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EVALUATION OF MALNUTRITION STATUSES IN SYSTOLIC HEART FAILURE PATIENTS

Irmak İrem Özyiğit[1], Beliz Koçyiğit[1], Begüm Söyleyici[1], Fatih Mehmet Uçar[2]

[1] Trakya University School of Medicine, Edirne, TURKEY
[2] Department of Cardiology, Trakya University School of Medicine, Edirne, TURKEY

ABSTRACT

Aims: The aim of this study is to determine the malnutrition statuses of patients with systolic heart failure in Trakya University Hospital and Edirne Sultan 1st Murat State Hospital.

Methods: Mini Nutritional Assessment was used to determine the patients' malnutrition statuses. In addition, patients' transthoracic echocardiography results, biochemistry tests, hemograms, medications and habits were evaluated with patients' nutritional scores. One-way ANOVA and Kruskal-Wallis tests were used for comparing the results and Pearsonχ2 test and Fischer's exact test were used to obtain categorical data.

Results: The total number of subjects in the study was 66 (61 patients from Trakya University Hospital; 5 patients from Edirne Sultan 1st Murat State Hospital). The mean age of all subjects was 65.3 ± 11.1. Out of all patients, 17 of them were female, while 49 of them were male. The mean Mini Nutrition Assessment score was 21.9 ± 4.7. In total, 34 patients had an adequate nutritional status, 25 patients were at risk of malnutrition and 7 patients were malnourished.

Conclusion: Although malnourished patients were detected, well – nourished patients were higher. Therefore, it could be said that patients with heart failure are conscious of their health and diet. It is crucial for the health care providers to maintain giving advices on healthy living and nutrition to keep this elderly population well–nourished.

Keywords: Nutrition assessment, systolic heart failure, malnutrition

INTRODUCTION

Heart failure (HF) is a pathophysiological condition defined as the failure of the heart to supply the requirements of the metabolizing tissues under normal cardiac pressures due to an abnormality in cardiac function (1, 2). HF is a major health problem which is a leading and increasing cause of mortality and morbidity around the world (3). Broadly, the prevalence of HF in the western world is at 1–2% and the incidence accounts for 5–10 per 1000 people per year (4). Symptoms of HF include fatigue, dyspnea, limited exercise tolerance and accumulation of concomitant fluid. With the aging population, higher portion of individuals such as people with hypertension, diabetes mellitus and obesity are exposed to the possibility of developing HF (2).

Clinically, HF patients can be divided into two categories; patients with HF with preserved (≥50%) ejec-

tion fraction (HFpEF) and patients with HF with reduced left ventricular ejection fraction (HFrEF) (≤40%). Leastwise, half of the HF patients have a reduced ejection fraction (5).

Heart failure with reduced left ventricular ejection fraction is caused by an initial injury or disease state, which can be cardiovascular-originated or originally include other organ systems followed by the evolution of secondary cardiovascular abnormalities that lead to reduced ventricular contraction. With the most important risk factor for HFrEF is being hypertension, other cardiovascular etiologies of HFrEF are myocardial infarction, cardiomyopathies, myocarditis, cardiac infection and valvular diseases. Extra-cardiac causes of HFrEF are systemic diseases, endocrine etiologies, high in take of illicit drugs and alcohol, side effects of chemotherapy treatment. When it comes to stable patients with pre-existing HFrEF, various factors can accelerate

clinical decompensation, worsen the symptoms thus create the need for hospitalization of patients. These factors consist of ischemia, arrhythmia, infection, failing to comply with medications and dietary restrictions (2).

According to World Health Organization (WHO) malnutrition is defined as excesses, imbalances, inadequacies in a person's intake of energy and/or nourishments (6). WHO also states that the term malnutrition covers two groups of conditions; one being undernutrition and the other one being overweight, obesity and noncommunicable diseases related to diet. Undernutrition includes wasting, stunting, underweight and micronutrient insufficiencies or deficiencies. Examples for diet-related noncommunicable diseases can be diabetes, stroke, cancer and heart disease (6).

Intestinal edema, anorexia, malabsorption, rise of basal metabolism ratio and the increase in energy and nutrition needs of the heart lead to malnutrition among HF patients (7). Moreover, pharmacological therapy can also lead to insufficient energy and nutrition intake by causing loss of appetite that (8). In conclusion, malnutrition induces intensified edema, inflammation, neurohormonal activity and is highly associated with adverse prognosis among HF patients (7).

