


Chapter 1

The relation between food consumption and biochemical exams and their nutritional consequences in patients treated in a Reference Hospital in Nephrology in Belém-PA

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ABSTRACT

Introduction: Renal failure occurs when the kidneys cannot develop their regulatory functions normally, leading the patient to several disorders, such as: water retention, electrolyte dysfunction and acid-base imbalance. **Objective:** To evaluate the food consumption of patients undergoing Renal Replacement Therapy and compare it with biochemical tests. **Methodology:** This is a qualitative-quantitative, comparative, descriptive and analytical study, carried out in the Renal Replacement Therapy Sector in a referral hospital, located in Belém do Pará, between November 2021 and January 2022, where data were collected biochemicals from the patients' charts and Food Frequency Questionnaires (FFQ) were applied. **Results:** The study involved 43 patients. A higher consumption of carbohydrates was observed in the diet, from different sources according to the FFQ. Regarding the biochemical tests, the values obtained were within the normal range. **Discussion:** In the present study, a prevalence in the daily food consumption of carbohydrates, fats and fried foods was observed, which may explain the changes in blood glucose levels. Regarding fruits, vegetables and animal proteins, the highest frequency was weekly. All these foods are rich in potassium and phosphorus respectively and if consumed in excess they can be harmful to the health of patients. **Conclusion:** Inadequate nutrition influences the alteration of biochemical tests. Elevated serum levels of macronutrients such as carbohydrate, protein and lipid, as well as micronutrients: phosphorus, potassium and sodium directly affect the quality of life of hemodialysis patients, as they attribute other symptoms to the pathology in question.

Keywords: Nutrition; Renal Replacement Therapy; Food consumption.

1 INTRODUCTION

Renal failure occurs when the kidneys are unable to perform their regulatory functions normally, leading the patient to various disorders, such as water and electrolyte retention and acid-base imbalance. It can be classified as acute renal failure (ARF) or chronic renal failure (CRF). ARF is characterized by a sharp drop in the glomerular filtration rate. Chronic is defined as kidney damage with progressive and irreversible loss of kidney function. Its main causes are hypertension and diabetes mellitus (Silva et al., 2020).

According to the Ministry of Health, chronic kidney disease (CKD) affects 10% of the world's population, affecting all ages and races. However, the most affected age group is the elderly population aged 65 to 74 years in a ratio of 1:5 in men and 1:4 in women, and still, half of the population aged 75 years suffers some degree of the disease (Silva et al., 2021).

Chronic Kidney Disease is defined as changes at the structural and functional level of the kidneys, in a period equal to or greater than three months, and its staging is according to the Glomerular Filtration Rate (GFR), defined as the kidneys' ability to eliminate toxic substances from the blood. Stage 1 is characterized by $GFR \geq 90$ ml/minute/1.73 m², in stage 2 the GFR is already slightly decreased between 89 and 60 ml/minute/1.73 m², in stage 3a the decrease is mild to moderate with GFR between 59 and 45 ml/minute/1.73 m², differently from stage 3b, where the decrease is moderate to severe, in stage 4 the GFR is already severely decreased between 29 and 15 ml/minute/m², and finally in stage 5 renal failure already occurs and the GFR is <15 ml/minute/m². In this stage, the only solution is the use of Renal Replacement Therapy, which can be Hemodialysis, Peritoneal Dialysis or Renal Transplantation (Silva et al, 2021).

Hemodialysis is a procedure that removes toxic substances from the blood and excess water with the help of a machine whose main purpose is to do the work that the patient's kidney can no longer perform due to a sudden or progressive drop in the glomerular filtration rate. Usually, patients undergoing renal replacement therapy already have a $GFR < 15$ ml/min/1.73 m². This procedure may be an option for patients who are on the kidney transplant list or maintained for life (Ribeiro, Jorge & Queiroz, 2020; Rocha & Borges, 2022).

