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Main dietari intake deficits in hemodialysis patients: approach to a healthy dietary model based on the Mediterranean diet

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SUMMARY

Objectives: *Inadequate nutrient intake seems to be one of the most important cause of malnutrition in hemodialysis patients. The purpose of this study was to analyse their nutrient intake and eating habits, comparing food groups' intake with standar Mediterranean diet values (Healthy Diet Guide 2004, Nutrition Community Spanish Society).* ***Material and methods:*** *There were 28 stable hemodialysis (HD) patients, 15 males and 13 females, mean age 62,9 ± 16 years. Dietary evaluation was based on 7-day dietary recalls conduced by a single observer. We compare nutrients intake with recommended hemodialysis intake and we contrast food groups consumption with the theoretical ideal based on Mediterranean diet.* ***Results:*** *The protein intake was 1,33 ± 0,2 g/kg/day and the energy intake 29,5 ± 2,1 kcal/kg/day. Carbohydrates accounted 43,1% of energy intake, proteins 19% and lipids 37,9% (55,5% monounsaturated fatty acids, 16,4% polyunsaturated fatty acids and 28,1% saturated fatty acids). Complex carbohydrates (potatoes, cereals, vegetables, fruits) and olive oil consumption was lower than that recommended to the Spanish healthy population and to the chronic hemodialysis patients. The animal protein intake (meat, fish, eggs) was correct, although excessive in red and processed meats.* ***Results:*** *Potatoes and cereals recommended frequency (RF) 4-6 portions/day, HD patients frequency (HDF) 4,1 portions/day; vegetables RF > 2 portions/day, HDF 1,2; fruits RF > 3 portions/day, HDF 1,3; olive oil RF 3-6 portions/day, HDF 1,5; Fish RF 3-4 portions/week, HDF 4,2; White meat RF 3-4 portions/week, HDF 1,5; Poultry RF 3-4 portions/week, HDF 2,3; Eggs RF 3-4 portions/week, HDF 3,6; Pulses RF 3-4 portions/week, HDF 1,7; Nuts RF 3-7 portions/week, HDF 0; Red meat RF occasionally, HDF 4,8 portions/week; Processed meats RF occasionally, HDF 4,6 portions/week; Sweets, snacks, soft drinks RF occasionally, HDF 1,7 portions/week; Butter, margarine, processed bakery products, biscuits RF occasionally , HDF 0,5 portions/week.* ***Conclusions:*** *Nutritional abnormalities are frequently found even in apparently stable patients on chronic hemodialysis. Caloric rather than protein undernutrition is the major abnormality. Inadequate caloric intake (< 35 kcal/kg/day) can lead to a negative nitrogen balance. Their eating habits are healthy and natural, but there is a deficit in slowly absorbed carbohydrates and olive oil intake (with caloric intake reduction), and an excessive consumption of red and processed meats (with saturated fats increase). The individual correction of these dietary patterns could reduce the saturated fats and increase the energy intake, obtaining a balanced diet integrated into our geographic region and culture.*

Key words: ***Mediterranean diet. Hemodialysis. Energy intake. Protein intake.***

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PRINCIPALES DÉFICITS DEL CONSUMO ALIMENTARIO DE LOS PACIENTES EN HEMODIÁLISIS: APROXIMACIÓN A UN MODELO DE ALIMENTACIÓN SALUDABLE BASADO EN LA DIETA MEDITERRÁNEA