Malnutrition is often seen among patients with HF and it is associated with the lower quality of life and increased risk of mortality (9, 10). Despite increasing evidence concerning the crucial role of micronutrient deficiencies in chronic HF, the HF guidelines have not yet declared definitive nutritional strategies and the number of clinical research inspecting the effects of micronutrient supplementations on the prevention of malnutrition are still confined. Therefore, to be able to assess generally recognized nutritional strategies to improve the functional capacity and quality of life more researches are needed to be carried out regarding malnutrition of HF patients (9).

The aim of this study is to determine the malnutrition statuses of systolic heart failure patients evaluated between 15 January - 10 February 2019 in Trakya University Medical Research and Practice Hospital and Edirne Sultan 1st Murat State Hospital by using the results of Mini Nutritional Assessment (MNA®), patients' transthoracic echocardiography, biochemistry tests, hemograms, medications and habits (11).

MATERIAL AND METHODS

This study was approved by the Scientific Research Ethics Committee of Trakya University Medical Faculty. Informed consent was obtained from all of the patients. In this cross-sectional and descriptive study, the study population was composed of patients over 18 years old who were diagnosed with systolic heart failure with EF ≤40%, and applied to the cardiology department of Trakya University Hospital, and Edirne Sultan 1st Murat State Hospital between 15th of January – 10th of February, 2019. Seventy patients were asked to fill the MNA® survey to evaluate their anthropometric characteristics, general status, dietary habits, and subjective assessments. After data collection, 66 patients (61 patients from Trakya University Hospital, 5 patients from Edirne Sultan 1st Murat State Hospital) were included in the study. The rest were excluded because of inconsistent and incomplete data. MNA® consists of 18 questions, and four parts to determine patients' nutritional status. If malnutrition indicator score is less than 17 points, the patient is malnourished. 17 to 23.5 points indicate a risk of malnutrition, and 24 to 30 points indicate that the patient is in normal nutritional status (11).

Mini Nutritional Assessment

A. Has food intake declined over the past 3 months due to loss of appetite, digestive problems, chewing or swallowing difficulties?
(0: Severe decrease in food intake. / 1: Moderate decrease in food intake. / 2: No decrease in food intake.)
B. Weight loss during the last 3 months
(0: Weight loss greater than 3kg (6.6lbs). / 1: Does not know. / 2: Weight loss between 1 and 3kg (2.2 and 6.6 lbs). / 3 : No weight loss.)
C. Mobility
(0: Bed or chair bound. / 1: Able to get out of bed / chair but does not go out. / 2: Goes out.)
D. Has suffered psychological stress or acute disease in the past 3 months?
(0: Yes. / 2: No.)
E. Neuropsychological problems
(0: Severe dementia or depression. / 1: Mild dementia. / 2: No psychological problems.)
F. Body Mass Index (BMI) = weight in kg / (height in m)2
(0: BMI less than 19. / 1: BMI 19 to less than 21. / 2: BMI 21 to less than 23. / 3: BMI 23 or greater.)
G. Lives independently (not in nursing home or hospital)
(1: Yes. / 0: No.)

H. Takes more than 3 prescription drugs per day
(0: Yes. / 1: No.)
I. Pressure sores or skin ulcers
(0: Yes. / 1: No.)
J. How many full meals does the patient eat daily?
(0: 1 meal. / 1: 2 meals. / 2: 3 meals.)
K. Selected consumption markers for protein intake
At least one serving of dairy products (milk, cheese, yoghurt) per day (Yes / No)
Two or more serving of legumes or eggs per week (Yes / No)
Meat, fish or poultry every day (Yes / No)
(0: If 0 or 1 yes. / 0.5: If 2 yes. / 1: If 3 yes.)
L. Consumes two or more servings of fruit or vegetables per day?
(0: No. / 1: Yes.)
M. How much fluid (water, juice, coffee, tea, milk...) is consumed per day?
(0: Less than 3 cups. / 0.5: 3 to 5 cups. / 1: More than 5 cups.)
N. Mode of feeding
(0: Unable to eat without assistance. / 1: Self-fed with some difficulty. / 2: Self-fed without any problem.)
O. Self view of nutritional status
(0: Views self as being malnourished. / 1: Is uncertain of nutritional state. / 2: Views self as having no nutritional problem.)
P. In comparison with other people of the same age, how does the patient consider his / her health status?
(0: Not as good. / 0.5: Does not know. / 1: As good. / 2.0: Better.)
Q. Mid-arm circumference (MAC) in cm
(0: MAC less than 21. / 0.5: MAC 21 to 22. / 1: MAC greater than 22.)
R. Calf circumference (CC) in cm
(0: CC less than 31. / 1: CC 31 or greater.)