Adequate nutritional status is fundamental in the treatment of Chronic Kidney Disease. Obesity is related to increased incidence of Non-Transmissible Chronic Diseases, such as Systemic Arterial Hypertension and Diabetes Mellitus, two main causes of CKD. On the other hand, energy-protein malnutrition (ESD) is associated with increased functional disability, longer and more frequent hospitalizations, reduced quality of life, greater possibility of developing infections and increased mortality (Borges & Fortes, 2020).

In this sense, the acceptance of the hospital diet (when offered by the service) is essential for the patient's clinical evolution and improvement of quality of life. Usually, the diet of the patient on hemodialysis is hyperproteic, hypercaloric, restricted in liquids, sodium, potassium, and phosphorus, varying according to the patient's case and needs. However, in most cases, patients are not used to and do

not accept the hospital diet very well, making the nutritional treatment more difficult (Oliveira & Souza, 2020).

The hemodialysis process can lead the patient to depression and anxiety, sleep disorders, non-acceptance of treatment, and chronic pain, associated with low quality of life and high mortality rates. For this reason, the application of the *Mindfulness* technique - characterized by paying attention in the present moment, with openness, curiosity, and acceptance - is extremely important for the improvement of symptoms and quality of life. In addition, by eating with full attention, the patient can better accept hospital diets (Razzera et al., 2021).

The aim of this study was to evaluate the food intake of patients undergoing Renal Replacement Therapy and compare it with biochemical tests.

2 METHODOLOGY

This was a quali-quantitative, comparative, descriptive and analytical study, conducted in the Renal Replacement Therapy Sector of the Fundação Pública Estadual Hospital de Clínicas Gaspar Vianna (FHCGV), located in the metropolitan area of Belém do Pará with nephropathic patients (Pereira et al., 2018; Estrela et al., 2018; Figueirôa et al., 2020; Ferrari et al., 2018). The foundation provides breakfast for patients on the first shift, morning snack and lunch for those on the second shift, and afternoon snack on the third shift. The research was conducted in the period between November 2021 and January 2022, where Food Frequency Questionnaires (QFA) were applied that observes the consumption of carbohydrates, cassava and tapioca flours, vegetables, fruits with emphasis on the regional consumption of açaí, milk and derivatives, proteins of animal origin, vegetable, beans, legumes, fats, fried foods, sugars, soft drinks, coffee and alcoholic beverages, adapted to the characteristic foods of the population studied, with the consumption classification: daily, weekly, monthly, rarely or never, and collected from the medical records, the biochemical results regarding: Glycemia, urea, albumin, phosphorus and potassium. The data were tabulated in Excel spreadsheet and statistically treated using BioEstat 5.0 software. The research followed the rules of resolution 466/2012 of CONEP with approval number: 4,160,103.

Regarding the biochemical tests, the reference values of the hospital's laboratory were used. Therefore, after data collection, an association was made to identify the patients' eating habits as to adequacy or inadequacy according to the food pyramid for nephropathic patients on hemodialysis, and whether this result directly influences the alteration of laboratory tests.

The sample was by convenience, composed of 43 patients of both sexes, adults and elderly with a diagnosis of kidney disease performing hemodialysis at the FHCGV.

The inclusion criteria of the research were: Present diagnosis of Chronic Kidney Disease, perform hemodialysis at the FHCGV, agree to participate in the research and sign the Informed Consent Form (ICF). The exclusion criteria were: Inability or refusal to participate in the research, not signing the ICF, and not being physically or mentally able to be evaluated.

3 RESULTS

For better analysis of the Food Frequency Questionnaire of the 43 research participants, the foods were classified into nine food groups: Carbohydrates, Flour and Acai, Vegetables, Fruits, Milk and dairy products, Animal proteins, Vegetable proteins, Fats, Fried foods and sugars, Coffee, and Alcoholic beverages.

