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ADESÃO À TERAPIA NUTRICIONAL POR PORTADORES DE DOENÇA RENAL CRÔNICA EM TRATAMENTO DE DIÁLISE NA EFETIVIDADE NO ESTADO NUTRICIONAL

NUTRITIONAL THERAPY ADHERENCE BY PATIENTS WITH CHRONIC KIDNEY DISEASE UNDERGOING DIALYSIS TREATMENT AND ITS EFFECTIVENESS IN IMPROVING NUTRITIONAL STATUS

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RESUMO

A hemodiálise (HD) é uma terapia dialítica associada a complicações agudas e crônicas. Um achado comum entre esses pacientes é a desnutrição protéico-calórica, excesso de gordura corporal e exames bioquímicos fora do adequado. A alimentação e adesão à dieta tem sido apontada como dois dos principais fatores envolvidos para manutenção a saúde do paciente. Assim, o objetivo do presente trabalho foi avaliar o consumo alimentar, a relação com o estado nutricional e parâmetros bioquímicos de pacientes em tratamento dialítico. Trata-se de um estudo descritivo retrospectivo e

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quantitativo realizado com 58 pacientes (de ambos os sexos) em tratamento hemodialítico, atendidos em um centro de diálise de Guarapuava-PR. Foram coletados, a partir de prontuários, os dados referentes à avaliação antropométrica, bioimpedância e indicadores bioquímicos e a avaliação do consumo alimentar foi realizada a partir da aplicação de um Questionário de Frequência Alimentar (QFA), adaptado pelos pesquisadores. Na validação das associações investigadas, foi adotado o valor de p< 0,05. A média de idade obtida foi de 54,0 ± 11,2 anos, predominando homens adultos. A doença preponderante foi a hipertensão arterial sistêmica (HAS) (51,7%), e a qualidade da diálise foi adequada (Kt/V: 1,44 ± 0,5). Quanto aos exames laboratoriais, foi observado anemia, hipoalbuminemia, ureia, creatinina e proteína c reativa (PCR) aumentadas. Quanto ao IMC, foi verificado em 41,4% dos pacientes estado de sobrepeso e obesidade e 69% apresentavam massa gorda acima do recomendado. Quanto à adesão dos pacientes à terapia nutricional, não houve diferença estatística. Entretanto, os dados antropométricos da bioimpedância e indicadores bioquímicos indicaram que esses pacientes necessitavam de uma maior atenção nutricional, pois 37,9% dos participantes faziam o consumo excessivo de fósforo e 20,7% deles consumiam sódio em números maiores do que o indicado.

PALAVRAS-CHAVE: Doença renal, Hemodiálise, Consumo alimentar, Hipoalbuminemia, Inflamação.

ABSTRACT

Hemodialysis is a kidney disease therapy associated with acute and chronic complications. A common finding among these patients is protein-caloric malnutrition, excess body fat and inadequate biochemical tests. Feeding and adherence to the diet have been identified as two of the main factors involved in maintaining the patient's health. Thus, the objective of this study was to evaluate food consumption, its relationship with the nutritional status and biochemical parameters of patients undergoing dialysis treatment. This is a descriptive, retrospective and quantitative study carried out with 58 patients on hemodialysis, treated at a dialysis center in

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Guarapuava-PR. Data regarding anthropometric assessment, bioimpedance and biochemical indicators were collected from medical records, and the assessment of food consumption was performed using a Food Frequency Questionnaire (FFQ), adapted by the researchers. In validating the investigated associations, the value of $p< 0.05$ was adopted. Predominant disease was systemic arterial hypertension (SAH) (51.7%), and the quality of dialysis was adequate (Kt/V: 1.44±0.5). As for laboratory tests, anemia, hypoalbuminemia, increased urea, creatinine, and c-reactive protein were observed. As for BMI, 41,4% of the patients were overweight and obese, and as for fat mass, 69% had it above the recommended level. As for patients' adherence to nutritional therapy and FFQ applied did not have shown statistical differences. Anthropometric data from bioimpedance and biochemical indicators indicated that these patients required greater nutritional attention, the participants consumed excessive amounts of phosphorus and consumed more sodium than indicated.

KEYWORDS: Kidney disease, Hemodialysis, Eating, Hypoalbuminemia, Inflammation.

INTRODUCTION

Kidneys play a fundamental role in maintaining the body's homeostasis. Some of its main functions would be waste elimination, control of body fluids and blood pressure, nutrient metabolism, and nutritional balance (Ana Rita Mira et al., 2017). Therefore, when this balance is disrupted, there is a progressive renal function deterioration with an accumulation of uremic solutes, water, and electrolytes, harming the body functioning and patient's Health (Araújo & Baratto, 2018)

Millions of people around the world are affected by kidney disease. In 2023, a total of 4.59 million for all sexes and ages used some kidney failure with replacement therapy (KFRT) and the mean prevalence per 100,000 inhabitants was 50.7 (Rafferty *et al.*, 2025). Among the most used KRFT were hemodialysis and peritoneal dialysis (3.57 million) and and kidney transplantation (1.2 million). In Brazil, in 2023, a total of

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157.35 thousand patients were estimated on dialysis, indicating an increase of 17,666 (12,6%) people on dialysis in the last five years (Nerbass *et al.*, 2025).

Numerous patients with kidney disease use hemodialysis, which plays fundamental role in purifying and filtering the blood, removing metabolite waste in a brief period. However, in this process some nutrients are also eliminated (Kim *et al.*, 2015). Due to chronic kidney disease patients having a large variation in weight between hemodialysis sessions, measuring exact body weight is not dependable. To prevent patients from presenting malnutrition as much as possible, even if the measured weight is consistent with levels within the normal range, new diagnostic methods to assess the lean mass loss are of utmost importance (Ribeiro *et al.*, 2011; Schlüssel; Anjos; Kac, 2008).

Studies have shown that laboratory parameters are better when there is greater adherence to dietary and fluid restrictions, in addition, they reduce complications related to hospitalizations and increase quality of life. However, there is still a lot of resistance to diet therapy treatment, mainly regarding sodium and fluid restriction (Bossola *et al.*, 2025) .

