Nutrition and peritoneal dialysis patients – a review

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ABSTRACT

Introduction: The Peritoneal Dialysis (PD) is a preferable treatment option of the renal replacement in patients with chronic renal failure (CRF) end stage.
Purpose: The purpose of this study was to review of articles published related to the contribution of nutrition to health promotion of patients undergoing haemodialysis.
Materials and methods: A review of the Greek and international literature on the subject was Performed through the electronic databases Medline, Google Scholar, Scopus and the Association of Greek Academic Libraries Link (Heal-Link), using as key words the following terms: haemodialysis, renal failure, peritoneal dialysis, nutrition. Most of the articles used in this literature review were recently published. Only few old - dated articles were included in the study and the reason was their significant contribution to the field. The exclusion criteria for the articles were the languages except from English and Greek.
Results: Patient's diet must contain 1.3 g of protein per kilogram of body weight per day. Consumption of foods rich in carbohydrates should be limited. Patients should consume foods with the adequate quantity of phosphorus and potassium. Finally, they should have their sodium levels and fluid intake checked because sodium causes severe thirst that can lead to excessive fluid intake. As a result, the patient experiences swelling, shortness of breath and high blood pressure.
Conclusion: Patients who undergo peritoneal dialysis must be checked regularly and pay special attention to their diets.
Key words: haemodialysis, renal failure, diet, peritoneal dialysis, nutrition

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INTRODUCTION

Chronic kidney failure is a disease which is increasingly recognized as a public health problem. It is usually characterized by an asymptomatic period which is potentially detectable [1]. Chronic kidney disease is common, and its prevalence increases significantly with age, and particularly in women. However, the classification of disease is not gradual according to age and gender, as well as with the level of proteinouria [2].

Furthermore, it is more common in the elderly than in young people due to atheromatosis of renal vascular disease. Over 70% of patients' cases suffering from chronic kidney disease are due to diabetes mellitus, hypertension and atherosclerosis. Patients who suffer from the disease have to maintain contact with a renal medicine specialist for their rehabilitation therapy of renal function in an early stage for, it is manifested that the final stage of the disease is associated with increased mortality and morbidity [3].

It is evident that in Greece there is a greater frequency of new patients for haemodialysis per million populations compared to 24 European countries in 2004. It possessed the 3rd position worldwide for the corresponding frequency in renal replacement therapy after the USA and Japan. The classification of Greece in the 8th place regarding the global comparison of the prevalence of renal replacement therapy, although more favorable, it remains very high and indicates the size of the increased number of 13 patients in end-stage chronic renal failure in our country [4].

Patients who suffer from kidney failure have great chances to be malnourished or develop malnutrition, which contributes to the patients' morbidity and mortality. Due to this fact, the present study attempts to show the contribution of nutrition in the health promotion of patients undergoing haemodialysis. The assessment of their nutritional status may be particularly difficult in this population on account of the changes as regards the metabolism of proteins and carbohydrates, disturbances of salt and water balance and other factors in comparison with the general population [5].

The purpose of this study was to review of articles published related to the contribution of nutrition to health promotion of patients undergoing haemodialysis.

MATERIALS AND METHODS

A review of the Greek and international literature on the subject was performed through the electronic databases Medline, Google Scholar, Scopus and the Association of Greek Academic Libraries Link (Heal-Link), using as key words the following terms: haemodialysis, renal failure, peritoneal dialysis, nutrition. Most of the articles used in this literature review were recently published. Only few old - dated articles were included in the study and the reason was their significant contribution to the field. The exclusion criteria for the articles were the languages except from English and Greek.

Chronic kidney disease

Chronic renal failure is defined as the damage of the kidneys. Proteinouria, haematouria or anatomic abnormality and the glomerular filtration rate (GFR) < 60 ml/min/1.73 m2 is at least present in cases for ≥ 3 months. The renal failure is irreversible and only a small number of people can follow a conservative treatment. The disease is classified into 5 (five) stages that depend on the glomerular filtration rate (GFR) and the presence of kidney damage (Table 1) [2].

Table 1. Stages of chronic kidney failure

STAGES	**DESCRIPTION**	**GFR (ml/min/1.72m^2)**
1	Kidney damage with normal or increased GFR	≥ 90
2	Kidney damage with mild decrease in GFR	60-89
3	Moderate decrease in GFR	30-59
4	Severe decrease in GFR	15-29
5	Kidney failure	< 15 or dialysis

All patients, regardless of their age, gender and proteinouria or albuminouria, when the GFR 60 ml/min </1.72 m2, are considered to have at least moderately severe chronic failure.