In table 1 below, the quantity and percentage of consumption evaluated are represented, the classification was related to the frequencies daily, weekly, rarely or never of each food group.

Table 1. FFQ of patients with kidney disease undergoing RRT in a reference hospital in Belém-PA.

Food Groups	Daily		Weekly		Rarely		Never	
	N	%	n	%	n	%	N	%
Carbohydrates	58	21,40	54	10,74	24	7,41	36	6,82
Flours and Acai	31	11,44	38	7,55	39	12,04	21	3,98
Vegetables	11	4,06	61	12,13	31	9,57	27	5,11
Fruit	20	7,38	48	9,54	27	8,33	35	6,63
Milk and Derivatives	38	14,02	26	5,17	44	13,58	64	12,12
PTN of animal origin	9	3,32	160	31,81	67	20,68	99	18,75
PTN of vegetal origin	5	1,85	42	8,35	29	8,95	52	9,85
Fats and Frying	55	20,30	42	8,35	27	8,33	48	9,09
Sugars, coffee and alcoholic beverages	44	16,24	32	6,36	36	11,11	146	27,65
Total	271	100,00	503	100,00	324	100,00	528	100,00

Source: Field research, 2021.

Regarding the study performed of the QFA of the 43 patients interviewed, we observed a prevalence of the consumption of carbohydrates daily (21.40%), cassava flour, tapioca and açaí daily and rarely (11.44% and 12.04% respectively), vegetables and fruits weekly (12,13% and 9.54% respectively), milk and dairy products daily (14.02%), proteins of animal origin weekly (31.81%), proteins of vegetable origin never (9.85%), fats and fried foods daily (20.30%), sugars, coffee and alcoholic beverages never (27.65%).

Table 2 shows the results of the blood glucose, albumin, urea, sodium, potassium, and phosphorus tests of the 43 patients studied.

Table 2. Biochemical tests of patients with kidney disease undergoing RRT in a reference hospital in Belém-PA.

Exams	Below the V. R.		Normality		Above the V. R.		Total	V. R.
	n	%	n	%	N	%		
Blood glucose	0	0	15	34,9	28	65,1	43	70-99 mg/dL
Albumin	11	25,5	32	74,5	0	0		3.5-5.2/3.2-4.6 g/dL

Urea	0	0	1	2,3	42	97,7	13-43/17-49 mg/dL
Sodium	28	65,1	15	34,9	0	0	136-145 mEq/L
Potassium	2	4,6	20	46,5	21	48,9	3.5-5.1 mEq/L
Phosphorus	1	2,3	18	41,8	24	55,9	2.5-4.5 mg/dL

Source: Field research, 2022.

According to the biochemical tests of the 43 patients who underwent the QFA, it was observed that most of them had hyperglycemia, uremia, hyperpotassemia, hyperphosphatemia, normoalbuminuria and hyponatremia. The reference values used are according to the laboratory of the hospital institution.

4 DISCUSSION

In the present study, a prevalence of daily consumption of carbohydrates, fats, and fried foods was observed, which may explain the changes in serum blood glucose levels. Regarding fruits, vegetables and proteins of animal origin, the highest frequency was weekly. The foods of vegetable origin (fruits and vegetables) are rich in potassium and animal proteins are rich in phosphorus, minerals that if consumed in excess can be harmful to the health of patients. Cassava, tapioca and açai flours were rarely consumed by the interviewees, which is very positive because the excess of açai flour can increase the levels of glycemia and potassium, which can cause a worsening in the quality of life. Most of the interviewees stated that they never consume milk and dairy products, proteins of vegetable origin, sugars, coffee, and alcoholic beverages, thus avoiding an increase in the levels of potassium, phosphorus, blood glucose, and changes in blood pressure.

The diagnosis of CKD is made through GFR <60 ml/min/1.73 m², associated or not with some pathology. When the GFR reaches the range of <15 ml/min/1.73 m², the patient requires immediate RRT, requiring some nutritional care, since food is a determining factor in quality of life (Plácido et al., 2021).

