-.521**	.058	.191
Prealbumin,g/L	-.405**	-.027	.683**
Albumin, g/L	-.646**	.035	1.000**
Urea, mmol/L	-.078	.004	.213*
GFR,mL/min/1,73m^2	.035	.162	-.016
Interleikin-6 (IL-6), pg/mL	.337**	.110	-.308**
Total Cholesterol (T-CHOL), mg/dL	-.678**	.002	.515**
Triglicerides (TG), mg/dL	-.388**	-.047	.327**
High Density Cholesterol (HDL-CHOL), mg/dL	-.450**	-.041	.557**
Low Density Cholesterol (LDL-CHOL), mg/dL	-.657**	.043	.417**
Very Low Density Cholesterol (VLDL-CHOL), mg/dL	-.323**	.054	.112
Atherogenic coefficient	-.323**	.054	.111
High sensitive C-reactive protein (hsCRP), mg/L	.131	-.035	-.103
Haptoglobine (Haptoglobin), g/L	.167	-.068	-.110
Acid Glicoproteine (Acid Glicoprotein), g/L	.004	.078	.133
Transferrine (Transferine), g/L	-.268**	.095	.505**
Ferritine (Ferritine), g/L	-.039	-.036	.062
Left ventricular Diastolic Diameter (LVDD), sm	.004	.022	.118
Intraventricular septum (IVS), sm	.154	-.040	-.090
Left ventricular posterior wallof (LVPW), sm	.166	-.039	-.115
Left ventricular ejection fraction (LVEF),%	-.146	.056	.143
Right ventricular (RV), sm	.074	-.013	-.032
Pulmonary hypertension (PASP max), mmHgP	.347**	.105	-.178

*** - p<0.01; * - p<0.05*

By examining the correlation between the CONUT, GNRI and PNI indices, a significant negative correlation was found between CONUT and PNI (Table 6). However, it is important to note that the Nutrition Risk Index makes it possible to determine morbidity and mortality risk [5,10], GNRI is an NRI revised version [5,11] specifically adapted for the elderly. CONUT score is also considered to be an effective tool for early detection and monitoring of malnutrition for all patients [5,12]. Some studies address the possibility of using these indices in patients with CHF.

The study suggests an opportunity to use these indices in CHF patient assessment. We quantitatively compared results obtained using CONUT, GNRI and PNI scale risk groups, as the primary picture suggested in our study group (ambulatory, quite compensated CHF) CONUT and PNI represents best option (Table 7).

The table 7 shows that prealbumin, lipid spectrum and transferrin values decrease with increasing risk for Conut and PNI, with Interleukin-6 increasing on both calculators. Changes in other data are not correlated.

Acute phase reactants such as C-reactive protein, fibrinogen, haptoglobin and acidic glycoprotein reduce the synthesis of albumin, prealbumin, and transferrin, and may therefore remain at low levels despite inadequate nutrient support. According to our results, the increase in the mentioned acute phase reactants is not reliably correlated with the severity of the nutrient indices (when there is a difference between groups); However, it is worth noting that in the study group C-reactive protein increased by 61.2%, fibrinogen – by 58.1%, haptoglobin – by 38.6%, acidic glycoprotein – by 37.5% (Table 8), which should be used not so much to assess the risk itself (outcome, hospitalization, clinically detected malnutrition, etc...), but to identify the close relationship of these risk factors with the realization.

Thus, there is a high number of malnutrition patients among those with more or less compensated outpatient CHF, requiring adequate evaluation and nutritional support. Selection of the nutritional index requires the use of an adequate calculator (degree of compensation, patient age, etc...) and additional research to study their correlation with the prognostic markers of CHF. According to our study, such an increase in risk is based on a decrease in prealbumin, lipid panel data and transferrin (protein-energy malnutrition) and Interleukin-6 (pro-inflammatory protein).