The number of proteinouria is a major risk factor for both the evolution of chronic kidney failure and cardiovascular disease. It is known that many other risk factors play a role in the development of the atherosclerotic lesion, which is responsible for the appearance and growth of many cardiovascular diseases [4,5]. Adverse health effects are linked with the effects that exist in a reduced glomerular filtration rate and in particular if it does not change with the passage of time [6].

The early stages of kidney failure are often asymptomatic, despite the accumulation of several metabolites. Some symptoms include: malaise, loss of energy, loss of appetite, insomnia, noctouria and polyouria due to reduced ability to concentrate, itching, nausea, vomiting and diarrhea, hallucinations due to, polyneuropathy, restless legs syndrome, bone pain due to bone metabolism disease, hallucinations and tetany due to

hypocalcaemia, symptoms due to salt and water retention (distal or pulmonary edema), and symptoms caused due to anemia are amenorrhea in women, erectile dysfunction in men [7].

Haemodialysis

Haemodialysis is a sustained vital process for the treatment of patients suffering from end-stage renal disease. Its objective is to restore the kidney function by reversing the dramatic uremic symptoms and also help patients' functional condition to increase the chances of their survival [6].

This is mainly achieved by the formation of a haemodialysis system whose ingredients and concentrations are formed approximately close to normal values that need the body. Particular emphasis is placed on individual adaptation of haemodialysis. A method of calculating the amount of dialysis is to calculate the Kt/V. Kt/V is an initial value that is indicative of the dose of the dialysis. The Kt/V is best described as the fractional clearance of urea as a function of volume distribution [8].

The link for the haemodialysis of artificial kidney during the first days of dialysis along with the concentration of sodium is set deliberately low to avoid volume overload problems such as hypertension and cardiovascular failure. Much evidence indicates that the correction of chronic acidosis is a clinical benefit regarding the bone metabolism and nutrition [7].

Therefore, a major risk factor for patients on dialysis is malnutrition. The mortality is affected by serum albumin levels. The lower the serum albumin level is, lesser than 4.5 g/dl, the higher the risk of mortality is [8].

Nutritional assessment

Patients that suffer from kidney failure have great chances to be malnourished or develop malnutrition, which contributes to their morbidity and mortality [9].

Malnutrition in conjunction with age, gender, and the respective functional disorders plays an important role in the progress of patients' situation [10].

The assessment of their nutritional status may be particularly difficult in this population on account of the changes as regards the metabolism of proteins and carbohydrates, disturbances of salt and water balance and other factors in comparison with the general population Most of the factors that lead to malnutrition in patients undergoing peritoneal dialysis involve one or a combination of the following ones [9]:

- decreased food intake, either due to psychological factors (depression) or physical factors (inadequate treatment of uremia, side effects from drug use, infections, changes in the sense of taste), and even financial reasons.
- increased nutritional needs or losses due to protein degradation process, inflammation in the process of hemodialysis and shortage of acid during dialysis
- changes in metabolism and endocrine disorders (increased catabolism, reduced anabolism).

Except for losses that are obvious, energy requirements are greater in CRF end-stage (up to 35-40 kcal/kg) due to the increased basic metabolism affected by the sympathetic nervous system. When calories are inadequate, amino acids are used to meet the needs. As a result, increased protein levels are required [9, 11].

Last but not least, vegetable sources of proteins that exceed the daily requirements are deprived in urea, other nitrogenous bases, phosphate, and sulfuric acid. These waste products accumulate in patients with uremia and lead to muscle catabolism, bone loss, and vascular calcification. Health and nutritional status improvement are the main objectives for patients undergoing haemodialysis. Their nutrition status must be assessed. Regularly by their medical expert with the cooperation of the dietician [12].

Obviously, if energy consumption is either above or below the needs of the individual in the long run, then, obesity or marasmus may appear. Protein intake should be sufficient for maintaining the structural integrity of the human organism. The laboratory measurements of serum proteins are vital for the patients' nutritional status. Similarly, the vitamin and mineral intake must be sufficient to meet the needs of the enzymatic function of the human body [13].