In addition to the MNA®, patients' medications were recorded according to the following classes: acetylsalicylic acid, angiotensin – converting enzyme inhibitors angiotensin 2 receptor blocker, β-blockers, aldosterone antagonists, statins, diuretics, antiarrhythmics, anticoagulants, sacubitril/valsartan. Findings of echocardiography that included their left ventricular enddiastolic diameter (LVEDD) and ejection fraction (EF) values were collected from the patients' files of Trakya University Medical Faculty and Edirne Sultan 1st Murat State Hospital. Patients' habit of smoking, sex, age, weight (kg), and height (cm) were recorded by their verbal statement. Pre-prandial blood glucose, urea, creatinine, aspartate aminotransferase (AST), alanine aminotransferase (ALT), low density lipoprotein (LDL), high density lipoprotein (HDL), triglyceride (TG), hemoglobin, hematocrit (HCT), albumin, white blood cell (WBC), neutrophile, lymphocyte, platelet (PLT), c-reactive protein (CRP) levels and history of patients' chronic diseases – if any [hypertension (HT), hyperlipidemia (HL), diabetes mellitus (DM)] were recorded from the archives of Trakya University Hospital and Edirne Sultan 1st Murat State Hospital through patients' medical record numbers to determine patients' nutritional status.

After data collection, statistical analysis was carried out with IBM SPSS Statistics for Windows, Version 22.0. Armonk, NY: IBM Corp. A p-value of <0.05 was set for statistically significance. As descriptive statistics, mean ± standard deviation or median with 25th-75th percentiles were used for continuous variables. Categorical variables were expressed as numbers and percentages. Compatibility of continuous variables to normal dissemination was evaluated with the Sharipo Wilk test. For comparing the groups, One-way ANOVA and Kruskal-Wallis tests were used. Pearson $\chi2$ test and Fischer's exact test were used to achieve categorical data.

RESULTS

The total number of subjects in the study was 66. The mean age of all subjects was 65.3 ± 11.1. Out of all patients, 17 of them were female, while 49 of them were male. The mean age of female subjects was 67.9 ± 11.2, whereas the mean age of male subjects was 63.9 ± 10.9. Taking into consideration the MNA results, the mean score was 21.9 ± 4.7. Our MNA results also portray that 7 female and 27 male subjects had an adequate nutritional status, 7 female and 18 male subjects were at risk of malnutrition, 3 female and 4 male subjects were malnourished. The mean MNA score for females was 21.5 ± 5.04, while the mean score for males was 23.3 ± 3.9. Evaluation of MNA questions and subjects' answers according to groups are presented at Table 1. The difference of subjects' answers to questions A, B, D, E, O among groups were found to be statistically significant (p<0.001). Biochemical, echocardiography parameters and medications of patients can be observed at Table 2. Statistically significant difference was found at platelet counts between groups (p=0.045).

Table 1: Evaluation of MNA questions according to groups.

Questions	Adequate nutritional status (n=34)		Risk of malnutrition (n=25)		Malnourished (n=7)		P value
	The option chosen the most	*n (%)*	*The option chosen the most*	*n (%)*	*The option chosen the most*	*n (%)*	
A	no decrease in food intake	33(97.1)	no decrease in food intake	17(68)	severe decrease in food intake	5(71)	0.0001
B	no weight loss	26(76.5)	no weight loss	13(52)	weight loss greater than 3kg	6(85.7)	0.0001
C	goes out	31(91.2)	goes out	19(76)	goes out	3(42.9)	0.004
D	no	3(88.2)	no	13(52)	yes	7(100)	0.0001
E	no psychological problems	31(91.2)	no psychological problems	16(64)	mild/severe dementia or depression	6(85.8)	0.0001
G	yes	34(100)	yes	22(88)	yes	7(100)	0.124
H	yes	29(85.3)	yes	23(92)	yes	7(100)	0.614
I	no	34(100)	no	23(92)	no	5(71.4)	0.012
J	3 meals	27(79.4)	3 meals	22(88)	3 meals	4(57.1)	0.106
K	if 2 yes	26(76.5)	if 2 yes	15(60)	if 0 or 1 yes	4(57.1)	0.007
L	no	27(79.4)	no	15(60)	no	5(71.4)	0.302
M	more than 5 cups	26(79.5)	more than 5 cups	16(64)	3 to 5 cups	3(42.9)	0.317
N	self-fed without any problem	33(97.1)	self-fed without any problem	24(96)	self-fed without any problem	5(71.4)	0.058
O	views self as having no nutritional problem	29(85.3)	views self as having no nutritional problem	10(40)	views self as being malnourished	5(71.4)	0.0001
P	As good	12(35.3)	Not as good	12(48)	Not as good	6(85.7)	0.024
Q	Mid-arm circumference greater than 22 cm	31(91.2)	Mid-arm circumference greater than 22 cm	23(92)	Mid-arm circumference greater than 22 cm	5(71.4)	0.193
R	Calf circumference 31 cm or greater	34(100)	Calf circumference 31 cm or greater	24(96)	Calf circumference 31 cm or greater	5(71.4)	0.012