In this sense, they described that food intake is an important determinant of interdialytic weight gain (IDWG) and such a measure, with good adherence, could reflect on adequate patients' nutritional status undergoing dialysis (Pereira *et al.*, 2022). Furthermore, they found that patients with higher IDWG had higher body mass index (BMI) and lower mortality rate (Rhee *et al.*, 2023). On the other hand, some studies show that excess weight can increase the death risk related to IDWG (Kim *et al.*, 2015).

Studies have demonstrated that extremely low patients' hemodialysis adherence to diet, in compliance with the necessary restrictions. The nutritionist presence in monitoring these patients is necessary, as this is a professional capable of influencing the eating habits modification and helping to increase adherence to these changes, with different approaches to the patient, from daily individual counseling to group activities, with the practice of food and nutritional education (Danelon *et al.*, 2018).

Adherence to adequate fluid intake is normally computed using the IDWG. However, this measure still does not present consensus in the literature, considering

the European guideline, it is recommended that the difference in weight between hemodialysis (HD) sessions, in percentage of body weight (%IDWG), remains at most between 4 and 4.5%, while the Kidney Disease Outcomes Quality Initiative (KDOQI) defined 5% as a limit, in absolute values it is recommended that patients do not exceed approximately 2.5 to 3 kg (Ferraz *et al.*, 2015; Holland, 2016; Levey *et al.*, 2003; Nerbass *et al.*, 2022).

In recent years, protein-calorie malnutrition has been considered a relevant factor in chronic kidney disease (CKD) evolution in hemodialysis patients. It was estimated that approximately 33% of patients have mild to moderate malnutrition and 6% to 8% of them have severe malnutrition. Therefore, the patient's nutritional status must be monitored regularly, as it is related to quality of life (Almeida, 2011).

The causes of protein-calorie malnutrition include inadequate nutrient intake, dietary restrictions, hormonal and gastrointestinal disorders, nutrients loss during dialysis treatment, inadequate dialysis, metabolic acidosis, effect of the hemodialysis procedure and medications that interfere with gastrointestinal food absorption (Almeida, 2011; Miguel Carlos Riella, 2003).

The main mortality cause in patients with advanced stage kidney disease would be cardiovascular complications, which would occur mainly due to inflammatory processes, oxidative stress, and metabolic changes (Humayun *et al.*, 2016). Common interventions to prevent cardiovascular complications through medications (statins and antiplatelet agents) have lesser effects in patients with advanced kidney disease, generating the need to use other methods to reduce these complications (Kumar; Shariff, 2019).

It can then be said that CKD is a determinant of cardiovascular events, and, therefore, the Clinical Guidelines for patients care with CKD in the Brazilian Unified Health System include them, as part of NCDs, in the CVD group, such as renocardiovascular diseases (RCVD) (systemic arterial hypertension, Diabetes mellitus and chronic renal failure) (Castro, 2016).

Finally, multidisciplinary work is considered essential, focused on the Clinical Guidelines for CKD patients care in the Brazilian Unified Health System, which include, among other actions, “advice and support on lifestyle changes; nutritional assessment;

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guidance on physical exercise, and smoking cessation" to ensure successful treatment (Castro, 2016).

Therefore, the purpose of this study was to evaluate food consumption and the relationship with the nutritional status and biochemical parameters of patients undergoing hemodialysis at the renal clinic in Guarapuava – PR - Brazil.

METHODS

Study Design: This is a retrospective and quantitative descriptive study with data collected from patient's medical records (n = 60) renal clinic in Guarapuava-PR. Data relating to anthropometric assessment, bioimpedance and biochemical indicators were evaluated to understand the patient's nutritional profile to delimit the study population. Data was collected in February 2020.

Sample recruitment and selection: The study included in the study were individuals over 18 years old with chronic renal failure undergoing hemodialysis at the Clire - Renal Disease Clinic Ltda is located in Guarapuava, Parana state - Brazil, and serves patients covering 17 municipalities in the 5th Health Region and a population of approximately 273 thousand inhabitants . Inclusion criteria: Patients undergoing hemodialysis at the kidney disease clinic, who are hypertensive and/or diabetic and who agreed to participate, participated in the research. These participants were previously invited to participate in the research and informed about the actions proposed in the paper (Lima *et al.*, 2023), they only included participants who signed the Free and Informed Consent Form (FICF). Exclusion criteria: Patients who were debilitated, unstable on hemodialysis, or who had suffered any hospital admission in the last 3 months before the start of the research (Feb/2020) were excluded from the research; patients with severe heart disease and who used cardiac pacemakers; who could not be evaluated and/or those who were unable to answer the questions and/or also those who refused or refused to sign the (FICF).

Data collection: Data were collected from medical records regarding age, sex, treatment time, comorbidities, medication use, pre- and post-hemodialysis blood pressure. Anthropometric assessment was also collected from the medical records and included data on dry weight (kg), height (m), the body mass index (BMI)

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calculation which was carried out using current body weight (kg) divided by height (m) squared and, for individuals over 18 years old and under or equal to 59 years old, it was classified according to the 1998 World Health Organization cutoff points, for individuals aged equal to or over 60 years old it was classified according to the Pan American Health Organization in 2002, its use is important to identify loss of body mass. Bioelectrical Impedance Analysis (BIA) was performed, with low amplitude and high frequency current determining values for resistance, reactance, impedance, and Phase Angle (PA) allowing the assessment of body composition, Lean Body Mass (LBM), Fat Mass (FM), Intracellular water, Extracellular and total water. To assess food consumption, the Food Frequency Questionnaire (FFQ) was used, adapted by the researchers in order to quantify and qualify the participants' food consumption. The FFQ was applied by the Nutrition Team (previously trained) or by the academic, during the HD session, a procedure that is part of the clinic's routine. To calculate food consumption, a scoring system was developed, shown in table 1 below. After that, variables were grouped into their respective food groups (meat, milk and derivatives, eggs, leguminous plants, salt and condiments, soft drinks, beer, chocolate, and chocolate milk), the scores were added, and their food consumption was compared with the treatment time in months. The meat group consisted of 8 variables; Milk and dairy products, 3 variables; Eggs ,1 variable; leguminous plants, 4 variables; Salt and seasonings, 2 variables; Soft drink, 1 variable, Beer, 1 variable; Chocolate and chocolate milk, 2 variables.

Table 1. Scoring system to evaluate food consumption.

