ROCZN. PZH 2007, 58, NR 1, 153-158

JOANNA WARDAK[1], DOMINIKA GŁĄBSKA[1], LUCYNA NAROJEK[1], JADWIGA ROJEK-TRĘBICKA[2]

ANALYSIS OF THE INTAKE OF PROTEIN AND ENERGY BY PREDIALYSIS PATIENTS WITH CHRONIC RENAL FAILURE RECEIVING ESSENTIAL AMINO ACID KETOANOLOGUES

OCENA SPOŻYCIA ENERGII I BIAŁKA PRZEZ PACJENTÓW Z PRZEWLEKŁĄ NIEWYDOLNOŚCIĄ NEREK STOSUJĄCYCH KETOANALOGI AMINOKWASÓW EGZOGENNYCH

[1)] Katedra Dietetyki
Szkoła Główna Gospodarstwa Wiejskiego
02-776 Warszawa, ul. Nowoursynowska 159c
Kierownik: prof. dr hab. *J. Gromadzka-Ostrowska*

[2)] Poradnia Nefrologiczna
Samodzielny Publiczny Centralny Szpital Kliniczny
02-097 Warszawa, ul. Banacha 1a
Kierownik: dr *E. Trzepla*

The aim of the study was to evaluate daily dietary intake of energy and protein by 60 predialysis patients with chronic renal failure (CRF) receiving a supplement containing essential amino acid ketoanalogues. As daily protein and energy intake was neither properly balanced nor adjusted to stage of progression of CRF, constant care of skilled dietitian might be helpful.

Key words: chronic renal failure (CRF), predialysis patients, low-protein diet (LPD), protein intake, energy intake, essential amino acid ketoanalogues

Słowa kluczowe: przewlekła niewydolność nerek, pacjenci w okresie przeddializacyjnym, dieta niskobiałkowa, spożycie białka, spożycie energii, ketoanalogi aminokwasów egzogennych

INTRODUCTION

The Glomerular Filtration Rate (GFR) is indicator of assessment of renal function. A gradual decline of GFR is a natural process of human aging but some medical conditions can accelerate that process [2]. Chronic kidney disease is formally classified into four stages: decreased renal reserve (GFR – 120-90 ml/min/1,73m^2), renal insufficiency (GFR – 90-40ml/min/1,73m^2), renal failure (GFR – 40-10ml/min/1,73m^2) and end stage renal failure (GFR – below 10ml/min/1,73m^2) [6].

For many years Low-Protein Diet (LPD) have been proposed to patients with Chronic Renal Failure (CRF) to correct uremic symptoms and metabolic complications of uremia [1]. Current guidelines suggest diet containing 0,6-0,8 g protein per kilogram of body weight per day, 50% of which should be protein of high biological value (animal protein containing essential amino acids) [3]. LPD is said to be better option, when it includes supplements with essential amino acid ketoanalogues [12]. At the same time substantial restrictions in protein supply without adequate energy intake may lead to malnutrition which is known as mortality risk factor in patients with CRF, therefore 30-35 kcal per kilogram of body weight per day is recommended [5, 2].

The aim of the study was to evaluate daily dietary intake of energy and protein by predialysis patients with chronic renal failure (CRF) receiving a supplement containing essential amino acid ketoanalogues.

MATERIALS AND METHODS

The study was carried out on 60 patients with CRF of different etiology receiving a supplement containing essential amino acid ketoanalogues and being monitored in outpatient clinics in Warsaw. Thirty-three male patients aged 32-83 years (GFR: 25,1±3,5ml/min/1,73m^2) and 27 female patients aged 43-83 years (GFR: 16±5,23) were qualified to the study. GFR was assessed by the calculation of *Cockcroft* and *Gault*.

Assessment of the patients diet was based on their three-day dietary recall. The results were analyzed using the computer program „Dietetyk 2" with the base of nutritional value of products [8] and on the base of „Gluten-free products composition and nutritive value" [9]. The statistical analysis was conducted using the computer program Statgraphics Plus 4.0. The intake of energy, protein (containing amino acids from supplements) as well as energy and protein per kilogram of body weight per day were tested by means of two-sample t test (hypothesis test) to compare diets between groups (GFR≤15, GFR>15ml/min./1,73m^2; male, female; BMI≤20, BMI∈(20 – 25), BMI ≥25; age≤60, age>60). The multiple variable analysis (coefficient of correlations by *Pearson*) was used to asses dependences between analyzed factors as well as between protein and energy intake.