Vitamins are important cofactors that regulate the metabolic pathways, by which lipids, proteins and carbohydrates are produced and processed. Patients in peritoneal dialysis are more liable to disturbances of water-soluble vitamins. So, they often need to take vitamin supplements. Vitamin E as well, which is a fat-soluble vitamin is associated with various degenerative conditions [14]. These failures are caused by inadequate dietary intake, decreased absorption due to certain drugs, metabolic changes that differentiate the needs and increased losses through the solution of peritoneal dialysis [15].

Peritoneal dialysis diet

In 2000, the National Kidney Foundation revealed results as (KDOQI) **Kidney Disease Outcomes Quality Initiative** for kidney disease with clinical practice guidelines regarding nutrition in chronic kidney disease. These guidelines continue to form the basis of nutrition care in adults with chronic kidney disease. However, if need be, the doctor along with the dietitian will discuss with the patient about some changes in his diet. In addition

to the nutrients, the patient's needs in vitamins and iron ought to be covered [16].

Proteins

The Diet KDOQI guidelines recommend 1.2 g protein/kg/day for adult maintenance for patients that undergo haemodialysis and 1.2-1.3 g/kg/day for adults under chronic peritoneal dialysis. These Nutritional guidelines KDOQI recommend an energy intake of 35 kcal/kg/day to maintain nitrogen balance. For this reason, it is essential that the Agency and the body be strong and this will be achieved by increasing the daily dietary protein intake [17,18].

Lean meat, oily fish, eggs and dairy products are some of the food rich in protein. However, they contain phosphorus and their consumption should be regulated by the dietician [19].

The presence of the dialysis fluid in the body causes satiety resulting in decreasing the patient's appetite. It is essential the patient increase the frequency of meals and consume small amounts of food more often. This is more preferable than two or more heavy meals per day. Moreover, decrease in appetite may be noticed in cases of infections or anemia. For this reason, the contribution of dietician is very important in order these needs to be met [20].

Carbohydrates

It is manifested that patients under haemodialysis may often experience glucose tolerance resulting in hypoglycemic or hyperglycemic episodes. One of the causes can be either the delayed action of insulin due to the resistance of tissues in it, or insulin resistance in uremia. This glucose tolerance rarely requires the administration of insulin. Thus, the patient should have the carbohydrates in his diet controlled. The recommended dietary regimen for patients is 50-60% of their total calorie-intake and it ought to be high in fiber [15]. What's more, a conducted survey revealed that diet low in carbohydrates and high in fat improves glycemic control and prevents the progression of kidney failure [21].

However, food rich in carbohydrates such as bread, cereals and sugar consumption should be limited by the patient to avoid gaining excessive weight and calorie intake in the body [22].

Fats

Special attention must be given in uremic patients regarding dietary fat intake because the main cause of death is atherosclerosis. The recommended dietary intake of fats is approximately 30% of total calories. Saturated fats must be less than 10% and cholesterol 250-300mg/day [21,23].

Potassium

Patients who undergo haemodialysis must pay particular attention to the consumption of fruit and vegetables for, they are high in potassium. Hyperkalemia (High Potassium in blood) occurs suddenly without warning signs leading to the onset of cardiac arrest, if the value of potassium in the blood plasma is greater than 9mEq/L. For this reason, biochemical levels of potassium and dietary intakes must be closely checked. The patient under haemodialysis three times per week is able to receive up to 1.5-2, 5g and an uric patients 2g (= 51mEq) of potassium a day [24,25].

Phosphorus and calcium

Phosphorus intake should be limited. High levels of phosphorous in patients undergoing peritoneal dialysis can cause heart problems, bone and joint disorders and skin ulcers [26].

Furthermore, the level of phosphorus in blood must remain at low levels in order osteodystrofy to be avoided. Phosphorus increases while calcium decreases in blood with the passage of time. As a result, the calcium is removed from bones. As a consequence, bones become more fragile and susceptible to fractures. This imbalance of phosphorus-calcium occurs from the first stages of kidney disease, long before some form of dialysis is required. Nevertheless, symptoms usually become apparent much later [24].

Dialysis along with phosphorus-binding agents removes more phosphorus from the blood and can provide extra calcium. The patient might need to reduce the amount of phosphorus intake which is difficult because plenty of foods rich in phosphorus are very good quality protein sources. The patient should understand that the more adjusted the level of phosphorus intake is, the greater the benefit to bone health will be [26, 27].