Frequency (Daily, weekly, monthly).	Frequency (Number of times)	Serving size	Score
Daily	Once	Small or medium	*4*
Daily	Once	Large or extra large	*5*
Daily	less than once	Small, medium, large or extra large	*5*
Weekly	Once	Small, medium, large or extra large	*1*

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Weekly	Twice	Small, medium, large or extra large	*2*
Weekly	Three times	Small, medium, large or extra large	*3*
Monthly	Twice to three time	Small, medium, large or extra large	*1*

Food consumption was calculated by adding scores for each food group, after which the mean and standard deviation were defined. A consumption classified as average was defined as one that was between the average value added to the standard deviation value or the average value subtracted from the standard deviation. Above these values were classified as high consumption, and below these values were classified as low consumption.

To evaluate the Biochemical Indicators, laboratory tests already carried out routinely by the clinic service were analyzed, where data relating to biochemical indicators were collected, namely, Blood count to analyze the prevalence of anemia; Albumin is an easy-to-measure marker and has a strong relationship with this population to indicate protein-energy malnutrition, markers of urea, potassium, phosphorus, creatinine, C-reactive protein (CRP) and ferritin.

Statistical Analysis: Data analysis was conducted using descriptive statistics, using means, standard deviation, and relative and absolute frequencies. Descriptive values were expressed as mean ± SD. All p values were two-sided, and significance levels are P values ≤ 0.05. A normality test (Kolmogorov-Smirnov) was performed to verify the distribution of numerical variables. The comparison of numerical variables was conducted using the Student's T test for independent samples or the Mann-Whitney test and for qualitative variables using the Pearson Chi-Square test. All analyzes were conducted using the IBM-SPSS® Statistics 25 software.

RESULTS

Participated in this study 58 patients, 60.3% (n= 35) male and 38.7% (n=23) female, with a mean age of 54 years (± 11.2 years), with the minimum and maximum age of 23 years and 76 years, respectively. The average treatment time was 45.9 months (± 55.8), with the minimum and maximum being 2.4 months and 248.7 months,

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respectively. Regarding comorbidities, 48.3% (n=28) had Diabetes Mellitus (DM) and 51.7% (n=30) had Systemic Arterial Hypertension (SAH). For Body Mass Index (BMI) values and classifications, they are found in Table 2.

Table 2. BMI classification of patients at Renal Clinic, Guarapuava -PR, 2024

		BMI Classification							
		Underweight		Normal weight		Overweight		Obesity	
Variables	Mean	n	%	n	%	n	%	n	%
BMI									
(kg/m²)	25,7±4,5	4	6,9	30	51,7	13	22,4	11	19,0

BMI - Body Mass Index

It is highlighted from Table 2 that adding the percentages of overweight and obese individuals, 41.4% (n=24) of the sample is above the recommended weight, thus being predisposed to chronic non-communicable diseases (NCD). Also, in this table we can highlight that more than half of the patients 51.7% (n=30) are eutrophic.

BIA and biochemical parameters analysis is shown at table 3.

Table 3. BIA and Biochemical data from patients at Renal Clinic, Guarapuava -PR, 2024

		Classification					
		Below recommended		Adequate		Above recommended	
Variables	Mean	n	%	n	%	n	%
Fat mass (Kg)	32,0±10,4	4	6,9	13	22,4	40	69
Phase angle (º)	5,15±1,35	27	46,6	30	51,7	-	-
Kt/v	1,44±0,5	21	36,2	7	12,1	30	51,7
Hemoglobin (g/dL)	9,1±1,7	47	81	8	13,8	3	5,2
Hematocrit (%)	28,7±5,5	45	77,6	-	-	13	22,4
Urea (mg/dL)	117,3±35,5	0	0	0	0	57	98,3
Serum Potassium (mEq/L)	5,3±0,6	-	-	36	62,1	22	37,9

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Serum Phosphorus (mg/dL)	5,2±1,4	5	8,6	32	55,2	21	36,2
Albumin (g/dL)	3,7±0,3	33	56,9	23	36,7	0	0
Ferritin (µg/L)	152,0±146,0	23	39,7	33	56,9	0	0
Creatinine (mg/dL)	9,1±3,1	-	-	-	-	58	100,0
CRP (mg/L)	2,0 ± 3,9	20	34,5	19	32,8	19	32,8

CRP - C-reactive protein

The main feature the individual's prevalence with fat mass above the recommended value (69%). Correlating this factor with the prevalence of patients with serum albumin levels below the recommended level (56.9%), there is a high patient's prevalence with protein-energy malnutrition.

The Kt/v value is also shown, with 36.2% of individuals presenting this parameter below the recommended level, thus demonstrating that the dialysis session is not being effective in maintaining adequate parameters.

As already expected for people with CKD, 100% of the individuals had a serum urea and creatinine value above the recommended level, thus demonstrating that they really need dialysis. It is also noted, about hemoglobin, that the average value indicates anemia (9.1±1.7g/dL) and that the prevalence of individuals with this parameter below the recommended level is also high (81%). One of the reasons for this low hemoglobin value may be the prevalence of 39.7% of individuals with ferritin values below the recommended level and in our case, only 3 patients have used erythropoietin-based medications.

To micronutrients, Table 3 indicates that 37.9% and 36.2% of individuals have a value above the recommended level of serum potassium and phosphorus, respectively, thus demonstrating that they are patients susceptible to hyperkalemia and hyperphosphatemia. Regarding C-Reactive Protein, it is also noted that adding patients with medium and high CRP classification n=38; (65.6%) it is observed that the majority of them are in a proinflammatory state.

Table 4 shows prevalence of medium and high food consumption patterns for meat groups; milk and dairy products; eggs; legumes; salt and condiments and low or no consumption for soft drinks; beer; chocolate and chocolate. It is concluded based

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on the p values of each group that none presents a value below p ≤ 0.05, that is, there is no significant difference between the groups.

DISCUSSION

The profile characterization of the studied sample indicated a predominance of male, eutrophic individuals, with the main etiology of SAH being in line with the profile of the Brazilian population published by the Brazilian Society of Nephrology (BSN) census (Biavo *et al.*, 2012). However, a study conducted by Nunes et al., 2008 reported a predominance of overweight and obese individuals.

