Nutritional Intervention in Patients with Diabetic Renal Diseasee

A brief presentation

DANIELA GABRIELA BALAN[1], ANDRA ELENA BALCANGIU STROESCU [1,2]*, MARIA DANIELA TANASESCU[3,4], ALEXANDRU DIACONESCU[2], LAURA RADUCU [5,6], ANDRADA MIHAI[7,8], MIHAELA TANASE[9], IULIA IOANA STANESCU[1,10], DORIN IONESCU[3,11]

[1]Carol Davila University of Medicine and Pharmacy, Faculty of Dental Medicine, Discipline of Physiology, 8 Eroii Sanitari, 050474, Bucharest, Romania

[2]Emergency University Hospital,Department of Dialysis, 169 Splaiul Independenei, 050098, Bucharest, Romania

[3]Carol Davila University of Medicine and Pharmacy, Faculty of Medicine, Department of Medical Semiology, Discipline of Internal Medicine I and Nephrology, 8 Eroii Sanitari, 050474, Bucharest, Romania

[4]Emergency University Hospital, Department of Nephrology, 169 Splaiul Independenei, 050098, Bucharest, Romania

[5]Carol Davila University of Medicine and Pharmacy, Faculty of Medicine, Department of Plastic and Reconstructive Microsurgery, 8 Eroii Sanitari, 050474, Bucharest, Romania

[6]Prof. Dr. Agrippa Ionescu Clinical Emergency Hospital, Department of Plastic and Reconstructive Surgery, 7 Ion Mincu, 011356, Bucharest, Romania

[7]University of Medicine and Pharmacy Carol Davila, Nutrition and Metabolic Diseases - N. Paulescu National Institute, Faculty of Medicine, Discipline of Diabetes,5-7 Ion Movila Str., 020475, Bucharest, Romania

[8]Department II of Diabetes, Nutrition and Metabolic Diseases National Institute of Diabetes, Nutrition and Metabolic Disease Prof. N. Paulescu, 5-7 Ion Movila Str., 020475, Bucharest, Romania

[9]Department of Pedodontics, Faculty of Dental Medicine, 8 Eroii Sanitari, 050474,

[10]Carol Davila University of Medicine and Pharmacy, Faculty of Dental Medicine, Discipline of Biochemistry, 8 Eroii Sanitari, 050474, Bucharest, Romania

[11]Emergency University Hospital, 169 Splaiul Independenei, 050098, Bucharest, Romania

Clinical nutrition represents one of the main tools the clinician has to help prevent, control and in some cases, treat different diseases. In this context, diabetes mellitus is a disorder for which the nutrition plan is one of major importance, both in preventing the disease, as well as in its evolution. Thus, the complications that can occur during its progression represent one of the major stimuli to adjust the non-pharmacological treatment (the diet). In the initial stages of the disease, daily intake of carbohydrates monitoring and weight control of the patient are mandatory. Subsequently, the development of diabetic renal disease and diabetic nephropathy are important arguments in favor of daily protein intake adjustment in these patients.

Keywords: diabetes mellitus, diabetic renal disease, diabetic nephropathy, proteinuria, hypoproteic

The increased number of over 18 years old patients with diabetes mellitus in the past years has determined the registration in 2014 of a disease prevalence of 8.5%, especially in low or medium income population. To emphasize the magnitude of the problem, we specify that in 1980 disease prevalence was 4.7% in the same category of patients. The chronic complications surging during the disease are the reason why diabetes mellitus is an important mortality cause, in particular cause due cardiovascular involvement. This fact is sustained by the 2016 statistic that attributes 1.6 million deaths to diabetes [1].

Managing diabetic patients first and foremost the correct administration of the non-pharmacological treatment- the diet. In these patients, a properly lead nutritional intervention contributes to a good control of the diabetes. This includes maintaining normal levels for glycated hemoglobin, blood pressure and LDL-cholesterol. In particular, in patients with type 2 diabetes, the nutritional intervention implies in addition to a meal schedule with a controlled calorie intake, a physical activity plan in order to obtain the optimal weight [2].

Experimental part

The design of the diet for diabetic patients, calories distribution and of micro- and macronutrients in main meals and snacks, patients' preferences and lifestyle should be taken into consideration [2, 3]. For a healthy lifestyle, daily carbohydrates consumption is advised to be monitored. The suggested carbohydrate sources for these patients are whole cereals, fruits, vegetables, as well as low fat milk products. The ingested quantity of lipids is also important for cardiovascular involvement in diabetic patients. These aspects derive from the negative influence that the trans fats have on the cardiovascular health in these patients. By contrast, the fats provided by fish meat, olive oil and seeds have a good effect on cardiovascular health. Additionally, the current guidelines for patients with diabetes mellitus emphasize on the recommend quantity of ingested sodium. In these subjects, it's suggested that sodium intake should be limited to 2300 mg/day, and if the patient for whom the diet is proposed also has hypertension, sodium consumption should be decreased even more. A low quantity of carbohydrates from alcoholic beverages is allowed as well. Fiber consumption is also encouraged with a suggested ration of 14 g to each 1000 ingested calories [2].