Foods high in phosphorus are dairy products, cheese, eggs, *small* fish and beverages like coca - cola [28,29].

Vitamins and minerals

Vitamins and minerals are essential for normal body function and development. Studies in adults under haemodialysis provided clues for low blood concentrations of water-soluble vitamins and minerals. That was because of the inadequate intake, increased losses and needs [30].

The recommended dietary intake should achieve the 100% of the dietary reference intake amount of thiamine (B1), riboflavin (B2), Pyridoxine (B6), vitamin B12 and folic acid. Also, the dietary intake of 100% of the recommended Dietary intake should be the goal for vitamins A, C, E and K, copper and zinc [27,29].

It is recommended that the intake of these metals must be checked every 4 to 6 months, because

patients whose dietary intake is very low or for those that undergo haemodialysis for prolonged periods of time, or for those whose laboratory or clinical data indicate the lack in minerals may need supplements [30].

Liquids-Sodium(salt)

The diet around peritoneal dialysis is not so limited as regards sodium and fluids in relation to haemodialysis. When the patient suffers from kidney failure, the kidneys produce less urine than usual or not at all. As a result, the amount of water in the body cannot be regulated and so, the fluids are retained. It is essential the patient's levels of sodium and fluid intake must be checked because sodium causes intense feeling of thirst and can lead to excessive fluid intakes. As a consequence, there is swelling, shortness of breath and high blood pressure [9,27].

In general, the fluid intake that must be consumed by the patient is 500-700mL, in addition to the volume of urine that he eliminates round in a 24-hour period. Moreover, the patient's body weight, the presence of edema and blood pressure ought to be taken into consideration. Many patients prefer to eat dry foods so as to be able to enjoy the liquids that are allowed such as tea, coffee, juice, fruit [9, 20].

CONCLUSIONS

The provision of nutritional interventions will result in improving or maintaining the quality of life of patients that undergo dialysis. This improvement in quality of life is probably facilitated by the provision of skilled supportive interventions that focus on patients. [27,31] Thus, patients can cope with the symptoms of decreased renal function and reduce stress and anxiety.[30] Apart from the improvement of nutrition status, patients feel more optimistic and positive for the treatment of kidney disease [8]. Therefore, they are less depressed and stressed. It is manifested the patient improves in most of the subcategories of quality of life in kidney disease.

Conflicts of interest

The authors declare no conflicts of interest in this work.

REFERENCES

1. Halpin D, Stevens P, Bakhshi L, Benett I, Crowe E, Dodwell M. Chronic kidney disease National clinical guideline for early identification and management in adults in primary and secondary care. Lavenham Press. London: Royal College of Physicans. 2008;5(1):61-2.
2. Alluru S. Reddi and Kishore Kuppasani, Nutrition and Health: Nutrition in Kidney Dis ease Edited by: L. D. Byham-Gray J, Burrowes D, Chertow G. M, Humana Press, Totowa, NJ. 2008; p. 3-5.
3. Kumar P, Clark M. L. Clinical medicine Saunders, 2009; 11: 625-31.
4. Kourkouta L, Papathanasiou I.V. , Koukourikos K, Kleisiaris C, Fradelos E. C, Tsaloglidou A. Circulatory System's Diseases in the Elderly. Journal of Pharmacy and Pharmacology, 2015;3:591- 595. Doi: 10.17265/2328-2150/2015.12.006
5. Tsaloglidou A, E. Ruska, Harokopos N. The effect of exercise on vascular endothelium. Cardiology, 2007; 2: 117-123.
6. Souliotis K, Papabasilopoulou M, Konstantinidou C, Spanaki A.M, Apostolakis M, Iatrou C, Insurance coverage for treatment of patients with chronic kidney disease, Introduction of economic assessment by the Institute of Social Insurance IKA. Archive of Hellenic Medicine, 2009; 26(5):668–77. (Greek)
7. Manios Y. Nutritional evaluation: Dietetic & medical history, Swmatometrikoi Clinical biochemists, markers & Medical Publications e.g. Paschalidis, 2006; p. 69. (Greek)
8. Panagopoulou A. Lifestyle of patients in the end stage renal failure, under renal function substitution with haemodialysis or peritoneal dialysis or successful kidney transplantation. Thesis. Faculty of Medicine University of Patra. 2009. (Greek)
9. Zampelas A. Clinical Dietetics and nutrition with elements of pathology. Chapter 15 Mpoletis in, Psimenou E, Michael S. Stamatiadis D, Constantinidou EU, the Friend Checkers, Kidney Diseases, Medical versions e.g. Paschalidis, Athens, 2007;385-436. (Greek)
10. Tsaloglidou A, Matziari X. Eating disorders and nursing interference bases in Alzheimer. Galinos. 2005;47(4):439-46. (Greek)
11. M. Papadimitriou. What is new in Clinical Nephrology? Hellen Nephrol. 2009;21(1):21-4. (Greek)
12. Kalochairetis P, Makryniwtoy A, Drouzas K. A, Results in chronic aimokathairomenoys patients Incidence, severity and causative factors, Ancient Greek Medicine. 2003 p. 295. (Greek)
13. James L, Bailey M.D, Harold A. Core curriculum in nephrology Nutritional considerations in kidney disease: core curriculum, 2010.
14. Kyparos A, Sotiriadou S, Tsaloglidou A, Matziari Ch, Ampatzidis C. Vitamin E: Structure and mechanism involved. Galen. 2004;46(6):626-43.
15. Campbell KL, Ash S, Bauer JD. The impact of nutrition intervention on quality of life inpredialysis chronic kidney disease patients. Clin Nutr. 2008 Aug;27(4):537-44