According to Neves et al (2020), the 2020 Brazilian dialysis census had an average age of 45 years and in the present study, the average was 54 years. Other researchers also ended up finding a lower average age, between 48 and 50 years old (Cavalcanti *et al.*, 2025; Viana, 2014). Regarding the main causes of CKD, the census showed hypertension with 32%, diabetes with 31%, 9% with glomerulonephritis, 4% with polycystic kidney disease, 11% undefined and 13% with other diagnoses. For our research we cannot make a comparison as it was a convenience sample.

In relation to overweight and obesity 41% of patients were in these IBM classification group and some studies (Fleischmann *et al.*, 1999; Leavey *et al.*, 1998; Saluhudeen, 2003) advise patients undergoing hemodialysis to have excess weight and fat, because, compared to patients who have a low BMI, individuals who are overweight or obese have a greater survival advantage, but there are more recent studies (Sarkar *et al.*, 2006), suggest that this excess can be dangerous due to its association with cardiovascular diseases. Cardiovascular diseases, in turn, are the main death cause among these patients, being 2 to 4 times higher than in general population (Tarsitano *et al.*, 2005). However, there is a case in which excess weight would be advantageous to the patient undergoing dialysis, which would be if this excess weight is the result of their lean mass being increased. This would increase patient survival (Beddhu, 2006; Sarkar *et al.*, 2006).

Although studies suggest that these patients should have a greater amount of muscle mass, this condition is not common in these patients; they usually show excess

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weight due to higher percentages of body fat and greater loss of muscle mass (Calado *et al.*, 2007).

We noticed a consonance with the study by Calado et al (2007) and the present study, in which 40 patients (69%) had fat mass above the recommended level, thus increasing the rate or predisposition for cardiovascular disease and a prevalence of patients with malnutrition protein-energy, evidenced by the majority of patients with serum albumin levels below the recommended level (56.9%) and an average of 3.7g/dL. Studies show that the death risk increases markedly when serum albumin levels decline to values below 4.0g/dL, making it a strong and independent predictor to mortality (Barros *et al.*, 2014).

Serum albumin levels below the recommended, there is an increase in inflammatory markers, as increased inflammation in patients undergoing hemodialysis may be associated with obesity, but also with increased catabolism, present in patients with CKD (Barros *et al.*, 2014). In the present study, it was noted that there was a predominance of patients in an inflammatory state. This prevalence was higher than that found in the study by Faintuch et al (2006), which varied between 32 and 65%. Annerose Barros, 2014, linked low levels of serum albumin and an increase in serious inflammatory markers in patients with CKD to an increase in mortality. Danielski et al (2003) also confirmed this, suggesting a worse prognosis in CKD when patient had the same biochemical conditions.

Table 4. Sum of patient's food consumption pattern at Renal Clinic, Guarapuava - PR, 2024

Variables	No consumption				Low consumption				Mean consumption				High consumption			
	Mean	n	%	p	Mean	n	%	P	Mean	n	%	p	Mean	n	%	p
Meat (months)	-	-	-	-	42,0±25,7	6	10,3	0,839	50,5±61,2	44	75,9	0,701	18,0±11,0	8	13,8	0,847
Milk and dairy products (months)	35,1±29,7	5	8,6	0,828	32,1±28,3	7	12,1	0,903	43,7±56,2	36	62,1	0,644	63,7±72,6	10	17,2	0,747
Eggs (months)	27,3±21,7	11	19,0	0,902	32,1±22,7	16	27,6	0,925	73,3±81,7	20	35,6	0,77	29,8±23,2	11	19	0,862
leguminous plants (months)	36,5±19,1	7	12,1	0,942	64,6±85,6	5	8,6	0,72	49,9±64,9	21	36,2	0,651	39,7±47,2	25	43,1	0,730
Salt and seasonings (months)	54,9±65,1	10	17,2	0,729	73,7±85,3	4	6,9	0,788	45,7±57,0	32	55,2	0,684	26,0±18,3	12	20,7	0,941
Soft drinks (months)	40,8±41,6	29	50,0	0,685	53,5±64,8	17	29,3	0,741	44,4±47,0	4	6,9	0,779	43,8±83,2	8	13,8	0,514
Beer (months)	50,3±59,1	45	77,6	0,671	-	-	-	-	31,7±38,4	8	13,8	0,787	19,7±21,2	5	8,6	0,685
Chocolate and chocolate milk (months)	44,5±53,8	30	51,7	0,705	32,3±19,3	9	15,5	0,96	47,3±57,0	10	17,2	0,681	55,7±79,2	9	15,5	0,644

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Still on the correlation between inflammatory state and hypoalbuminemia, Kaysen et al (2001) published a study in which they measured the serum concentrations of CRP and albumin in 364 patients undergoing hemodialysis, over a period of six uninterrupted months, and concluded that, when the patient has a high protein intake, inflammatory markers were reduced, that is, the patient's prognosis improved. Therefore, patients who have CKD must undergo treatment with nutritionists to meet their needs for micronutrients that are lost in CKD (Barros *et al.*, 2014). According to Steiber (2014) a significant reduction in inflammation can be achieved with a quality diet.

Regarding the average dialysis time observed in patients in this research, these were similar to values found by Silva et al (2021), of 43.0 months and were lower than those found by Ferraz et al (2015).

Regarding Kt/v, Peixoto (2015) stated that it is the mathematical expression that evaluates dialysis effectiveness. In the present study, the average Kt/v found agrees with several Brazilian dialysis units 20 (Castro, 2016). But it is still necessary to highlight a crucial point regarding body weight and Kt/v, as Claudino, De Souza & Mezzomo (2018) found a negative correlation between Kt/v and body weight, that is, the lower patient’s body weight, the greater dialysis efficiency. Going against the obesity paradox as a protective factor for mortality in the dialysis population and going against other morbidity and mortality factors explained previously.

To hemoglobin values, it is noted that the individual’s prevalence with this parameter below the recommended level is high (around 81%), that is, indicators of anemia. However, this is common in patients with chronic renal failure, and according to Cabral, Diniz & Arruda (2005), it has been known for more than 150 years, with one of the main causes being deficient erythropoietin production (EPO) by the kidneys.

