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Two months of protein–rich dietary recommendations for older patients at risk of malnutrition improves nutritional status, and decreases body fat percentage

İki aylık proteinden zengin beslenme önerileri malnütrisyon riski altındaki yaşlı hastalarda nütrisyonel durumu düzeltir ve vücut yağ oranını azaltır

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ABSTRACT

Aim: It is aimed to evaluate the impact of protein – rich dietary (PRD) recommendations on the body composition of older patients at malnutrition risk (MR) in this study.

Materials and Methods: Patients ≥65 years of age, without cognitive problems, diabetes, renal diseases, admitted to Internal Medicine Nutrition Outpatient Clinic consecutively were screened, and 30 patients in normal nutritional status (NS), 30 patients at MR were planned to be enrolled. Body compositions, NS, and anthropometric measurements were performed. Patients at MR were trained for PRD recommendations. Evaluations were repeated in both groups after two months.

Results: Sixty older patients were enrolled (mean age 72.5 ± 6.2; Female / Male: %63.3 / %36.7). After two months; in the group at MR (n = 30); there was a significant decrease in mean body fat ratio (P = 0.036), increase in body water ratio and Mini Nutritional Assessmnet – Short Form (MNA-SF) score (P = 0.020 and P < 0.001). Mean body weight (BW) , body mass index (BMI), waist – hip circumference, fat mass, fat free mass (FFM) and calf circumference were similar. In the normal NS group (n = 30) mean BW, waist – hip circumference, fat mass, FFM, calf circumference values significantly decreased (P = 0.001, P = 0.021, P = 0.016, P = 0.025, P = 0.002, P = 0.017, respectively), and BMI, fat ratio, body water and MNA – SF scores were similar.

Conclusion: In the group at MR, PRD recommendations improved NS, and fat ratio decreased. In patients given general nutritional recommendations with normal NS; BW, waist – hip circumference, fat mass, FFM, and calf circumference decreased. PRD recommendations should be given for the care of appropriate older patients.

Keywords: Aged, malnutrition, body composition, program, nutrition therapy, proteins,

ÖZ

Amaç: *Bu çalışmada; proteinden zengin beslenme (PZB) programının malnütrisyon riski (MR) altındaki yaşlı hastalarda vücut kompozisyonuna etkisinin araştırılması amaçlanmıştır.*

Gereç ve Yöntem: *İç Hastalıkları Diyet polikliniğine başvuran, kognitif sorunları, diyabeti ve renal hastalığı olmayan ≥65 yaş bireyler taranarak, çalışmaya normal nütrisyonel durum (ND)'da 30 yaşlı, MR altında 30 yaşlı alınması planlandı. Vücut kompozisyonu, ND, antropometrik değerlendirmeler yapıldı. Malnütrisyon riski altındaki bireylere PZB programı eğitimi verildi. İki aylık program sonrasında tüm değerlendirmeler her iki grupta tekrarlandı.*

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Bulgular: *Çalışmaya 60 yaşlı dahil edildi (yaş ortalaması 72,5 ± 6,2; Kadın / Erkek: %63,3 / %36,7). İkinci ay sonunda MR altındaki grupta (n = 30): ortalama vücut yağ oranı azalmış (P = 0,036), total vücut suyu ve Mini Nütrisyonel Değerlendirme Kısa Form (MND – KF) skoru artmış bulundu (P = 0,020 ve P < 0,001). Ortalama vücut ağırlığı (VA), vücut kitle indeksi (VKİ), bel - kalça çevresi, yağ kütlesi, yağsız vücut kitlesi (FFM) ve baldır çevresi ölçümleri ise benzer bulundu. Normal ND'daki grupta (n = 30) ölçülen ortalama VA, bel - kalça çevresi, yağ kütlesi, FFM, ve baldır çevresi ölçümlerinde anlamlı düşüş gözlenirken (sırasıyla; P = 0,001, P = 0,021, P = 0,016, P = 0,025, P = 0,002, P = 0,017), VKİ, yağ yüzdesi, toplam vücut suyu ve MND-KF skorları iki ölçümde benzerdi.*