RESULTS AND DISCUSSION

The intake of energy (kcal per day and kcal per kilogram of body weight per day), protein, animal protein, and protein including supplements (g per day and g per kilogram of body weight per day) are presented in Table I.

The results showed that the diet of examined patients was not properly balanced. In the large quantity of patients – 33% (38% when ketoanalogues supplementation was taken into account) protein overnutrition was observed (as consumed more than 0,8g of protein per kilogram of body weight per day). Only 37% of patients (33% when ketoanalogues supplementation was taken into account) had adequate protein intake. Unlimited intake of protein-rich food may contribute to progressive loss of renal function [10].

Only 12% of the group had the adequate calories intake, while 88% of patients did not have sufficient energy intake (below 30kcal per kilogram of body weight per day). The outcomes of our study demonstrated also that decrease of total protein and animal protein intake (in g per day) was related to decrease of energy intake (in kcal per day) (Figure 1). Low energy intake might

Table I. Energy, total protein, animal protein and total protein with supplementation intake in the studied group.

Category	Groups (quantity of patients)		Energy		Total diet protein		Animal protein		Total diet protein with supplementation		
			[kcal]	[kcal/kg]	[g]	[g/kg [a]]	[g]	[g/kg [a]]	[g]	[g/kg [a]]	[g/1000kcal [b]]
GFR [ml/min/ /1,73m^2]	GFR≤15 (20)	Mean ± SD	1537±337	24,4±6,9	45,4±17,7	0,72±0,32	28,3±16,1	0,45±0,28	47,2±17,8	0,75±0,32	30,9±10,2
	GFR>15 (40)		1652±450	22,6±6,5	53,7±17,1	0,73±0,24	33,2±14,7	0,45±0,19	55,6±17,2	0,76±0,24	34,0±7,2
	p		-	-	0,0851*	-	-	-	0,0832*	-	-
Sex	Male (33)	Mean ± SD	1799±419	24,6±6,2	56,3±17,8	0,76±0,23	35,5±15,5	0,48±0,20	58,2±17,9	0,78±0,23	32,7±8,9
	Female (27)		1388±283	21,6±7,0	44,4±15,2	0,69±0,30	26,8±13,7	0,42±0,25	46,3±15,3	0,72±0,30	33,2±7,9
	p		0,0000**	0,0838*	0,0080**	-	0,0265**	-	0,0083**	-	-
BMI [kg/m^2]	BMI≤20 [I] (3)	Mean ± SD	1684±285	35,2±7,3	52,1±15,9	1,11±0,48	30,8±16,7	0,67±0,45	53,8±15,4	1,15±0,47	32,0±7,4
	BMI∈ (20; 25> [II] (27)		1598±333	24,8±5,2	46,5±15,6	0,72±0,24	28,8±13,2	0,45±0,20	48,3±15,7	0,75±0,24	30,1±7,8
	BMI>25 [III] (30)		1621±497	20,6±6,2	54,8±19,0	0,70±0,24	34,2±16,8	0,43±0,21	56,8±19,0	0,72±0,24	35,6±8,4
	[I] vs. [II]		-	0,0036**	-	0,0221**	-	-	-	0,0187**	-
	[II] vs. [III]		-	0,0079**	0,0789*	-	-	-	0,0793*	-	0,0135**
	[I] vs. [III]		-	0,0006**	-	0,0147**	-	0,0990*	-	0,0106**	-
Age [years old]	Age≤60 (24)	Mean ± SD	1744±485	25,6±7,3	51,3±18,7	0,75±0,27	30,4±15,7	0,44±0,22	53,2±18,8	0,78±0,27	30,7±7,3
	Age>60 (36)	Mean ± SD	1527±344	21,6±5,8	50,7±17,1	0,71±0,26	32,4±15,1	0,46±0,23	52,6±17,1	0,74±0,27	34,4±8,8
	p		0,0470**	0,0218**	-	-	-	-	-	-	0,0937*
Total group		Mean ± SD	1614±416	23,2±6,7	50,9±17,6	0,73±0,26	31,6±15,2	0,45±0,22	52,8±17,7	0,75±0,27	32,9±8,4

** p-Value ≤ 0,05 – difference statistically significant;
* p-Value (0,05; 0,1> - difference close to signification
[a] kg of body weight, [b] kcal of the diet

have been caused by loss of appetite, that in group of patients with CRF is probably connected not only with the disease but also with its complications [4]. These results, combined with inadequate amount of animal protein (23% of patients – below 0,3 g of animal protein per kilogram of body weight per day) may have had an influence on malnutrition development in patients with CRF [11].