In type 2 diabetes, maintaining a normal weight of the patients is one of the main treatment strategy. Obesity conducts to type 2 diabetes and its association with the diabetes mellitus occurrence enhances cardiovascular involvement. Besides a careful follow-through of calorie

*email: stroescu_andra@yahoo.ro *All authors contributed equally to the present work and thus are main authors*

intake, the evaluation of the anti-diabetic treatment is also advised in diabetic patients. This aspect is of great value because some of the currently used anti-diabetic medicines have miscellaneous effects on the patient's weight. Hence, we would like to mention the increasing effect on weight of insulin, sulfonylurea drugs and thiazolidinedione, and the decreasing effect observed in new medicine classes of anti-diabetics- GLP-1 agonist and SGLT2 inhibitors [2, 4, 5].

Table 1
THE EFFECTS OF THE DIFFERENT ORAL ANTI-DIABETIC MEDICINES ON WEIGHT

Medicine class	Effect on patient's weight
Insulin	Weight gain
Sulfonylurea drugs	Weight gain
Thiazolidinedione	Significant weight gain (+hydrosaline retention)
Biguanides	No influence on patient's weight
GLP-1 agonist	Weight loss
SGLT 2 inhibitors	Weight loss

One of the main complications is diabetes mellitus is represented by diabetic renal disease which is a major cause of ESRD. In order to prevent it, it is important to maintain a good glycemic control and an optimal blood pressure [6, 7]. In patients with diabetic renal disease, just like in diabetic patients, the non-pharmacological treatment – the diet is extremely important in their management. Thus, for a better evolution, the nutritional intervention with restricted protein consumption advised in this category of patients [8].

Results and discussions

To better understand the need to restrict protein intake in diabetic renal disease patients, it is necessary to fully understand the effects that protein consumption has in the kidneys. Hence, researchers have described a directly proportional relationship between the quantities of proteins provided to the organism through the diet and the increased levels of nitrogen retention, a relationship that later was explained on account of the glomerular filtration rate. Furthermore, several studies have demonstrated the certain influence that an increased protein consumption has on chronic renal disease progression and emphasis of renal function decline. Also, our research group would like to point out that no accentuation of the renal function decline subsequently to a high protein intake was noticed in patients with normal renal function [9].

Modifications such as glomerular hyperfiltration, glomerular hypertension or kidney hypertrophy with glomerular deterioration can be observed in the kidneys of diabetic [7]. In these subjects, in order to improve the renal function and to prevent diabetic renal disease progression, the recommended protein ingestion is 0.8-1g protein/ kilogram body weight/day. Depending on urinary protein loss, it is advised to ingest either 0.8 g protein/kilogram body weight/day up to 1 g protein/kilogram body weight/ day is the patient has microalbuminuria or 0.8 g protein/ kilogram body weight/day if he has [10]. It is important to remember that in diabetic patients without chronic renal complications, the suggested protein consumption level is similar to the one proposed for general population – 1.3 g protein/kilogram body weight/day [11].

The results of the research in this field show that protein restriction in diabetic patients has clear benefits over diabetic renal disease progression. The explanation is provided by renal protein loss as well as by the metabolic acidosis and inflammation improvement - frequent complications in diabetic patients with renal involvement [11].

Some studies fail to prove certain benefits regarding the type of protein- animal or from vegetables, however other studies describe the various benefits of a diet with more vegetables proteins in patients with diabetic renal disease. Eloquent examples for such diets are the DASH diet and the Mediterranean diet [10-12]. Meanwhile, a prospective study concluded that there is a dependency relationship between red meat consumption and ESDR occurrence where a major role is played by the quantity of ingested red meat [11].

At the same time with chronic renal disease progression, specific chronic complications of the disease can be observed. Regarding the diet in these patients, an important aspect is represented by hyperphosphatemia- a significant component of bone mineral disorders associated with chronic renal disease [13, 14]. Proteins are a major source of phosphorus and therefore, a diet based on a low quantity of proteins is a good non-pharmacological solution to maintain a low phosphorus serum level. Another non-pharmacological way to prevent this complication is to avoid foods with preservatives based on phosphorus [16].

Simultaneously to the initiation of one of the extrarenal epuration methods, the protein restriction is no longer justifiable and therefore the diabetic patient included in the dialysis program is encouraged to have a 1.2 g/kilogram body weight/ day protein ingestion. Meanwhile, it is worth mentioning that in this patient category the protein malnutrition risk is considerable due to the loss of proteins and amino acids during the dialysis as well as due to a high protein catabolism [11]. Constant inflammation in hemodialysis patients is another factor that influences their nutritional status [16]. According to previous studies, new hemodialysis membranes besides high biocompatibility have a clear benefit in decreasing the inflammation during the dialysis sessions [17]. By increasing the protein consumption in the diabetic patients with ESRD the risk of hyperphosphatemia is also higher. The association between hyperphosphatemia and cardiovascular involvement in these subjects and implicitly the higher mortality rate due to cardiovascular involvement explains the necessity of intense nutritional counseling for these patients, with proper explanations regarding protein sources and the provided phosphorus and the encouragement to limit foods rich in phosphorus [15]. The serum level of phosphorus is also influenced by the physical activity in chronic hemodialysis patients. The recommendations regarding optimal daily phosphorus intake should depend on the physical activity of hemodialysis patients [16]. The admitted daily phosphorus intake for these is 800-1000 mg/ day [19].