Another difficulty in maintaining high hemoglobin levels is the decrease in iron absorption, and this is since, according to Kooistra et al (1998), iron retention is significantly low in patients undergoing hemodialysis due to low uptake by the mucosa. This difficulty in retaining and absorbing iron was proven by studies by Lourenço et al (2020) and Cabral; Diniz & Arruda (2005), in which even patients having an adequate daily food intake or even above the recommended, according to this author, (8mg for men and 15mg for women), still had anemia.

Concerning biochemical potassium levels, it is noted that 37.9% of patients had elevated levels of this micronutrient. Related to the consumption pattern of foods rich in potassium, according to SBN - Sociedade Brasileira de Nefrologia (2023) (legumes, chocolate, and beer) had a high consumption of 43.1%, 15.5% and 8.6%, respectively. Potassium is the main intracellular cation that contributes to metabolism and the synthesis of proteins and glycogen, according to Shibata & Uchida (2022). It plays a significant role in neuromuscular excitability and regulating in body's water content, and which represents at the intracellular fluid content more than 90% of the body's potassium (Paula; Foss, 2003).

Hyperkalemia is a significant and frequent problem among these patients and the contribution of dietary potassium intake to serum elevation of this element is noticeably clear (Paula; Foss, 2003; Shibata; Uchida, 2022). Potassium Excess in blood can lead to anything from muscle paralysis to cardiac arrest (Mariana Marroni Burmeister, 2008).

A resource developed by National Kidney Foundation provides information on ways to reduce the potassium content in foods, such as the “rinse” method (Levey *et al.*, 2003). This method can be carried out in two ways, the first is to place the food raw, cut into the largest possible number of portions (the more fractionated, the greater the area of contact with water and the greater percentage of potassium is removed), leaving the soak for at least 2 hours. Discard this water and repeat the process. The second way recommends cooking vegetables for 10 minutes, discarding the water from the first boil. Return the vegetables to new, boiling water to finish the process, as indicated by BSN (SBN - Sociedade Brasileira de Nefrologia, 2023).

There is another mineral that is also particularly important for maintaining the health of these patients, phosphorus. It is essential in muscle function, in controlling blood pH, in chemical reactions in which energy is released, in the production of hormones and is also an integral part of the nucleic acids RNA and DNA (Valenzuela *et al.*, 2003).

At the present study, 36.2% of patients had high phosphorus levels in their blood. In relation to the dietary consumption pattern of foods rich in phosphorus, according to Huidobro; Velasco & Rojas (2001) and SBN - Sociedade Brasileira de Nefrologia (2023) (meat, milk, eggs, legumes, soft drinks and beer) there is a high

consumption, 13.8%, 17.2%, 19 %, 43.1%, 13.8%, 8.6%, respectively, highlighting legumes, which obtained the highest percentage.

Hyperphosphatemia, or elevated blood phosphorus concentrations, can lead to hypertension, anemia, increased fractures risk, cardiovascular calcification, soft tissue calcification, and osteopenia. Studies from Huidobro, Velasco & Rojas (2001) and Valenzuela et al (2003) demonstrates that few patients have a high consumption of this nutrient, and that in most cases, due to nutritional guidance received, consumption is reduced. Regarding the pattern of protein consumption (meat, legumes, eggs, milk, and derivatives), the present study had, for the most part, a medium or high consumption of these foods. Low consumption of foods that are sources of protein, such as chicken, fish, beef, and legumes, may be a future problem, as they are sources of protein, and these patients need a minimum amount of 1g/kg daily.

Some studies have showed that protein consumption was varied greatly from 0.68g/kg/day to 1.1g/kg/day, that is, many patients do not reach their daily protein target, which It can lead to a deficit in protein consumption, leading to problems such as protein-energy malnutrition (Javera; Salado, 2008; Lopes *et al.*, 2018; Pinto *et al.*, 2009). Protein energy malnutrition and clinical changes resulting from CKD can compromise the daily activities of dialysis patients, reducing their functional capacity and muscle strength (Campos, 2017).

A micronutrient that is of great concern to doctors and registered dietitians who monitor patients is sodium. Unfortunately, the present study did not measure serum sodium, it only identified the pattern of dietary consumption for this mineral. And it was found that 20.7% of patients consumed excessive sodium, in line with the study by Campos (2017), which found a sodium intake above the recommended amount, which worsens the patients' clinical cases. One of the biggest reasons for this excess sodium consumption is the worsening of systemic arterial hypertension (SAH). This disease and the expansion of extracellular volume are well-established factors in the development of left ventricular hypertrophy, with progressive concentric dilation, leading to dilated cardiomyopathy, heart failure and death (Campos, 2017).

In addition to worsening high blood pressure, another major problem that excess sodium consumption can cause is interdialytic weight gain (IDWG). To Batistão (2013), o GPID IDWG has an influence on survival and death, with a high IDWG being

considered an indicator of non-adherence to sodium restrictions. Ferraz et al (2015) cited by Holland (2016) “this population should continually be advised to consume adequate food and limit the intake of foods rich in sodium and added salt, to facilitate thirst control, favoring lower fluid intake and maintaining adequate IDWG.

The primary mechanism of fluid weight gain is excessive salt intake. “If salt consumption is controlled, water consumption and net weight consumption will also be controlled. According Cristóvão (2015) one way to reduce thirst, and consequently reduce water intake, is to avoid eating very spicy meals.

In view of the above, it is known that patients with chronic kidney disease must follow dietary guidelines to avoid excessive fat gain, excessive fluid gain between dialysis, avoiding muscle mass loss, and maintain effectiveness in good dialysis. This way, maintains a good biochemical test parameter, among other reasons necessary to increase survival. For this to happen successfully, it is important that he is monitored by a Registered Dietitian.

CONCLUSION

Based on this study, the role of correct nutrition in health and survival of dialysis patients can be confirmed, such as the excessive consumption of foods rich in phosphorus and sodium. We also note that the obesity paradox for people with chronic kidney disease undergoing dialysis treatment is false and that these patients require greater nutritional intervention, as some adherence to nutritional therapies still needs to be done to increase the patient's survival. Despite the findings, this study had some limitations, such as the limited number of participants, as this is the patient’s number that the clinic receives, and this meant that the FFQ applied did not have significant differences. This study is of foremost importance in encouraging the development of new nutritional interventions, so that patients with chronic kidney disease undergoing.