Sonuç: *PZB önerilen MR altındaki yaşlılarda ND düzelirken, yağ oranı azalmıştır. Normal ND'daki genel öneriler verilen yaşlılarda ise VA, bel - kalça çevresi, yağ kütlesi, FFM, ve baldır çevresi ölçümlerinde anlamlı düşüş gözlenmiştir. İleri yaştaki hastaların bakımında uygun hastalarda PZB önerileri yapılmalıdır.*

Anahtar Sözcükler: *Yaşlı, malnütrisyon, vücut kompozisyonu, program, beslenme tedavisi, protein.*

INTRODUCTION

Undernutrition is a substantial problem for older people. Various factors such as physiological changes, increasing comorbidities that develop with advancing age, polypharmacy, environmental and socio-economic factors, functional losses increase the risk of malnutrition. Many kinds of nutritional problems may occur at an older age, and a diet poor in protein is of particular importance (1, 2). Inadequate food intake may be characterized by muscle and weight loss. A diet low in protein contributes to those losses. Low protein consumption leads to consequences such as sarcopenia and weakness, impairing the quality of life in older people and causing increased morbidity and mortality. It has been shown that nutritional supplements rich in protein provide improvement in muscle quality, muscle strength, and functions in malnourished sarcopenic older patients (3). However, the effect of protein-rich dietary (PRD) recommendations on the body composition of older malnourished patients has not yet been clearly elucidated. It is also important to reveal the consequences of dietary and lifestyle changes regarding the quality of life and health.

So, we aimed to evaluate the nutritional status and body composition of older individuals and to provide PRD recommendations and training for appropriate older patients at risk of malnutrition to be re-evaluated after eight weeks, thus investigating the effect of PRD recommendations on the body composition of older patients at risk of malnutrition.

MATERIAL AND METHODS

Study population

Patients aged 65 and over whom applied to Internal Medicine Department Outpatient Clinic and referred to Internal Medicine Clinical Nutrition Outpatient Clinic were enrolled in the study consecutively within two months. Inclusion criteria in the study; Patients aged 65 and over and volunteered to participate in the study were enrolled. Exclusion criteria were as follows; patients with cognitive dysfunction (defined dementia or registered Mini - Mental Assessment Test <24), patients younger than 65 years of age, diabetic patients, and patients with renal diseases (defined chronic kidney disease, glomerular filtration rate <60 ml / min / 1.73 m^2, dialysis patients). It was planned to enroll 30 older patients in normal nutritional status and 30 older patients at malnutrition risk. Informed consent was obtained from all of the patients. This study was conducted in accordance with the Helsinki declaration, and approval from Ege University Medical Research Ethics Committee was obtained (Ethics committee decision no: 12-3.1 / 6).

Nutritional Assessment

Mini Nutritional Assessment - Short Form (MNA - SF) was applied to assess the nutritional status of the patients by the same dietician to all patients on their first visit. This test is used both as a screening tool and an evaluation method, and its sensitivity has been proven in older individuals. It includes anthropometric measurements, and questions about the health status of the person. In the MNA, normal nutritional status is diagnosed with a score of 24 and above (4, 5). In MNA - SF, the patient is at malnutrition risk when the score is ≤11. Scores between 12 - 14 points indicate normal nutritional status. In recent years, scores between 8 and 11 have been scored as at risk, and between 0 and 7 as malnutrition. However, in this study, patients

were examined in two categories as malnutrition risk and normal nutritional status, and individuals with an MNA - SF score ≤11 were grouped as at risk of malnutrition.

Body composition, socio-demographic – anthropometric assessments

The socio-demographic data, comorbidities, and medication of the older patients were evaluated with a questionnaire. Comorbidities were noted as diabetes, chronic kidney disease, dialysis, and other conditions (other possible problems present in the patient) and classified as yes / no. Medication use was noted as yes / no, and all individuals using at least one regular medication were classified as "medication use", regardless of the number of medications used. Anthropometric measurements (waist circumference, hip circumference, body mass index (BMI)) were performed. Body composition was evaluated using a bioelectrical impedance analyzer (BIA) (BC - 418 MA Segmental Tanita). Fat mass (kg), fat percentage (%), fat free mass (FFM) (kg) measurements were evaluated.