In diabetic patients with renal disease it is advised that the carbohydrates included in the diet bring 45-60% of the total calories in order to obtain a daily calorie intake of 30-35 kcal/ day. Foods with a low glycemic index are preferred. The daily simple carbohydrates ingestion should not exceed 10% of the total calories. Lipids provide energy and the recommended intake of saturated fats is of less than 7% of the total calories. Research studies have shown the miscellaneous benefits that polyunsaturated (PUFA) and monosaturated fat acids have on endothelial dysfunction and thus, their consumption is advised in diabetic renal disease patients. Also, some studies describe the positive

Table 2

RECOMMENDATIONS REGARDING MICRO- AND MACRONUTRIENTS CONSUMPTION IN PATIENTS WITH DIABETIC RENAL DISEASE

PREDIALISIS						
	PROTEIN	**CARBOHYDRATES**	**FATS**	**SODIUM**	**POTASIUM**	**PHOSPORUS**
Recommended quantity	0,8g/kilogram body weight (<15%)	45-60% of the total calories/day	Maximum 30-35% of the total calories/day	1,5-2,3 g Na/day	40-70 mEg/day	800-1000mg/day
Nutrients quality	It is recommended the consumption of mostly vegetables proteins, milk products (skimmed/ low fat), proteins with high biological value –such as eggs, meat- in the daily protein recommended intake	Low glycemic index foods are recommended, the daily ingestion of simple carbohydrates should be limited to maximum 10% per day	Foods rich in omega-3, omega-9, polyunsaturated acids are recommended	Low sodium products are recommended to be consumed; Low salt products: fresh meat (low fat beef, chicken, fresh fish), rice, pasta, tofu, fresh fruits, vegetables, spices without added salt	Low potassium products are recommended for consumption: fruits (apples, melon, cherries, raspberry, pineapple, tangerines, pears, peaches etc), vegetables (green peas, pumpkins, cabbage, radishes, onion, cauliflower, cucumbers, eggplants, green salad etc.)	Caution is needed regarding foods rich in phosphorus: vegetables proteins with high biological value (soy), whole grains, processed meat, seeds, animal organs, different kinds of cheese, carbonated beverages, food supplements. Fresh foods are recommended, without preservatives, with low phosphorus leve

Table 2
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HEMODIALYSIS						
	PROTEIN	**CARBOHYDRATES**	**FATS**	**SODIUM**	**POTASIU**	**PHOSPHORUS**
Recommended quantity	>1,2g/ kilogram body weight/day	55-60% of the total calories/day	Maximum 30-35% of the total calories/day	Medium daily quantity needed 2,4 g Na. Quantity should be adjusted depending on the patient	40-70mEg/day	800-1000mg/day
Nutrients quality	Protein sources are recommended to be chosen depending on phosphorus quantity contained: optimal-10 mg of phosphorus/ g protein	Low glycemic index foods are recommended, the daily ingestion of simple carbohydrates should be limited to maximum 10% per day	Foods rich in omega-3, omega-9, polyunsaturated acids are recommended	Low sodium products are recommended to be consumed; Low salt products: processed cheese, processed meat, ham, crumb, bagels, preserved vegetables, tomato juice, preserved sauces etc.	Foods rich in potassium are to be avoided: fruits (banana, apricots, plums, pomegranate, mango, kiwi, dry fruits, figs, oranges, nectarines, papaya etc.), vegetables (tomatoes, spinach, dry beans, carrots, lentil potatoes, preserved mushrooms)	Caution is needed regarding foods rich in phosphorus: vegetables proteins with high biological value (soy), whole grains, processed meat, seeds, animal organs, different kinds of cheese, carbonated beverages, food supplements. Fresh foods are recommended, without preservatives, with low phosphorus leve

effects that PUFA has over the quantity of lost urinary proteins and on cardiovascular involvement as well [11].

Another important item in the nutritional management of the diabetic patient is represented by the recommended sodium quantity to be consumed. The advocated sodium intake is limited to 1.5-2.3 g/day. A more significant decrease of the sodium ingestion in these patients is a stimulus for insulin resistance with a negative impact on glucose metabolism. Also, this strategy (of decreasing daily sodium consumption could lead to SRAA and SNS [11].

Conclusions

Diabetes mellitus is a disorder for which the nutrition plan is one of major importance. In patients with diabetic renal disease, just like in diabetic patients, the non-pharmacological treatment - the diet - is extremely important in their management.

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