REFERENCES

ADRIANA LOPES PEIXOTO. **Solicitação e Interpretação de Exames Laboratoriais Uma visão fundamentada e atualizada sobre a solicitação, interpretação e associação de alterações**. 1a Edição. [*S. l.*]: AS Sistemas, 2015. vol. 1, .

ALMEIDA, R. de. **Vancomicina: avaliação do uso em pacientes internados na unidade de terapia intensiva**. 2011. 1–49 f. Programa de Pós-Graduação em Medicina : Ciências Médica – Universidade Federal do Rio Grande do Su, Porto Alegre - RS, 2011.

ANA RITA MIRA; CRISTINA GARAGARZA; FLORA CORREIA; ISABEL FONSECA; ROSÁRIA RODRIGUES. **Manual de Nutrição e Doença Renal**. Porto: [*s. n.*], 2017.

ARAÚJO, G. C.; BARATTO, I. Estado nutricional de pacientes com insuficiência renal em hemodiálise na cidade de Pato Branco – PR. **Revista Brasileira de Obesidade, Nutrição e Emagrecimento**, [*s. l.*], vol. 12, no. 71, p. 356–367, 2018.

BARROS, A.; SUSSELA, A. O.; FELIX, R.; SILVEIRA LUCAS, L.; D'AVILA, D. O. Pacientes em hemodiálise: estado inflamatório e massa magra corporal. **Scientia Medica**, [*s. l.*], vol. 24, no. 1, p. 6–10, 2014. Available at: http://creativecommons.org/licenses/by/4.0/.

BEDDHU, S. If fat is good, muscle is better. **American Journal of Kidney Diseases**, [*s. l.*], vol. 47, no. 1, p. 193–197, 2006.

BIAVO, B. M. M.; TZANNO-MARTINS, C.; CUNHA, L. M.; ARAUJO, M. L. de; RIBEIRO, M. M. C.; SACHS, A.; UEZIMA, C. B. B.; DRAIBE, S. A.; RODRIGUES, C. I. S.; BARROS, E. J. G. Nutritional and epidemiological aspects of patients with chronic renal failure undergoing hemodialysis from Brazil, 2010. **J Bras Nefrol**, [*s. l.*], vol. 34, no. 3, p. 206–215, 2012. .

BOSSOLA, M.; MARIANI, I.; STRIZZI, C. T.; PICCINNI, C. P.; DI STASIO, E. How to Limit Interdialytic Weight Gain in Patients on Maintenance Hemodialysis: State of the Art and Perspectives. **Journal of Clinical Medicine**, [*s. l.*], vol. 14, no. 6, 1 Mar. 2025. https://doi.org/10.3390/jcm14061846.

CABRAL, P. C.; DINIZ, A. da S.; ARRUDA, I. K. G. de. **Nutritional evaluation of patients on hemodialysis**. [*S. l.*: *s. n.*], 2005.

CALADO, I. L.; FRANÇA, A. K. T. da C.; SANTOS, A. M. dos; SALGADO FILHO, N. Avaliação Nutricional de Pacientes Renais em Programa de Hemodiálise em um Hospital Universitário de São Luís do Maranhão. **J Bras Nefrol**, [*s. l.*], vol. 29, no. 4, p. 215–221, 2007. .

CASTRO, M. C. M. Variability in quality of care among dialysis units in the state of São Paulo and the ordinance number 389/2014 of the Health Ministry of Brazil. **J Bras Nefrol**, [*s. l.*], vol. 38, no. 1, p. 62–69, 1 Mar. 2016. https://doi.org/10.5935/0101-2800.20160010.

CAVALCANTI, M. I. da C. D. F.; SILVA, P. K. de A.; DANTAS, A. L. de M.; PAIVA, M. das G. M. N. de; ARAÚJO, M. G. de A.; LIRA, A. L. B. de C. Patients receiving

hemodialysis with the nursing diagnosis of fluid volume excess: socioeconomic and clinical aspects. **Cogitare Enferm.**, [*s. l.*], vol. 20, no. 1, p. 160–168, 2025.

CLAUDINO, L. M.; DE SOUZA, T. F.; MEZZOMO, T. R. Relationship between dialytic efficiency and nutritional status of patients with chronic kidney disease on hemodialysis. **Scientia Medica**, [*s. l.*], vol. 28, no. 3, 2018. https://doi.org/10.15448/1980-6108.2018.3.31674.

CRISTÓVÃO, A. F. A. J. Fluid and dietary restriction's efficacy on chronic kidney disease patients in hemodialysis. **Rev Bras Enferm.**, [*s. l.*], vol. 68, no. 6, p. 842–50, 1 Nov. 2015. https://doi.org/10.1590/0034-7167.2015680622i.

DANELON, B.; MOREIRA, M. A.; ALVARENGA, L.; NASCIMENTO, R.; MENDES, L. L.; AGUIAR, A. Short-term and long-term effects of Food and Nutrition Education actions on the nutritional profile of hemodialysis patients. **Nutr. clín. diet. hosp.**, [*s. l.*], vol. 38, no. 4, p. 131–136, 2018. https://doi.org/10.12873/384danelon.

DANIELSKI, M.; IKIZLER, T. A.; MCMONAGLE, E.; KANE, J. C.; PUPIM, L.; MORROW, J.; HIMMELFARB, J. Linkage of hypoalbuminemia, inflammation, and oxidative stress in patients receiving maintenance hemodialysis therapy. **American Journal of Kidney Diseases**, [*s. l.*], vol. 42, no. 2, p. 286–294, 1 Aug. 2003. https://doi.org/10.1016/S0272-6386(03)00653-X.

FAINTUCH, J.; MORAIS, A.; SILVA, M.; VIDIGAL, E.; COSTA, R.; LYRIO, D.; TRINDADE, C.; PITANGA, K. Nutritional profile and inflammatory status of hemodialysis patients. **Renal Failure**, [*s. l.*], vol. 28, no. 4, p. 295–301, 1 Jul. 2006. https://doi.org/10.1080/08860220600577742.

FERRAZ, S. F.; FREITAS, A. T. V. de S.; VAZ, I. M. F.; CAMPOS, M. I. V. A. M.; PEIXOTO, M. do R. G.; PEREIRA, E. R. S. Nutritional status and interdialytic weight gain of chronic hemodialysis patients. **J Bras Nefrol**, [*s. l.*], vol. 37, no. 3, p. 306–314, 1 Jul. 2015. https://doi.org/10.5935/0101-2800.20150050.