REFERENCES

1. Tanaka A., Inaguma D, Shinjo H. et al. Relationship between mortality and Geriatric Nutritional Risk Index (GNRI) at the time of dialysis initiation. // Renal Replacement Therapy. 2017; 3:27.
2. Kalanatar-Zadeh K., Anker S.D., Horwich T.B. Fonarow G. Nutritional and Anti-Inflammatory Interventions in Chronic Heart Failure. // Am J Cardiol. 2008; 101 (11A): 89-193
3. Nakagomi A., Kohashi K., Morisawa T. et al. Nutritional Sta-

tus is Associated with Inflammation and Predicts a Poor Outcome in Patients with Chronic Heart Failure. // J Atherosclerosis and Thrombosis vol. 23,2016:713-727.
4. Pinho CPS, Silveira AC. Nutritional Aspect in Heart Failure. // J Nutrition and Health Sciences, 2014: Vol. 1 (3): 305. doi: 10.15744/2393-9060.1.30
5. Yoshihisa A., Kanno Y., Watanabe S. et al. Impact of Nutritional indices on mortality in patients with heart failure. // J Open Heart, 2018;5(1): e000730.doi:10.1136/open-heart-2017-000730.
6. Ponikowski P, Voors AA, Anker SD, et al. ESC Guidelines for the diagnosis and treatment of acute and chronic heart failure: The Task Force for the diagnosis and treatment of acute and chronic heart failure of the European Society of Cardiology (ESC) Developed with the special contribution of the Heart Failure Association (HFA) of the ESC. // Eur Heart J; 2016:2129–200.
7. Yancy CW, Jessup M, Bozkurt B, et al. ACCF/AHA guideline for the management of heart failure: a report of the American College of Cardiology Foundation/American Heart Association Task Force on Practice Guidelines. // J Am Coll Cardiol 2013;2013: e147–239.
8. Kalantar-Zadeh K., Block G, Horwich T, Fonarow GC et al. Reverse epidemiology of conventional cardiovascular risk factors in patients with chronic heart failure. // J Am Coll Cardiol,2004;1439-1444.
9. Sargento L, Longo S, Lousada N, dos Reis RP. The importance of accessing nutritional status in elderly patients with heart failure. // Curr Heart Dail Rep,2014;11:220-226.
10. Lin H, Zhang H, Lin Z, et al. Review of nutritional screening and assessment tools and clinical outcomes in heart failure. // Heart failure Rev2016; 21:549-65.
11. Bouullanne O, Morineau G, Dupont C et al. Geriatric Nutriotional Risk Index: a new index for evaluating at-risk elderly medical patients // Am J Clin Nutr 2005;82:777-83
12. Ignacio de Ulibarri J.Gonzales-Madrono A, de Villar NG et al. CONUT: a tool for controlling nutritional status. First validation in a hospital population. // Nutr Hosp 2005;20:38-45.

SUMMARY

ASPECTS OF NUTRITION IN PATIENTS WITH CONGESTIVE HEART FAILURE

Gulatava N., Tabagari S., Tabagari N.

David Tvildiani Medical University, Tbilisi, Georgia

Congestive heart failure (CHF) is a significant healthcare problem, and is associated with high levels of morbidity and mortality. The majority of patients have poor quality of life in spite of the modern evidence-based treatment. Malnutrition is more common in patients with HF, especially at the severe stage of HF, and is associated with the risk of complications and mortality. Consequently, evaluation of malnutrition in patients with HF, monitoring of patients in this regard, and identifying the right assessment tools are the basis for developing of an effective nutritional strategy that can have a significant impact on the treatment and management of such patients.

Our aim was to study the prevalence of different markers of malnutrition, their association with nutrient indices, and their correlation with CHF in Georgian population.

The total of 96 patients relevant to the research objective (43 female and 53 male with average age 69.85) were enrolled in the study. Nutritional screening was performed using the GNRI, which was calculated as follows: GNRI=14.89× serum albumin (g/dL) +41.7*body weight÷ideal body weight. Ideal body weight=22* square of height in meters and PNI was calculated as follows: PNI=10* serum albumin (g/dL) +0.005*total lymphocyte (count per mm^3) and The Controlling Nutritional Status (CONUT) score was calculated by serum albumin score plus total cholesterol score and total lymphocyte score. Peripheral venous blood was tested for acute phase reactant (hsCRP, Interleukin-6, fibrinogen, acid glycoprotein) and for protein-energy malnutrition (prealbumin, albumin, lymphocytes, lipid profile and transferrin).

By examining the correlation between the CONUT, GNRI and PNI indices, a significant negative correlation was found between CONUT and PNI. We quantitatively compared results obtained using CONUT, GNRI and PNI scale risk groups, as the primary picture suggested it in our study group (ambulatory, quite compensated CHF). CONUT and PNI represent best option.