Table 2: Biochemical, echocardiography parameters and medications of patients.

	Adequate nutritional status MNA >24 (n=34)	Risk of malnutrition MNA 17-23.5 (n=25)	Malnourished MNA<17 (n=7)	P value
Age (years)	64.5 (58-67.2)	66 (58-74)	68 (65-69)	0.145
Male n, (%)	27 (79.4)	18 (72)	4 (57.1)	0.447
BMI, kg/m²	29.1 ± 4.2	27.5 ± 4	25.4 ± 4.1	0.081
Hypertension n, (%)	24 (70.6)	17 (68)	6 (85.7)	0.793
Hyperlipemia n, (%)	11 (32.4)	8 (32)	1 (14.3)	0.746
Diabetes n, (%)	10 (29.4)	12 (48)	3 (42.9)	0.333
Smoking n, (%)	6 (17.6)	8 (32)	2 (28.6)	0.428
Ejection Fraction (%)	31.5 (29-35)	32 (30-35.5)	30 (23-34)	0.393
LVEDD (mm)*ᵈ	60.5 (56-67.7)	61.5 (56-67.5)	53 (50-64)	0.416
Glucose (mg/dl)ᵇ	112 (98-130.5)	122.5 (106-206.7)	152 (103-209)	0.154
Urea (mg/dl)ᵇ	40 (33.5-48.5)	42.5 (33-54.2)	101 (42-116)	0.098
Creatinine (mg/dl)ᵃ	1 (0.8-1.1)	1 (0.8-1.2)	1.3 (0.8-3.2)	0.254
AST (U/lt)ᵇ	21.5 (16-25)	24 (18-28)	23 (18-60)	0.239
ALT (U/lt)ᵇ	15 (10-18.5)	15 (12-23)	23 (13-63)	0.181
LDL (mg/dl)ᶜ	107.4 ± 26.8	112 ± 29.4	109.8 ± 38.2	0.843
HDL (mg/dl)ᶜ	35 (32.7-40.2)	35.5 (28.2-42.2)	31 (17-46.8)	0.793
TG (mg/dl)*ᶜ	148.5 (98.7-185)	116.5 (65.7-149)	96.5 (63.2-165)	0.072
Hemoglobin (mg/dl)ᵃ	12.9 ± 1.8	12.5 ± 1.9	12.4 ± 1.7	0.659
HCT (%)*ᵃ	38.5 ± 4.4	37.9 ± 5.7	38.2 ± 5.6	0.901
PLT 10³/mm³ *ᵃ	210 (181-259.7)	222 (171.2-297.7)	155 (126-178)	0.045
WBC 10³/ml *ᵃ	8.6 (7-10)	8.2 (7-9.8)	6.9 (5.4-8.4)	0.318
Neutrophil (%)ᵃ	62 ± 12.3	65.6 ± 7.8	70.6 ± 13.5	0.133
Lymphocytes/μlᵃ	2 ± 0.6	2 ± 1.1	1.4 ± 0.6	0.179
CRP (mg/l)ᶜ	0.6 (0.4-1.6)	0.8 (0.3-1.5)	7.5 (1-7.9)	0.057
Albumin (g/dl)ᵉ	3.7 (3.3-4.2)	3.5 (3.1-4.1)	3 (2.7-3.4)	0.070
Medications				
ASA n, (%)*ᵃ	19 (55.9)	13 (54.2)	2 (28.6)	0.458
ACEI n, (%)*ᵃ	15 (44.1)	11 (45.8)	3 (42.9)	1.000
ARB n, (%)*ᵃ	1 (2.9)	5 (20.8)	0 (0)	0.085
Beta-blocker n, (%)ᵃ	33 (97.1)	22 (91.7)	7 (100)	0.692
Ald-antg n, (%)*ᵃ	18 (52.9)	14 (58.3)	4 (57.1)	0.935
Statin n, (%)ᵃ	16 (47.1)	13 (54.2)	1 (14.3)	0.202
Diuretic n, (%)ᵃ	21 (61.8)	18 (75)	5 (71.4)	0.643
Antiarrhythmics n, (%)ᵃ	5 (14.7)	3 (12.5)	0 (0)	0.870
Anticoagulant n, (%)ᵃ	15 (44.1)	7 (29.2)	4 (57.1)	0.312
Sacubitril/Valsartan n, (%)ᵃ	3 (8.8)	3 (12.5)	2 (28.6)	0.339