FLEISCHMANN, E.; TEAL, N.; DUDLEY, J.; MAY, W.; BOWER, J. D.; SALAHUDEEN, A. K. Influence of excess weight on mortality and hospital stay in 1346 hemodialysis patients. **Kidney International**, [*s. l.*], vol. 55, p. 1560–1567, 1999.

HOLLAND, H. **Estado nutricional e composição corporal de pacientes em hemodiálise, segundo ganho de peso interdialítico**. 2016. 1–84 f. Programa de Clínica Médica – Universidade de São Paulo, Ribeirão Preto - SP, 2016.

HUIDOBRO, A.; VELASCO, N.; ROJAS, T. Prevalencia de desnutrición calórico proteica en pacientes hemodializados crónicos. **Rev. Méd. Chile**, [*s. l.*], vol. 129, no. 5, p. 1–6, 2001. .

HUMAYUN, Y.; BALL, K. C.; LEWIN, J. R.; LERANT, A. A.; FÜLÖP, T. Acute oxalate nephropathy associated with orlistat. **Journal of Nephropathology**, [*s. l.*], vol. 5, no. 2, p. 79–83, 1 Apr. 2016. https://doi.org/10.15171/jnp.2016.14.

JAVERA, V. B. M.; SALADO, G. A. Orientações Nutricionais para Pacientes em Programa de Hemodiálise. **Revista Saúde e Pesquisa**, [*s. l.*], vol. 1, no. 3, p. 319–324, 2008. .

KAYSEN, G. A.; CHERTOW, G. M.; ADHIKARLA, R.; YOUNG, B.; RONCO, C.; LEVIN, N. W. Inflammation and dietary protein intake exert competing effects on serum albumin and creatinine in hemodialysis patients. **Kidney International**, [*s. l.*], vol. 60, no. 1, p. 333–340, 2001. https://doi.org/10.1046/j.1523-1755.2001.00804.x.

KIM, J. K.; KIM, Y. S.; SONG, Y. R.; KIM, H. J.; KIM, S. G.; MOON, S. J. Excessive weight gain during the first year of peritoneal dialysis is associated with inflammation, diabetes mellitus, and a rapid decrease in residual renal function. **PLoS ONE**, [*s. l.*], vol. 10, no. 9, 25 Sep. 2015. https://doi.org/10.1371/journal.pone.0139033.

KOOISTRA, M. P.; NIEMANTSVERDRIER, E. C.; ES, A. van; MOL-BEERMANN, N. M.; STRUYVENBERG, A.; MARX, J. J. M. Nephrology Dialysis Transplantation Iron absorption in erythropoietin-treated haemodialysis patients: effects of iron availability, inflammation and aluminium. **Nephrol Dial Transplant**, [*s. l.*], vol. 13, p. 82–88, 1998. Available at: https://academic.oup.com/ndt/article-abstract/13/1/82/1833702.

KUMAR, A.; SHARIFF, M. Omega-3 polyunsaturated fatty acid supplementation in chronic kidney disease and its effects on cardiovascular mortality and kidney disease progression. **Clinical Nutrition**, [*s. l.*], vol. 38, no. 5, p. 2460–2461, 1 Oct. 2019. https://doi.org/10.1016/j.clnu.2019.07.009.

LEAVEY, S. F.; STRAWDERMAN, R. L.; JONES, C. A.; PORT, F. K.; HELD, P. J. Simple Nutritional Indicators as Independent Predictors of Mortality in Hemodialysis Patients. **American Journal of Kidney Diseases**, [*s. l.*], vol. 31, no. 6, p. 997–1006, 1998.

LEVEY, A. S.; CORESH, J.; BALK, E.; KAUSZ, A. T.; LEVIN, A.; STEFFES, M. W.; HOGG, R. J.; PERRONE, R. D.; LAU, J.; EKNOYAN, G. **National Kidney Foundation Practice Guidelines for Chronic Kidney Disease: Evaluation, Classification, and Stratification**. [*S. l.*: *s. n.*], 2003. Available at: www.annals.org.

LIMA, K. de; MAZUR, C. E.; VICENTE CAVAGNARI, M. A.; CASTILHO, A. J.; SCHIESSEL, D. L. Omega-3 supplementation effects on cardiovascular risk and inflammatory profile in chronic kidney disease patients in hemodialysis treatment: An intervention study. **Clinical Nutrition ESPEN**, [*s. l.*], vol. 58, p. 144–151, 1 Dec. 2023. https://doi.org/10.1016/j.clnesp.2023.09.914.

LOPES, L. C. C.; GIGLIO, B. M.; NEVES, J. B.; MOTA, J. F. **Efeito protetor do maior consumo de proteína sobre a composição corporal, capacidade funcional e nível de atividade física de pacientes em hemodiálise**. Mineiros - GO: [*s. n.*], 21 May 2018.

LOURENÇO, L. S.; FARIAS, B. B. De; OLIVEIRA, L. D. L.; LENQUISTE, S. A.; GOMES, R. L. Associação entre ingestão alimentar e risco de sarcopenia em pacientes idosos em hemodiálise. **COLLOQUIUM VITAE**, [*s. l.*], vol. 12, no. 3, p. 16–25, 15 Sep. 2020. https://doi.org/10.5747/cv.2020.v12.n3.v306.

MARIA ISABELA XAVIE CAMPOS. **Influência dos fatores clínicos, bioquímicos e do consumo alimentar sobre o ganho de peso interdialítico de pacientes submetidos à hemodiálise no município da Vitória de Santo Antão - PE**. 2017. 1–57 f. Trabalho de Conclusão de Curso – Universidade Federal de Pernambuco, Vitória de Santo Antão-PE, 2017.

MARIANA MARRONI BURMEISTER. **Ingestão e níveis séricos de potássio, fósforo e cálcio de pacientes em tratamento hemodialítico**. 2008. 1–109 f. Pós-Graduação em Medicina e Ciências da Saúde Área de Concentração em Nefrologia – Pontifícia Universidade Católica do Rio Grande do Sul., Porto Alegre, 2008.

MIGUEL CARLOS RIELLA. **Princípios de nefrologia e distúrbios hidroeletrolíticos**. 4 Ed. Rio de Janeiro: Guanabara Koogan, 2003. vol. 1.