By category of GFR, daily energy intake did not differ substantially, but differences in daily intake of non-animal protein resulted in differences in total protein consumption. Mean protein intake in the group of patients with better renal function was higher than in the group with lower GFR. That result suggests decline of protein intake during progression of chronic renal disease, that corresponds with conclusions of other researches [7].

Association between sex and protein intake indicates that male patients consumed more total protein and animal protein (in g per day) than female patients. This dependence may have been connected with higher energy intake by male patients. Low energy intake in women group (<30 kcal per kg of body weight per day) may be associated with higher risk of malnutrition in that group [6].

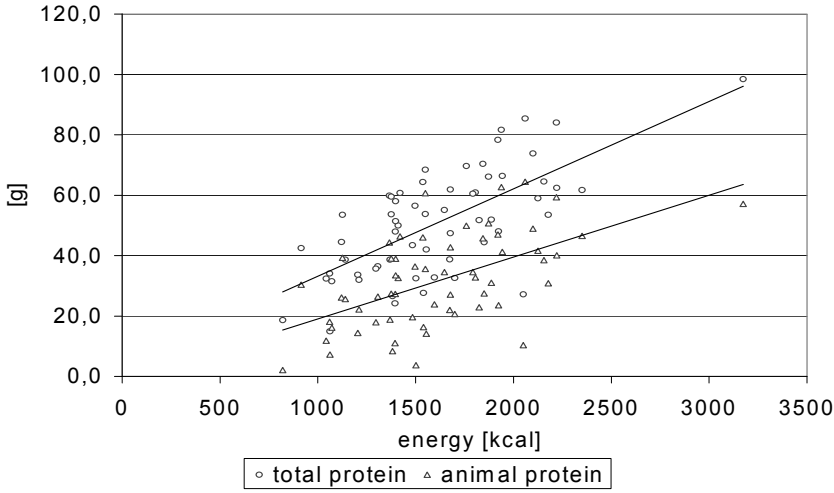

Figure 1. Correlations between the consumption of energy [kcal] and the consumption of total protein [g] (p=0,0000; R=0,6842), animal protein [g] (p=0,0000; R=0,5602).

The higher BMI may result in better nutritional status and in higher survival rates of patients with CRF [*Beto* and *Bansal*, 2002]. In examined group, patients with BMI below 20 consumed more total protein, animal protein (g per kg of body weight per weight) and energy (kcal per kg of body weight) than patients with BMI above 20. Higher protein and energy intake may be a factor which protects patients with low BMI against malnutrition and its negative consequences.

By the category of age, daily energy intake differed statistically – younger patients had higher energy intake (stated in kcal per day and kcal per kilogram of body weight per day), but they had also lower intake of protein per 1000 kcal of diet. Correct mean protein intake (stated in g per kilogram of body weight per day), higher intake of protein per 1000 kcal of diet in the group of older patients may protect them against malnutrition.

CONCLUSIONS

1. Daily protein and energy intake was not properly balanced and not adjusted to stage of progression of CRF.
2. Inadequate energy intake and the decline of protein consumption during progression of CRF may have been in analyzed group the factor of malnutrition development.
3. Patients with chronic renal failure need constant care of skilled dietitian connected with individual modifications of diet.

J. Wardak, D. Głąbska, L. Narojek, J. Rojek-Trębicka

ANALYSIS OF THE INTAKE OF PROTEIN AND ENERGY BY PREDIALYSIS PATIENTS WITH CHRONIC RENAL FAILURE RECEIVING ESSENTIAL AMINO ACID KETOANOLOGUES

Summary

The aim of the study was to evaluate daily dietary intake of energy and protein by predialysis patients with chronic renal failure (CRF) receiving a supplement containing essential amino acid ketoanalogues. The study was carried out on 60 patients with CRF of different etiology. Low intake of energy (88% of tested patients) and animal protein (23% of tested patients) were observed, whereas total protein level was too high (33% of tested patients). As a consequence, the analyzed diets were not properly balanced. Our data strongly suggest that constant dietician care is essential to correct protein and energy intake in patients with CRF and can protect them against malnutrition and progression of CFR.