RESUMEN

Introducción y objetivos: *La dieta inadecuada desempeña un papel importante en la malnutrición del paciente en hemodiálisis periódica (HDP). El propósito de este estudio es analizar su ingesta alimentaria y hábitos dietéticos, detectando el alejamiento entre el consumo real y el aconsejado. Para ello, contrastamos el consumo alimentario por grupos de alimentos con un ideal teórico basado en la Dieta Mediterránea.* ***Material y método:*** *Seleccionamos pacientes en HDP en situación clínica estable y con apetito conservado. Se realiza el análisis de la ingesta alimentaria mediante el Registro de Consumo Alimentario de 7 días. Comparamos la ingesta de nutrientes y minerales con la recomendada en HDP y contrastamos el consumo por grupos de alimentos con las medias recomendadas por la Guía de la Alimentación Saludable 2004 de la Sociedad Española de Nutrición Comunitaria.* ***Resultados:*** *Incluimos 28 pacientes, 15 varones y 13 mujeres, con una edad media de 62,9 ± 16 años. Registramos una ingesta proteica correcta, de 1,33 ± 0,2 g/kg peso ideal/día. Sin embargo el aporte energético fue de 29,5 ± 2,1 kcal/kg de peso ideal/día, inferior al recomendado en un 16%. La distribución por principios inmediatos fue: 19% proteínas, 43,1% hidratos de carbono y 37,9% grasas (55,5% ácidos grasos monoinsaturados, 16,4% poliinsaturados y 28,1% saturados). En el consumo por raciones de grupos de alimentos encontramos un déficit en las raciones de hidratos de carbono complejos y en el consumo de aceite de oliva. El consumo proteico animal es correcto cuantitativamente, aunque excesivo en carnes rojas y embutidos.* ***Conclusiones:*** *En este grupo de pacientes en HDP estables, la ingesta proteica es adecuada, y la calórica insuficiente, lo que puede conducir a un balance nitrogenado negativo. En la composición por principios inmediatos, el aporte de hidratos de carbono es bajo y el de lípidos excesivo, aunque con una buena relación entre ácidos grasos mono-poliinsaturados/saturados. En general la dieta es sana, con productos naturales, pero excesiva en carnes rojas y pobre en hidratos de carbono complejos y aceites vegetales. La corrección de estos problemas, dentro de las posibilidades de cada caso, permitiría una reducción en el consumo de grasas saturadas y un mayor aporte calórico, equilibrando la dieta con alimentos propios de nuestra zona geográfica.*

Palabras clave: ***Dieta mediterránea. Hemodiálisis. Ingesta proteica. Ingesta calórica.***

INTRODUCTION

Protein-caloric hyponutrition is frequently present in patients with regular hemodialysis (RHD), significantly increasing its morbimortality.[1,2,3] The cause for this malnutrition is multifactorial: uremic state, hormonal factors, intercurrent pathologies, issues related with replacement therapy, etc.

Among this multifactorial origin, inappropriate diet intake plays an important role,[4,5] and its cause is not just anorexia, since the latter is also observed in stable patients with preserved appetite. Other difficulties to be considered are protein and caloric needs higher than those of the general population (estimated at 1.2 g/kg/day of proteins and 35 Kcal/kg/day[6,7,8]), the limitations of a restrictive diet (which aims at controlling excessive weight gains and potassium and phosphorus levels[9]), and the lack of education and patient's difficulties in following dietary recommendations.

In stable patients on RHD, a deficient caloric intake is usually observed, with low carbohydrate and high fat intake.[5,10,11] Therefore, aiming at providing an adequate intake of nutrients to maintain an optimal nutritional status, we should correct these limitations before evident signs of hyponutrition become evident, which increase morbimortality and are difficult to overcome.[2,3,12]

Our goal was to compare dietary intake of stable RHD patients, without eating difficulties and preserved appetite, with an ideal theoretical intake based on the Mediterranean diet, using the 2004 Healthy Diet Guidelines published by the Spanish Society of Community Nutrition.[13] In this way, we pretend to detect those nutrients for which the larger difference between reality and the recommendations exist and plan corrective strategies.