Protein-rich nutritional regime

Protein-rich dietary regime training was given to 30 patients who were found to be at risk of malnutrition after nutritional evaluation by the same dietitian. Protein-rich dietary recommendations containing 25 - 35 kcal / kg / day, and 1.2 - 1.5 g / kg / day protein were given as a medical nutritional program. Practical examples were explained. At the end of one month, 30 patients at risk of malnutrition were called by phone, and suggestions were made for their compliance with the program. The other group with normal nutritional status were given general healthy nutritional recommendations.

After the implementation of a two-month medical nutrition program; nutritional, anthropometric evaluations and body composition analysis measurements were repeated in both groups.

Statistical analyses

SPSS 19.0 (SPSS Inc., Chicago, IL, USA) program was used for the statistical analysis of the data. The Shapiro-Wilk test was used to examine the distribution of the data. Numerical variables were given as mean ± SD. The differences between the PRD group and the control group at the first and second follow-up after two months were investigated by Paired *t*-test. P <0.05 was considered significant.

RESULTS

Among the 378 patients screened; patients with cognitive dysfunction (n = 20), patients under 65 years of age (n = 150), diabetes (n = 100) and renal diseases (n = 48) were excluded from the study. Sixty patients who met the inclusion criteria and did not present the features of the exclusion criteria were included in the study [normal nutritional status (n = 30), malnutrition risk (n = 30)]. Of the 60 patients included (mean age 72.5 ± 6.2); 38 of them were females (63.3%) and 22 of them were males (36.7%). Sociodemographic, anthropometric, nutritional data, body composition parameters, and medical history of the whole group are shown in Table-1.

General healthy dietary recommendations were given to patients with normal nutritional status. In this group, a significant decrease was observed in the mean body weight, waist circumference, hip circumference, fat mass, fat free mass and calf circumference measurements at the end of the second month (respectively; P = 0.001, P = 0.021, P = 0.016, P = 0.025, P = 0.002, P = 0.017). Body mass index, percentage of fat, total body water, and MNA - SF scores were similar in the two measurements. The initial evaluation and the second evaluation data of patients with normal nutritional status are shown in Table-2.

Protein-rich nutritional training was given to patients at risk of malnutrition. At the end of the second month; the mean body fat ratio decreased (P = 0.036) where total body water and MNA - SF score were found to be increased (P = 0.020 and P <0.001). There was no statistically significant difference in body weight, BMI, waist circumference, hip circumference, fat mass, FFM, and calf circumference measurements. The data of the initial evaluation and the second evaluation for the group at risk of malnutrition which was given a PRD program are shown in Table-3.

Table-1. Sociodemografic, nutritional, anthropometric, medical and body composition data in the total group in the initial assessment.

Parameters	Total group (n = 60)
Age (year)	72.5 ± 6.2 (65 - 89)
Sex (Female / Male), n (%)	38 (63.3) / 22 (36.7)
Comorbidities (yes), n (%)	49 (81.7)
Female / Male, n (%)	34 (89.5) / 15 (68.2)
Medication (yes), n (%)	49 (81.7)
Female / Male, n (%)	34 (89.5) / 15 (68.2)
Body mass index (kg/m^2)	28.6 ± 6.8
Waist circumference (cm)	95.4 ± 13.4
Hip circumference (cm)	105.6 ± 9.3
Calf circumference	36.4 ± 3.8
Fat mass (kg)	24.4 ± 9.5
Fat ratio (%)	33.6 ± 9.2
FFM (kg)	46.9 ± 10.4
Total body water (kg)	34.5 ± 7.6
MNA-SFscore	11.4 ± 2.6

MNA - SF: Mini Nutritional Assessment Short Form, FFM: fat free mass.

Table-2. Sociodemografic, nutritional, anthropometric, medical and body composition data in the normal nutritional status group in the initial and the second assessments.