Prealbumin, lipid profile data, transferrin decreases with increasing risk for CONUT and PNI, with Interleukin-6 increasing on both calculators. Changes in other data are not correlated.

Keywords: Malnutrition, chronic Heart Failure, CONUT, GNRI, PNI .

РЕЗЮМЕ

АСПЕКТЫ НУТРИЦИОЛОГИИ У ПАЦИЕНТОВ С ХРОНИЧЕСКОЙ СЕРДЕЧНОЙ НЕДОСТАТОЧНОСТЬЮ

Гулатава Н.А., Табагари С.И., Табагари Н.С.

Медицинский университет им. Д. Твилдиани, Тбилиси, Грузия

Цель исследования - определение частоты распространения различных биомаркеров, указывающих на развитие мальнутриции, их взаимосвязи с нутрициологическими индексами и корреляции индексов между собой у пациентов грузинской популяции с компенсированной хронической сердечной недостаточностью.

Рассчитаны нутрициологические индексы 96 вовлеченных в исследование амбулаторных пациентов (43 женского и 53 мужского пола, средний возраст 69.85 лет) грузинской популяции с компенсированной хронической сердечной недостаточностью: GNRI (Geriatric Nutritional Risk Index)=14.8× альбумин в сыворотке (г/дл)+41.7+масса тела (кг)÷идеальную массу тела. Идеальная масса тела расчитана по формуле: 22× рост($м^2$).

PNI (Prognostic Nutritional Index)=10× альбумин в сыворотке (г/дл)+0.005×общее количество лимфоцитов ($мм^3$). The Controlling Nutritional Status (CONUT) = сумма баллов альбумина в сыворотке, общего холестерина и общего количества лимфоцитов ($мм^3$). Периферическая венозная кровь исследована на реактанты острой фазы (С-реактивный белок, интерлейкин-6, фибриноген, кислый гликопротеид) и тесты, оценивающие иммунный статус (лимфоциты, альбумин, преальбумин, трансферин, липидный обмен).

Изучена корреляционная взаимосвязь между нутрициологическими индексами и выявлена статистически достоверная обратная зависимость между CONUT и PNI. Исследование различных биомаркеров в корреляции со степенью тяжести (увеличение риска развития мальнутриции) нутрициологических индексов CONUT, GNRI и PNI показало, что для грузинской популяции больных компенсированной

хронической сердечной недостаточностью более информативным является расчет индексов CONUT и PNI.

С ростом риска мальнутриции по индексам CONUT и PNI уменьшаются преальбумин, трасферин и показатели липидного обмена. По изменениям показателей остальных биомаркеров взаимосвязь не выявлена.

რეზიუმე

ნუტრიციული ასპექტები გულის ქრონიკული უკმარისობით პაციენტებში

ნ.ღულათავა, ს.თაბაგარი, ნ.თაბაგარი

დავით ტვილდიანის სამედიცინო უნივერსიტეტი, თბილისი, საქართველო

გულის ქრონიკული უკმარისობა (გქუ) წარმოადგენს ჯანდაცვის სისტემის მნიშვნელოვან პრობლემას, რომელიც ასოცირდება ავადობისა და სიკვდილობის მაღალ დონესთან. მალნუტრიცია ხშირად გვხდება გქუ-ით პაციენტებში, უმეტესად გქუ-ის მძიმე სტადიაზე და კავშირშია გართულებებისა და სიკვდილობის რისკთან. შესაბამისად, გქუ-ით პაციენტებში მალნუტრიციის შეფასება, ამ თვალსაზრისით პაციენტთა მონიტორინგი და შეფასების სწორი ინსტრუმენტების განსაზღვრა ეფექტური ნუტრიციული სტრატეგიის შემუშავების საფუძველია, რამაც მნიშვნელოვანი გავლენა შეიძლება იქონიოს ასეთი პაციენტების მკურნალობასა და მართვაზე.

კვლევის მიზანი - მალნუტრიციის სხვადასხვა მარკერის გავრცელების სიხშირის, ნუტრიციულ ინდექსებთან კავშირისა და ინდექსებს შორის ურთიერთკავშირის განსაზღვრა ქართული პოპულაციის გქუ-ით პაციენტებში (ამბულატორიული, მეტ-ნაკლებად კომპენსირებული).