MATERIALS AND METHODS

Study population

An observational study is carried out with positive selection of the patients on regular hemodialysis at the Hemodialysis Unit of the Hospital of Alcañiz (Teruel). We considered as inclusion criteria being on RHD for at least 6 months, with stable clinical condition, being considered as such those patients free from acute diseases and without hospitalizations for the last 6 months, and being able to keep a diary on ingested foods. A Questionnaire on Food Consumption and Appetite[11] was passed to all patients, with two objectives:

— To confirm the absence of eating difficulties and preserved appetite as a must criterion for entering into the study.
– To analyze the appropriate attitude towards food intake, keeping a diary on complete full meals (lunch and dinner comprising fist and second dishes and dessert) and the number of daily intakes (including breakfast, morning snack, lunch, evening snack, and dinner).

The prescribed diet was of 35-40 Kcal/kg of ideal weight/day and 1.2 g/kg of ideal weight/day of proteins, 60% of these being of high biological value, with specific restrictions according to potassium and phosphorus levels, and in no case restrictions due to overweight or dyslipidemia.

A clinical history was taken considering particulars, baseline disease diagnosis, dialysis schedule, and clinical condition for the last 6 months. The following laboratory determinations were done: Urea, creatinine, total proteins, albumin, prealbumin, cholesterol, triglycerides, LDL-cholesterol, HDL-cholesterol, sodium, potassium, calcium, phosphorus, iPTH, hematocrit, hemoglobin, ferritin, transferrin, and parameters for an adequate dialysis and the PCR protein catabolic rate according to the urea kinetic model were calculated.

Analysis of food intake by means of the Food Intake Registry:

To assess food intake, we used a mixed (weight measurement and interview) dietary intake registry for seven days.[14,15] Patients and their relatives were instructed to identify, register and in some cases weigh all foods and beverages consumed, as well as their cooking.

During dialysis sessions, dietary questionnaires were reviewed to check the diaries and resolve patients' doubts. In order to standardize the food portions, we used a combination of weighing, home measurements, a briefcase with food reproductions, and photographic archive that included traditional local dishes. Transformation of food intake into energy and nutrients was done by using the food composition tables from the Institute of Food Technology.[16] To calculate food intake per kg we used the patient's ideal weight by gender, age, and height. The calculation of the predicted energy waste was individually established taking into account weight, age, and physical activity, and applying the equations proposed by the WHO.[17]

To analyze the appropriateness of our patients' diet, we carried out two comparisons. In the first place, we compared food intake with that recommended for chronic renal insufficient patients on RHD.[8] Then, in order to assess its difference from the ideal predicted, we compared intake by food groups with the averages recommended for the adult healthy population in the 2004 Healthy Diet Guidelines of the Spanish Society of Community Nutrition.[18,19]

Post-dialysis weight and height were taken and the body mass index (BMI) was calculated. The patient's ideal weight was that corresponding to a BMI of 22 in relation to height.

Statistical analysis

Description of quantitative variables is done by measurements based on moments (mean and standard deviation) and for qualitative variables by frequencies distribution. A p value < 0.05 is considered to be significant. The SPSS software for Windows version 10.0 was used statistical analysis.

RESULTS

Twenty-eight (15 men and 13 women) out of 42 evaluated patients met the established criteria, mean age 62.9 ± 16 years (range 20-84 years). The causes for chronic renal failure were: nephroangiosclerosis 35.7%, diabetic nephropathy 28.6%, glomerulonephritis 21.4%, interstitial nephropathy 7.1%, polycystic renal disease 3.6%, and unknown 3.6%. Mean stay

on hemodialysis was 32.6 ± 12 months, and mean session duration was 230 ± 42 minutes. The dialysis bath was bicarbonate-based and polysulphone dialysis membranes were used in all cases, in 66% of the cases of low flow, and in 34% of high flow.

The biochemical, hematological, and dialysis quality parameters are shown in Table I. No patient had hypolipidemic therapy, lipids determination being fairly good. In total, 13 patients presented residual diuresis higher than 500 ml/24 h. During the week of the diet, mean weight gains during hemodialysis sessions were 1.6 ± 0.5 kg (range 1-2.6 kg) during the week and 2.1 ± 1 kg during the weekend (range 1-4.3 kg). Mean post-dialysis weight was 67.8 ± 8 kg (range 56-86 kg), with BMI of 24.9 ± 3.5 (range 19-34). The mean ideal weight value was 68.6 ± 8 kg (range 62-75 kg).