16. Dimitriadou-Panteka A, Koukourikos K, Pizirtzidou E. The concept of self-esteem in nursing education and its impact on professional behavior. International Journal of Caring Sciences. 2014;7(1):6-11.
17. Kourkouta L, Papathanasiou IV. Communication in Nursing Practice. Mater Sociomed. 2014;26(1):66-8.
18. Markaki A, Kyriazis I. Assessment of nutritional status in patients with end-stage renal disease. Hellen Nephrol. 2015;27(2):153-70. .(Greek)
19. Tzamaloukas A, Raj D. Hemodialysis in the twenty-first century. Hellen Nephrol. 2006;18 (3):181-9.(Greek)
20. Kopple JD, Kalantar-Zadeh K, Mehrotra R. Risks of chronic metabolic acidosis in patients with nchronic kidney disease. Kidney Int Suppl. 2005 Jun;(95):S21-7.
21. Zirogiannis T, Pierides MT, Diamantopoulos AA. Clinical Nephrology. Technogramma, Athens, 2005. (Greek)
22. Kosmadakis G, Boletis J. Physical exercise in patients with chronic kidney disease. Hellen Nephrol. 2011;23(1):28-36.(Greek)
23. Nielsen JV, Westerlund P, Bygren P. A low-carbohydrate diet may prevent end-stage renal failure in type 2 diabetes. A case report. Nutrition & Metabolism. 2006;3(23):1-5.
24. Mahan LK, Escott-Stump S. Krause's Food Nutrition and Diet Therapy. 11th edition. Saunders, 2004.
25. Tzanakis I. Is magnesium the missing link between risk factors and cardiovascular disease in chronic renal disease? Hellen Nephrol. 2007; 19(3):202-15.(Greek)
26. Hensley MK. Historical Perspective of Nutrition in Kidney Disease, Nutrition in Kidney Disease Edited by: Byham-Gray L. D, Burrowes J. D, Chertow GM, Humana Press, Totowa, NJ. 2008;2(3):25-7.
27. Giaramazidou T, Giovreki A, Morfakidou L, Iliou C, Karapanagiotou P. A study of dietary knowledge and its religious relationship in patients receiving haemodialysis. EDTNA ERCA J. 2005;31:199-202.(Greek)
28. Beto JA. Bansal VK. Medical Nutrition Therapy in Chronic Kidney Failure: Intergrating Clinical Practice Guidelines. American Dietetic Association. 2004;103:404-8.
29. Sonikian MA. Phosphorus, hyper-phosphataemia and phosphate binders in chronic kidney disease. Hellen Nephrol. 2013;25(2):99-112. (Greek)
30. Mavromatidis K. Diet of patients with chronic renal failure. Hellen Nephrol. 2008;20(2):113-20. (Greek)
31. Tsaousoglou A, Koukourikos K. Quality and service health. Stigma. 2007;15(2):18-24. (Greek)