Parameters	Initial assessment (*n* = 30)	Second assessment (*n* = 30)	p
Age (year)	71 ± 5.9 (65 – 88)	-	-
Female / Male, n (%)	17 (56.7) /13 (43.3)	-	-
Comobidities (yes), n (%)	24 (80)	-	-
Medication (yes), n (%)	24 (80)	-	-
Weight (kg)	78.1 ± 4.7	76.9 ± 13.8	**0.001**
BMI (kg/m^2)	31 ± 7.7	29.5 ± 4.9	NS
Waist circumference (cm)	98.7 ± 13.4	97.7 ± 12.9	**0.021**
Hip circumference (cm)	109.7 ± 8.9	109.1 ± 8.7	**0.016**
Calf circumference (cm)	38.1 ± 3.9	37.9 ± 4.0	**0.017**
Fat mass (kg)	27.5 ± 9.4	26.8 ± 8.5	**0.025**
Fat ratio (%)	34.8 ± 8.1	33.6 ± 9.1	NS
FFM (kg)	50.6 ± 9.7	50.1 ± 9.7	**0.002**
Total body water (kg)	37.1 ± 7.2	37.1 ± 7.0	NS
MNA - SF score	12.9 ± 0.4	12.6 ± 1.4	NS

MNA – SF, Mini Nutritional Assessment Short Form; FFM, fat free mass; BMI, body mass index.

Table-3. Sociodemografic, nutritional, anthropometric, medical and body composition data in malnutrition risk group in the initial and the second assessments**.**

Parameters	Initial assessment (*n* = 30)	Second assessment (*n* = 30)	p
Age (year)	73.7± 6.2 (65 - 89)	-	-
Female / Male, n (%)	21 (70) / 9 (30)	-	-
Comorbidities (yes), n (%)	25 (83.3)	-	-
Medication (yes), n (%)	25 (83.3)	-	-
Weight (kg)	64.8 ± 13.2	65.5 ± 12.9	0.054
BMI (kg/m^2)	26.1 ± 4.6	26.4 ± 4.4	0.066
Waist circumference (cm)	92.1 ± 12.8	93 ± 13	0.098
Hip circumference (cm)	101.6 ± 7.9	102 ± 8.1	0.272
Calf circumference (cm)	34.7 ± 2.9	34.7 ± 2.7	0.859
Fat mass (kg)	21.2 ± 8.6	20.8 ± 8	0.194
Fat ratio (%)	32.5 ± 10.1	31.6 ± 9.4	**0.036**
FFM (kg)	43.2 ± 9.8	43.9 ± 10	0.158
Total body water (kg)	31.6 ± 7.1	32.5 ± 7	**0.020**
MNA – SF score	9.8 ± 2.6	11.7 ± 2.1	**<0.001**

MNA – SF, Mini Nutritional Assessment Short Form; FFM, fat free mass; BMI, body mass index.

DISCUSSION

In this study which "investigates" the impact of the PRD program on body composition in older patients at malnutrition risk, nutritional status improved after two months of the program. Also, the average body fat ratio decreased and total body water increased. In the normal nutritional status group for whom general nutritional recommendations were given, a significant decrease was observed in mean weight, waist-hip circumference, fat mass, FFM, and calf circumference measurements.

Physiological changes in older persons increase the risk of undernutrition. Besides, present comorbidities and various medications, and polypharmacy increase this risk. The frequency of chronic diseases also increases in older ages (6, 7). It has been found that 84.7% of older persons have at least one chronic disease (8). Similarly, in our study, comorbid diseases were present in 83.3% of the risky group for malnutrition, and 80% of the normal nutritional status group. Similarly, all patients with chronic diseases were using at least one medication regularly. Female patients are shown to be at a higher risk of malnutrition than men (9, 10). Consistent with the literature, 70% of the group at risk of malnutrition, and 56.7% of the group with normal nutritional status were females. Female patients were 63.3% of the entire group. As the study population consisted of mainly female patients, this might have led to this result. It might also be assumed that female patients apply to the diet outpatient clinic more than men.

Morbidity and mortality are higher in older individuals with malnutrition (11-13). Body composition changes play an important role in increased mortality and functional decline in the elderly. Sarcopenia which is characterized by decreases in muscle mass and functions is more common in individuals with malnutrition (14). Though physiological factors such as gender, aging, and increased protein need are important in the sarcopenia process, there are intervention areas such as insufficient protein consumption, vitamin D levels, and physical activity like resistance exercises (1, 2)."