Table II shows the results obtained when estimating energy and nutrients expressed as mean and standard deviation by person and day; these results are compared with nutritional recommendations for chronic renal failure patients (CRF) patients on RHD.

Mean protein intake was 90.8 ± 9 g/patient/day (range 69.3-106.2 g), which represents 1.33 ± 0.2 g/kg of ideal weight/day (range 1.02-1.57 g). Thirty percent of ingested proteins are of vegetable origin, and 70% or animal origin. Protein intake was less than 1.2 g/kg/day in 6 patients, although all of them were within the 1-1.2 g/kg of ideal weight/day interval. This acceptable protein intake value is in agreement with an appropriate mean PCR of 1.1 ± 0.2.

Table I. Biochemical, hematologic, and dialysis quality parameters

Parameters	Results
Urea mg/dL	129 ± 32
Creatinine mg/dL	6.9 ± 1.6
Proteins g/dl	6.8 ± 0.5
Albumin g/dl	3.85 ± 0.5
Prealbumin mg/dL	24.6 ± 5
Sodium mEq/l	140 ± 6
Potassium mEq/l	4.9 ± 0.5
Calcium mg/dL	8.9 ± 0.5
Phosphorus mg/dL	4.3 ± 1.2
PTH	296 ± 160
Cholesterol mg/dL	170.6 ± 34
Triglycerides mg/dL	134.3 ± 56
HDL Cholesterol mg/dL	52.9 ± 7
LDL Cholesterol mg/dL	106.9 ± 36
Ferritin ng/dl	172 ± 145
Transferrin mg/dL	214 ± 76
KTv	1.5 ± 0.2
URR	69.9 ± 6
Hemoglobin g/dl	12.2 ± 0.8
Hematocrit %	37 ± 3

Mean energy intake is 2018.5 ± 104 Kcal/day (range 1805-2179), which represents 29.5 ± 2.1 Kcal/kg of ideal weight/day (range 25-33). Mean recommended caloric intake was 2386.2 ± 204 Kcal/day (range 1848-2928), thus caloric intake being 16% lower than the ideal one.

The distribution of energy proportion by mean components was as follows: 19% of total diet energy came from proteins, 43.1% from carbohydrates, and 37.9% from fat. Lipid structure of fat is composed as monounsaturated fatty acids (55.1%), polyunsaturated fatty acids (16.4%), and saturated fatty acids (28.1%). The ratio monounsaturated/polyunsaturated fatty acids is higher than 1.5. The cholesterol content is slightly higher than the recommended one (Table II).

About mineral content, intakes of Na, K, and P are reasonable and insufficient for calcium (Table II).

In spite of an adequate attitude towards food intake, we observe that there still is an important number of meals that are not complete (first and second dishes, and dessert). During the week, out of 14 lunches and dinners, an average of 8.9 ± 1.8 are incomplete (4.8 ± 1.4 lunches and 4.1 ± 1.6 dinners). The mean value of daily food intake, considering breakfast, morning snack, lunch, evening snack, and dinner, is 4.2 ± 0.5. Of the 14 morning and evening snacks that patients should take, the mean was 8.8 ± 3.2 morning/evening snacks per week, considering that during their dialysis session they had a food intake.

Table III compares consumption by groups of foods in our patients with the averages recommended for the adult healthy general population in the 2004 Healthy Diet Guidelines of the Spanish Society of Community Nutrition. When reviewing the recommended weights of the portions and home measurements, we found a deficit in complex carbohydrate portions. Although intake of potatoes, rice, bread and pasta is within the lower normal limit, intake of vegetables is decreased, as well as fruits. Consumption of olive oil is low, as well. Consumption of animal proteins, including meat, processed cold meats, eggs, and fish is quantitatively adequate, although excessive for red meats (specially pork and lamb) and processed cold meats. Consumption of vegetable proteins is moderate. In our setting, intake of sweets, snacks, sugared beverages, butter, margarine, and pastries is low.