J. Wardak, D. Głąbska, L. Narojek, J. Rojek-Trębicka

OCENA SPOŻYCIA ENERGII I BIAŁKA PRZEZ PACJENTÓW Z PRZEWLEKŁĄ NIEWYDOLNOŚCIĄ NEREK STOSUJĄCYCH KETOANALOGI AMINOKWASÓW EGZOGENNYCH

Streszczenie

Celem przeprowadzonych badań była ocena dobowego spożycia energii i białka przez pacjentów z przewlekłą niewydolnością nerek (PNN) leczonych zachowawczo z zastosowaniem suplementu diety zawierającego ketoanalogi aminokwasów egzogennych. Badaniem objęto 60 pacjentów z PNN o różnej etiologii. Stwierdzono, iż dieta badanych osób była nieprawidłowo zbilansowana pod względem wartości energetycznej i podaży białka. Wyniki badania podkreślają konieczność zapewnienia pacjentom z przewlekłą niewydolnością nerek stałej opieki dietetycznej.

REFERENCES

1. *Aparicio M., Chauveau P., Combe C.*: Low protein diet and outcomes of renal patients, J. Nephrol. 2001, 14, 433-439.
2. *Beto J.A.*: Which diet for which renal failure: Making sense of the options, J. Am. Diet. Assoc., 2001, 95, 898-903.

3. *Beto J. A., Bansal V. K.*: Medical Nutrition Therapy in Chronic Kidney Failure: Integrating Clinical Practice Guidelines, J. Am. Diet. Assoc., 2004, 104, 404-409.
4. *Chrzanowski W., Zamojska S.*: Niedożywienie u chorych z przewlekłą niewydolnością nerek – jak leczyć? Polskie Archiwum Medycyny Wewnętrznej, 2003, CX, 1185-1196.
5. *Czekalski S., Rutkowski B., Chrzanowki W., Ciechanowski K., Klinger M., Książek A., Manitus J., Myśliwiwec M., Oko A., Sułowicz W., Wańkowicz Z., Więcek A.*: Zalecenia Zespołu Krajowego Konsultanta w Dziedzinie Nefrologii dotyczące postępowania zachowawczego u chorych z przewlekłą niewydolnością nerek, Nefrologia i dializoterapia polska, 2002, 6, 197-202.
6. *Czekalski S.*: Przewlekła Niewydolność Nerek (stadia progresji przewlekłej niewydolności nerek); w: Książek A., Rutkowski B. [red.], 2004, 186-221.
7. *Ikizler T.A., Greene J.H., Wingard R., Parker R.A., Hakim R.M.*: Spontaneous Dietary Protein Intake During Progression of Chronic Renal Failure, Journal of the American Society of Nephrology, 1995, 6, 1386-1901.
8. *Kunachowicz H., Nadolna J., Iwanow K., Przygoda B.*: Tabele wartości odżywczej produktów spożywczych. IŻŻ, Warszawa 1998.
9. *Kunachowicz H., Nadolna I., Kłys W., Iwanow K., Kruszewska B.*: Produkty bezglutenowe – skład i wartość odżywcza, Wyd. IŻŻ, Warszawa 1995.
10. *Meyer T.W., Lawrence W., Brenner B.M.*: Dietary protein and the progression of renal disease, Kidney International, 1983, 24, suppl. 16, 243-247.
11. *Nowicki M., Czupryniak A.*: Dieta ubogobiałkowa a postęp niewydolności nerek: korzyści i ryzyko, Polskie Archiwum Medycyny Wewnętrznej, 2002, CVII, 361-367.
12. *Rutkowski B.*: Czy leczenie zachowawcze obejmujące dietę niskobiałkową winno być nadal istotnym elementem terapii przewlekłej niewydolności nerek? Nefrologia i dializoterapia polska, 2002,6,143-146.