კვლევაში ჩართულ 96 კვლევის ამოცანის შესაბამის პაციენტებში (43 ქალი და 53 მამაკაცი, საშუალო ასაკი 69.85 წელი) გამოთვლილია GNRI (Geriatric Nutritional Risk Index) შემდეგი ფორმულის გამოყენებით:

GNRI=14.89xშრატის ალბუმინის კონცენტრაციაზე (გ/დლ)+41.7+წონა/იდეალურ წონაზე. იდეალური წონის გამოთვლა შესრულდა შემდეგი ფორმულით: 22xსიმაღლე ($მ^2$).

აგრეთვე გამოვითვალეთ PNI (Prognostic Nutritional Index) შემდეგი ფორმულით: PNI=10xშრატის ალბუმინის კონცენტრაცია (გ/დლ)+0.005xსაერთო ლიმფოციტების რიცხვი პერიფერიულ სისხლში ($მმ^3$) და CONUT (Controlling Nutritional Status) ინდექსი, რომლის გამოთვლა შესრულდა ალბუმინის ქულა+საერთო ლიმფოციტების ქულა+საერთო ქოლესტერინის ქულა. პერიფერიული ვენური სისხლიდან იქნა გამოკვლეული როგორც მწვავე ფაზის რეაქტანტები (მაღალი მგრძნობელობის C-რეაქტიული ცილა, ინტერლეიკინი-6, ფიბრინოგენი, მჟავე გლიკოპროტეინი), ასევე იმუნოლოგიური სტატუსის შესაფასებელი კვლევები (ალნუმინი, პრეალბუმინი, ტრანსფერინი, ლიმფოციტების რაოდენობა, სრული ლიპიდური სპექტრი).

CONUT, GNRI და PNI ინდექსების ურთიერთკორელაციის შესწავლით, გამოვლენილ იქნა სარწმუნო უარყოფითი კორელაცია CONUT და PNI შორის. CONUT, GNRI და PNI სიმძიმის (რისკის მატება) მიხედვით შესწავლილ ბიომარკერთა კორელაციური ანალიზის საფუძველზე კვლევის პოპულაციისათვის უფრო გამოიკვეთა CONUT და PNI-ის გამოყენების განხილვა/გამოყენება.

კლევამ აჩვენა, რომ პრეალბუმინი, ლიპიდური სპექტრის მონაცემები, ტრანსფერინი კლებულობს CONUT და PNI სიმძიმის რისკის მატებასთან ერთად. მატულობს ინტერლეიკინ-6-ის კონცენტრაცია ორივე ნუტრიციული ინდექსების მიხედვით. სხვა მონაცემებში ცვლილებების ურთიერთკორელაცია არ აღმოჩნდა.

АТЕРОГЕННОЕ ВОЗДЕЙСТВИЕ ДИСБИОЗА РОТОВОЙ ПОЛОСТИ (ОБЗОР)

[1]Авагимян А.А., [2]Манукян И.А., [1]Навасардян Г.А., [3]Челидзе К.Л., [2]Рисованный С.И.

[1] Ереванский государственный медицинский университет им. М. Гераци, Армения;
[2]ФГБОУ ВО «Кубанский государственный медицинский университет» МЗ РФ, Россия;
[3]Тбилисский государственный медицинский университет, Грузия

Сердечно-сосудистые заболевания (ССЗ) остаются лидирующей причиной смертности населения и экономического бремени системы здравоохранения. В настоящее время на долю ССЗ приходится более 17,6 миллиона смертей в год, и, согласно прогнозам, к 2030 году данный показатель превысит 23,6 миллиона [17]. Нестабильная атерома и ее разрыв являются основой патологий большинства сердечно-сосудистых осложнений, в частности острого коронарного синдрома (ОКС), смертность от которого, в сравнении с иными СС событиями, остается лидирующей. Несмотря на многочисленные усилия Всемирной организвции здравоохранения, национальных систем здравоохранения и органов медицинского управления, показатели распространенности и смертности от сердечно-сосудистых событий остаются критически высокими [21], что диктует необходимость дальнейшего развития профилактической кардиологии.

С динамичным развитием науки и техники улучшилось представление об безусловно мультифакториальном пато-