DISCUSSION

In this group of stable hemodialysis patients with no eating difficulties and preserved appetite, it was found difficult to achieve the recommended food intakes, detecting wrong feeding patterns already described in other studies.[5,10,11] We observed an adequa-

Table II. Mean dietary intake of energy and nutrients

Nutrients	Units	Mean ± SD	Hemodialysis needs
Energy	Kcal	2,018.5 ± 104	
Energy	Kcal/kg/day	29.5 ± 2.1	> 35 kcal/kg/day
Proteins	g	90.8 ± 9	
Proteins	gr/kg/day	1.33 ± 0.2	> 1.2 gr/kg/day
– Percentage		19%	10-35%
Carbohyrates	g	220.5 ± 30	
– Percentage		43.1%	45-65%
Total lipids	g	80.3 ± 10	
– Percentage		37.9%	20-35%
Monoinsatured FA	g	35.9 ± 5	
– Percentage		55.1%	50%
Polyunsatured FA	g	10.8 ± 2	
– Percentage		16,6%	25%
Saturated FA	g	18.4 ± 4	
– Percentage		28.6%	25%
Cholesterol	mg	322 ± 80	< 300
Sodium	mg	2,052 ± 529	< 2,000
Potassium	mg	1,876 ± 350	< 2,500
Calcium	mg	754 ± 184	1,400-1,600
Phosphorus	mg	1,067 ± 193	< 1,200

te protein intake of 1.33 ± 0.2 g/kg of ideal weight/day although caloric intake reached only 84% of the recommended one, which is 29.5 ± 2.1 Kcal/kg of ideal weight/day. Besides, the caloric deficit may produce a nitrogen imbalance in spite of adequate proteins intake since part of them are used as an energy source.[20] With intakes of 32 Kcal/kg of ideal weight/day body weight may be maintained, but intakes of 38 Kcal/kg of ideal weight/day are required to maintain nitrogen balance, so for these latter are recommended.[21] Slomowitz *et al.* confirm that protein usage greatly depends on energy intake. In six patients having mean protein intake of 1.13 g/kg of ideal weight/day, the adjusted nitrogen balance was negative when energy intake was 25 Kcal/kg/day and neutral or positive when energy intake reached 35-45 Kcal/kg of ideal weight/day.[22]

About macronutrients, the distribution of caloric intake by main components was close to ideal values, although there was a slightly reduced consumption of carbohydrates and increased of fat. In dialysis patients, due their increased cardiovascular pathology, values for lipids even below 30% of total energy intake are recommended. This value is partially compensated by an adequate ratio of mono-polyunsaturated/saturated fat, which is characteristic of our diet thanks to vegetables and fish consumption and the use of vegetable oils, especially olive oil.

Finally, there are difficulties related with weight gains and mineral intake. The calculation of mineral content in the dialysis patients' diet is complicated since leaving foods to soak or double cooking modify their characteristics in an imprecise way, although losses are estimated to be up to 75% for potassium. Taking this into account, it seems that potassium and sodium limitations are achieved with difficulty, it may a problem to achieve an adequate phosphorus intake, and calcium intake may be deficient, having all of them to be supplemented and complemented during dialysis sessions (Table II).

In order to detect the main intake deficits in our patients, we recorded for one week the food groups, their consumption frequency, and the weight for each portion, and we compared these feeding patterns with the ideal predicted. Since we have not available an ideal diet for dialysis patients, we then used the 2004 Healthy Diet Guidelines of the Spanish Society of Community Nutrition. This diet may be applied to dialysis patients provided that limiting issues regarding fluid intake (which limits water intake), potassium intake (which limits fruits, vegetables, and nuts), or phosphorus intake (which limits cereals and meats) are considered.