Typically, patients during hemodialysis (HD) sessions experience hypoglycemia, characterized by a sudden decrease in serum glucose levels, and hypotension, a drop in blood pressure of at least 110 x 70 mmHg. This is due to the fact that the machine removes not only impurities from the blood, but also energy, causing the patient to become extremely tired. Therefore, proper glycemic and sodium control both during and after hemodialysis is very important (Silva, 2021).

Urea is defined as the end product of protein consumption, and its serum levels decrease considerably during HD sessions. It is extremely toxic to the body if found in excess, and its symptoms are nausea, vomiting, and shortness of breath. A balanced protein intake is necessary for control, since low levels of urea may be related to malnutrition (Stumpf, 2021).

Some nutrients suffer alterations due to inadequate diet leading to serious consequences, where the most commonly observed is energy-protein malnutrition, associated with decreased serum albumin levels.

Foods rich in potassium, phosphorus, and refined carbohydrates lead to changes in laboratory tests in these patients. The consumption of processed foods is associated with increased sodium in the body, which can cause edema, especially in the lower limbs (Medeiros et al., 2021).

Potassium works together with muscles and nerves in healthy individuals. When in proper working order, the kidneys are able to filter out what is consumed in excess through the excretion of urine. However, in conditions of partial or total dysfunction, the organ is unable to eliminate it properly, requiring a decrease in food intake by 2000 to 3000 mg/day. Its toxicity is associated with cardiac arrhythmias and sudden death. For a greater decrease of potassium in food, it is important to be careful when preparing vegetables, and cooking them in water, discarding the cooking water after boiling. In the process of cooking food, there is approximately a 60% loss of this nutrient (Vasconcelos et al., 2021).

One of the causes leading to the increase in serum phosphorus levels is the progressive deterioration of Chronic Kidney Disease. Its recommendation for the healthy population is 700 mg/dL, and a concentration of 3.5 mg/dL for hemodialytic renal patients. This mineral is widely found in protein sources of animal origin (meat, eggs, fish, and poultry) and non-animal (cereals, legumes, nuts, grains, and alcoholic beverages), as well as in processed foods (sausages, cheeses, and instant products). Inadequate phosphorus may be related to increased risk of death from cardiovascular disease, atherosclerosis, hyperparathyroidism, and bone disease. Control can be accomplished by reducing intake, using chelating agents to prevent absorption, and elimination by the hemodialysis machine (Fernandes et al., 2021).

Some patients with kidney failure have several other problems. The most common of these is the condition called diabetic nephropathy, where diabetes damages the blood vessels of the kidneys, a condition caused by excessive consumption of refined carbohydrates such as soft drinks, sweets, sodium, saturated and trans fats, and excessive alcoholic beverages (Silva et al., 2021).

5 CONCLUSION

Finally, it is concluded that inadequate diet influences the alteration of biochemical tests, due to observation and data collection of patients with a regulated consumption of fruits and vegetables according to nephropathy versus those who do not have this care with food. The elevation of the serum levels of macronutrients such as carbohydrate, protein and lipid, as well as the micronutrients: phosphorus, potassium and sodium directly affect the quality of life of the patient on hemodialysis, since they attribute other symptoms to the pathology in question, in addition to a longer time of performance of the procedure on the machine, potentiating hypoglycemia and hypotension episodes. In a final way, it emphasizes the importance of an adequate diet, regulated, elaborated and accompanied by a professional nutritionist, in addition to a greater openness to treatment adherence by these patients, since many give up following the food plan due to psychological fatigue caused by the prolonged time of hemodialysis, factors of socioeconomic origin, and ingrained eating habits.

In view of what was found in this study, it is suggested that further work be done, aimed at complementing the diet of these patients and/or supplemental nutritional therapy, in order to contribute to better biochemical and nutritional control and consequently to a better quality of life.

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