*LVEDD: left ventricular end-diastolic diameter, TG: Triglycerides, HTC: Hematocrit, PLT: Platelets, WBC: White blood cells, CRP: C-reactive protein, ASA: Acetylsalicylic acid, ACEI: Angiotensin-converting-enzyme inhibitor, ARB: Angiotensin II receptor blocker, Ald-antg: Aldosterone antagonist,

a: one missing data, b: two missing data, c: four missing data, d: five missing data, e: eight missing data

As descriptive statistics, quantitative data were expressed as mean ± standard deviation or median (25th-75th percentiles) and qualitative data were expressed as numbers (percentages).

DISCUSSION

Heart failure is a worldwide health problem among the elderly population and mainly appears with reduced ejection fraction that causes reduced living standards and morbidity (2). Due to this condition, heart is inoperative to supply the requirements of the tissues to maintain normal cardiac function (1).

In line with previous studies, risk factors such as obesity, hypertension, and diabetes mellitus are seen frequently among HF patients (1). In our study the result of body – mass index was lower in undernourished patients, compared to the other groups, but there was not a significant difference since the malnourished group was already in normal weight range. According to the local studies, body mass index may cause misdirection because it does not reflect weight loss completely (12). In our findings, when body mass index is compared to weight loss in the last 3 months, in the malnourished group, there is a significant weight loss greater than 3 kg (p=0.0001), even though they are in normal weight range. Additionally, the comorbid dieseases of our patients' hypertension and diabetes were consistent with the study of Bonilla-Palomas et al. (13) which was conducted on 208 patients.

In our study, although there was no significant difference in smoking rate among all groups (p=0.428), quitting smoking is important to reduce the risk of smoking-related cardiovascular diseases (14).

According to the literature, the majority of the HF patients are classified as at risk of malnutrition (12, 13). Our study revealed that 51.5% of the patients were in adequate nutritional status. As for the reason, it is thought that patients with heart failure are cautious about their health. Nevertheless in our study the percentages of the malnourished patients are in accordance with the literature (12, 13).

Our results demonstrated that the percentage of medication usage was higher in well–nourished group for ASA and antiarrhythmic drugs. Beta–blocker was prescribed for all malnourished patient group (n=7), meanwhile ARB and antiarrhythmic drugs were not in their drug therapy. A similar conclusion was reached by Bonilla–Palomas et al. (13) in beta–blocker usage but they indicate that there was no prognostic benefit specified with this drug.

In this study, the main limitation was the patient profile that we conducted the questionnaire. It could be argued that a higher percentage of the malnutrition and the risk of malnutrition levels could be obtained if this survey would be performed on severely ill patients, but these severe patients have refused were incapable of attending to our survey.

High in reliability and validity, MNA® was originally developed for the elderly (mean age 73 ± 10.1) patients , and the mean age of our subjects was 65.3 ± 11.1 which was another limitation for our study (13). In addition, in our study, no significant difference was found in the measure of mid-arm circumference (p=0.193), in contrast with the literature that evaluated Japanese elderly (15). We attribute this to the fact that these measurements can vary in populations, and should be modified for the specific population that was conducted.

As a conclusion, although malnourished patients were detected, the number of well–nourished patients were higher. Therefore, it could be said that patients with heart failure are conscious of their health and diet. It is crucial for the health care providers to give advices on healthy living and nutrition to keep this elderly population well–nourished.

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