The perception of a healthy diet in Europe comes close to the so-called Mediterranean diet, usually expressed by graphical models (pyramid, lozenge, plate, pagoda) that are a visual expression of relative amounts of food we should consume, or by groups of foods with the recommended frequency and weight of each portion.[13] Taking this as a reference assures a healthy feeding model since it has been shown to prevent cardiovascular diseases and cancer,[13,23,24] and it is integrated within our environment. Some studies even show its advantages in patients on renal re-

Table III. Comparison between intake by portions of groups of foods recommended by the Spanish Society of Community Nutrition and intake of patients on regular hemodialysis

Groups of foods	Recommended frequency (crude and net)	Frequency in hemodialysis patients	Weight of each portion	Home measurements
Potatoes, rice, bread and pasta	4-6 portions/day	4.1 ± 1.2 portions	60-80 g of pasta, 60-80 gr of rice 40-60 g of bread 150-200 g potatoes	1 normal dish 3-4 slices or 1 small bread 1 big/2 small potatoes
Vegetables and greens	> 2 portions/day	1.2 ± 0.4 portions	150-200 g	1 dish mixed salad 1 dish boiled vegetables 1 big tomato 2 carrots
Fruits	> 3 portions/day	1.3 ± 0.4 portions	120-200 g	1 one intermediate-size piece
Olive oil	3-6 portions/day	1.5 ± 0.3 portions	10 ml	1 tablespoonful
Milk and dairy products	2-4 portions/day	1.8 ± 0.6 portions	200-250 ml of milk 200-250 g of yogurt 40-60 g cured cheese 80-125 g of fresh cheese	1 cup of milk 2 units of yogurt 2-3 cheese slices 1 individual portion
Fish	3-4 portions/week	4.2 ± 1.9 portions	125-150 g	1 single fillet
Lean meats	3-4 portions/week	1.5 ± 0.5 portions	100-125 g	1 small fillet
Poultry	3-4 portions/week	2.3 ± 0.4 portions		250 mg of chicken or rabbit
Eggs	3-4 portions/week	3.6 ± 1.4 portions		1-2 eggs
Legumes	3-4 portions/week	1.7 ± 1 portions	60-80 g	
Nuts	3-7 portions/week	0 portions	20-30 g	
Fat meats	Ocassional/moderate	4.8 ± 2 portion/wk		
Processed cold meats	Ocassional/moderate	4.6 ± 1.8 portion/wk		
Sweets, snacks and beverages	Ocassional/moderate	1.7 ± 2 portion/wk 0.5 ± 0.7 portion/wk		
Butter, margarine and pastries	Ocassional/moderate			
Beer or wine	Optional/moderate	0.2 ± 0.4 portion/wk	Wine 100 ml Beer 200 ml	1 glass 1 glass or small bottle

placement therapy, for instance talking about lower inter-dialysis weight gain with this type of diet[25] or an improvement in the cardiovascular risk profile in renal transplanted patients.[26]

By distributing by portions the consumption of the different foods, virtually all patients are able to meet adequate needs in animal protein intake, although with an excessive intake of red meats and processed cold meats, which represent an unwanted intake of animal fat. This value assures sufficient intake of proteins with high biological value and seems to relate with the relatively easy understanding by the patients that meat, fish, and eggs consumption is beneficial for them.

However, there are different deficits in complex carbohydrates consumption. The reasons may be that, due to their phosphorus content, patients tend to limit at least bread and pasta from the group of potatoes, rice, bread, and pasta; and from the group of vegetables and fruits, there is some concern due to their potassium content. Vegetables intake is insufficient in spite of important potassium clearance with usual measures, and consumption of greens is virtually inexistent. The low intake of these products brings low intake of crude olive oil, an essential part of the Mediterranean diet and which assures energy intake and an adequate balance of mono-polyunsaturated/saturated fatty acids in spite of increasing lipid content in the diet.