Older people with coronary artery disease, and diabetes mellitus, even older people who think that they should not consume protein because they are elderly only, may reduce their protein consumption. Therefore, a diet poor in protein is an issue that needs particular attention in the elderly, and strategies that preserve protein content in the diet are areas to be investigated (15-17). In a study by Bouillanne et al., it has been reported that pulse protein nutrition

presented a positive effect on FFM mass in hospitalized patients with malnutrition and at risk of malnutrition (18). Arnal et al. showed that intense protein nutrition increases protein synthesis in the elderly (19). In another study, the inclusion of protein-enriched bread and yogurt drinks in regular meals was associated with better clinical outcomes in individuals with acute illness (20). In a recent multicenter, randomized controlled, double-blind study, 330 elderly patients with malnutrition and sarcopenia were given two different oral nutritional supplements for 24 weeks containing different protein and other ingredients, and the results were compared. Products contained similar calories and were prescribed for one group with 14 grams of protein and 147 IU of vitamin D, and the other with 20 grams of protein, 499 IU vitamin D, and 1.5 grams of calcium beta-hydroxy beta-methyl butyrate (3). Muscle mass, strength, quality, and functions were investigated at the beginning and the end of 24 weeks. In both groups, muscle quality, muscle strength, and functions showed similar improvement. The authors reported that oral nutritional supplements improved muscle strength in sarcopenic and malnourished patients. Besides, it was reported that treatment with a higher protein, vitamin D, and calcium beta - hydroxy beta – methyl butyrate provided additional benefits in improving leg muscle strength and quality in mild to moderate sarcopenic patients (3). In another study investigating two groups, one group was recommended to consume ricotta cheese (210 g / day) and the other group continued a daily routine diet. At the end of 12 weeks, an improvement in muscle mass and balance scores and a decrease in muscle strength loss was reported (21). Though it has been reported that nutritional interventions in malnourished and sarcopenic individuals may improve muscle outcomes in such studies in recent years, in a recently published review; it has been reported that exercise training is the most effective method for sarcopenia, and nutritional and drug interventions are ineffective or do not show promising synergistic effects in addition to exercise (3, 22). The impact of dietary recommendations on body composition, especially FFM, muscle mass, and function, by only itself in malnourished elderly patients is not clearly revealed to date. To the best of our knowledge, there is no study on this subject.

In our study, the PRD recommendation intervention for older persons at risk of malnutrition improved nutritional status, decreased body fat percentage and increased total body water. Though not statistically significant, there was an increase in FFM values. The reason for this insignificant result might be the small size of the study group and the short follow-up period. As nutritional status improved, body fat percentage decreased. Evaluating those data together with the non-significant increase in FFM and the increase in total body water; it may be hypothesized that this result is due to the positive effect of PRD recommendations on body composition and possibly muscle parameters.

In the group with normal nutritional status, a significant decrease in FFM and an overall decrease in nutritional parameters were observed. This situation may have occurred due to the causes of admissions to the hospital. However, since the comorbidities of the patients in this study were only noted as presence / absence of comorbidity, we could not demonstrate the disease effect on these results. Our small study population may also have affected those results.

Our cross-sectional study design is a limitation as it does not reveal the cause - effect relationship. Besides, both groups were evaluated within their groups. The differences among those groups in terms of nutritional status, gender, age, and BMI are the weaknesses of our study. Physical activity has an important contribution to lean body mass. However, physical activity was not evaluated in our study. In this study, we did not use predicted segmental muscle mass values. We preferred to use total FFM values measured and directly reported by the BIA model we used. On the other hand, the strength of our study is that it is a pioneering study investigating body composition changes by applying only PRD recommendation intervention in older outpatients at risk of malnutrition. Our study should be evaluated considering those limitations and strengths.

CONCLUSION

The nutritional status improved and the fat ratio decreased in older persons at risk of malnutrition for whom a protein-rich diet was recommended. In older persons who were given general recommendations in normal nutritional status, a significant decrease was observed in nutritional data and FFM measurements in general. In the care of older patients, PRD recommendations should be made in suitable patients.

Future perspectives

Further randomized controlled studies are needed to investigate the early and long-term effects of nutrition with high protein content for older individuals who are malnourished or at risk of malnutrition.

Conflict of interest

None declared.

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