Finally, patients seem to be aware of the inappropriateness of high-energy value products but with high content in saturated fat or refined sugars (sugar, pastries, sweets, butter, margarine, preserves, etc.), with low consumption of these products.

Other aspects to consider are the appropriate attitude towards food intake (which was assessed by appetite and by the number of complete main meals) and the distribution of total daily intake in five intakes. Our patients had an average of 8.9 ± 1.8 main complete meals per week (considering lunch and dinner) and an average of 4.2 ± 0.5 daily intakes (considering breakfast, morning snack, lunch, evening snack, and dinner), with a margin then for improvement.

After having analyzed this feeding pattern, two diet modifications could be tried out: on the one hand, limiting intake of red meat and processed cold meat, and focus it on lean meats, poultry meat, fish and eggs, reducing in this way the intake of saturated fat. On the other hand, intake of complex carbohydrates (potato, pasta, and bread) could be increased, as well as that of fat from vegetables (in our environment, essentially crude virgin olive oil). Although vegetables are a poor source of carbohydrates, their fiber content and the associated increase in potato and olive oil consumption favor the recommendation of higher intakes. Thus, we may set up several strategies: when lunch or dinner comprise only one dish, we may add a course of vegetables, potato, and olive oil, or a course with pasta or rice. Another choice would be to make sure that this single course is pasta, rice or legumes and is accompanied by an appropriate of proteins such as mincemeat, tuna fish, etc. When 5 daily intakes are not achieved and the morning or evening snacks are missing, we may supplement these intakes with dairy products or small portions of bread with lean processed cold meat (cured or boiled ham, mortadella, turkey). Another strategy would be adding to breakfast slices of toast with marmalade or honey, in non-diabetic patients. In this way, diet would be improved in two aspects: a decrease in saturated fat intake while keeping an adequate protein intake, and an increase in caloric intake with healthy foods integrated in our habits.

The limitations concerning these recommendations are essentially higher fluid, potassium, and phosphorus intake. The increase in crude virgin olive oil consumption does not seem to be a big problem, since it provides calories, its mineral content is low and although it may increase the percentage of lipid intake, its high monounsaturated fatty acid content make of it a healthy food. Adding the remaining products should be done individually, based on the characteristics of dialysis quality, weight gains, residual diuresis, and potassium and phosphorus management. A reduction in phosphorus intake, particularly in young patients, is possible by limiting dairy products and bread, allowing rice and pasta intake, which provide this element in moderate amounts.

As an example, a dish or vegetables with 100 g of potato and 20 g of oil provides 4.5 g of proteins and 328 Kcal, although it will add 300 mg of potassium and 90-100 mg of phosphorus. Eating 50 g of bread with 50 g of boiled ham may provide 5-14 g of proteins and 170-180 Kcal, with 120-180 mg of potassium and 100-140 mg of phosphorus; and adding a dish with boiled pasta may provide 9 g of proteins, 275 Kcal, 175 mg of potassium and 150 mg of phosphorus. These moderate increases in fluid and minerals may be compensated by correcting other dietary defects,[27,28] and a considerable number of patients would be able to tolerate them, thus achieving two beneficial effects: an appropriate caloric intake and a healthy and well-balanced diet.

The regimens commented here would be adequate for stable patients, with good appetite and without special problems with their dialysis therapy and even with residual diuresis. The reason for an inappropriate intake in this group may be partially due to poor dietary counseling and deeply rooted dietary habits, difficult to correct. The importance of early working on adequate dietary intake in those cases with good clinical condition would be preventing future sings of hyponutrition that is so harmful for RHD patients.

To conclude, in spite of a good clinical condition and preserved appetite, of selected patients on RHD, dietary intake deficits are detected. Protein intake is adequate although caloric intake is insufficient. The diet is generally a healthy one, with natural products, although excessive in red meats and poor in complex carbohydrates and vegetable oils. Correcting these problems within each case possibilities would allow for a reduction in saturated fat consumption and higher calórica intake, balancing the diet with foods from our geographical area.

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