NERBASS, F. B.; LIMA, H. do N.; STROGOFF-DE-MATOS, J. P.; ZAWADZKI, B.; MOURA-NETO, J. A.; LUGON, J. R.; SESSO, R. Censo Brasileiro de Diálise 2023. **Braz. J. Nephrol.**, [*s. l.*], vol. 47, no. 1, p. 2–10, 2025. https://doi.org/10.1590/2175-8239.

NERBASS, F. B.; LIMA, H. do N.; THOMÉ, F. S.; VIEIRA NETO, O. M.; LUGON, J. R.; SESSO, R. Censo Brasileiro de Diálise 2020. **Braz. J. Nefphrol.**, [*s. l.*], vol. 44, no. 3, p. 349–357, 2022. DOI 10.1590/2175-8239. Available at: https://doi.org/10.1590/2175-8239-.

NEVES, P. D. M. de M.; SESSO, R. de C. C.; THOMÉ, F. S.; LUGON, J. R.; NASICMENTO, M. M. Brazilian dialysis census: Analysis of data from the 2009-2018 decade. **Braz. J. Nephrol.**, [*s. l.*], vol. 42, no. 2, p. 191–200, 1 Jun. 2020. https://doi.org/10.1590/2175-8239-JBN-2019-0234.

NUNES, F. T.; CAMPOS, G.; PAULA, S. M. X.; MERHI, V. A. L.; PORTERO-MCLELLAN, K. C.; MOTTA, D. G.; OLIVEIRA, M. R. M. Dialysis adequacy and nutritional status of hemodialysis patients. **Hemodialysis International**, [*s. l.*], vol. 12, p. 45–51, 2008.

PAULA, F. J. A.; FOSS, M. C. Tratamento da hipercalcemia e hipocalcemia. **Medicina, Ribeirão Preto**, Ribeirão Preto-SP, Brasil, vol. 36, p. 370–374, 2003.

PEREIRA, J.; GAMBARINI, M. Z. dos S.; BARRETO, M. A.; PAIXÃO, M. P. C. P.; SANTOS NETO, E. T. dos; CATTAFESTA, M.; SALAROLI, L. B. Relação entre o ganho de peso interdialítico e estado nutricional de pacientes renais crônicos em hemodiálise. **Research, Society and Development**, [*s. l.*], vol. 11, no. 7, p. 1–14, 30 May 2022. https://doi.org/10.33448/rsd-v11i7.30036.

PINTO, D. E.; ULLMANN, L. S.; BURMEISTER, M. M.; ANTONELLO, I. C. F.; PIZZATO, A. Associações entre ingestão energética, proteica e de fósforo em pacientes portadores de doença renal crônica em tratamento hemodialítico. **J Bras Nefrol**, [*s. l.*], vol. 31, no. 4, p. 269–276, 2009. .

RAFFERTY, Q.; STAFFORD, L. K.; VOS, T.; THOMÉ, F. S.; AALRUZ, H.; ABATE, Y. H.; ABBAFATI, C.; (…); HAY, S. I.; MURRAY, C. J. L.; ONG, K. L. Global, regional, and national prevalence of kidney failure with replacement therapy and associated aetiologies, 1990–2023: a systematic analysis for the Global Burden of Disease Study 2023. **The Lancet Global Health**, [*s. l.*], vol. 13, no. 8, p. e1378–e1395, Aug. 2025. DOI 10.1016/S2214-109X(25)00198-6. Available at: https://linkinghub.elsevier.com/retrieve/pii/S2214109X25001986.

RHEE, C. M.; WANG, A. Y. M.; BIRUETE, A.; KISTLER, B.; KOVESDY, C. P.; ZARANTONELLO, D.; KO, G. J.; PICCOLI, G. B.; GARIBOTTO, G.; BRUNORI, G.; SUMIDA, K.; LAMBERT, K.; MOORE, L. W.; HAN, S. H.; NARASAKI, Y.; KALANTAR-ZADEH, K. Nutritional and Dietary Management of Chronic Kidney Disease Under Conservative and Preservative Kidney Care Without Dialysis. **Journal of Renal Nutrition**, [*s. l.*], vol. 33, no. 6, p. S56–S66, 1 Nov. 2023. https://doi.org/10.1053/j.jrn.2023.06.010.

RIBEIRO, S. M. L.; MIYAMOTO, M. V.; DE MELO, C. M.; KEHAYIAS, J. Análise vetorial de bioimpedância e estado nutricional de idosas de acordo com o índice de massa corporal. **Rev Bras Cineantropom Desempenho Hum**, [*s. l.*], vol. 13, no. 6, p. 415–421, 2011. https://doi.org/10.5007/1980-0037.2011v13n6p415.

SALUHUDEEN, A. K. Is it really good to be fat on dialysis? **Nephro Dial Transplant**, [*s. l.*], vol. 18, no. 7, p. 1248–1252, 1 Jul. 2003. https://doi.org/10.1093/ndt/gfg101.

SAMANTHA MARQUETI BATISTÃO. **Influência do ganho de peso interdialítico na sobrevida e risco de óbito em pacientes tratados por hemodiálise crônica**. 2013. 1–61 f. Tese Doutorado – Universidade Estadual Paulista, Faculdade de Medicina de Botucatu, Botucatu, 2013.

SARKAR, S. R.; KUHLMANN, M. K.; KOTANKO, P.; ZHU, F.; HEYMSFIELD, S. B.; WANG, J.; MEISELS, I. S.; GOTCH, F. A.; KAYSEN, G. A.; LEVIN, N. W. Metabolic consequences of body size and body composition in hemodialysis patients. **Kidney International**, [*s. l.*], vol. 70, no. 10, p. 1832–1839, 27 Nov. 2006. https://doi.org/10.1038/sj.ki.5001895.

SBN - SOCIEDADE BRASILEIRA DE NEFROLOGIA. Orientações Nutricionais. 4 Sep. 2023. **https://sbn.org.br/publico/tratamentos/orientacoes-nutricionais/**.

SCHLÜSSEL, M. M.; ANJOS, L. A. dos; KAC, G. A dinamometria manual e seu uso na avaliação nutricional. **Rev. Nutr**, [*s. l.*], vol. 21, no. 2, p. 223–235, 2008.

SHIBATA, S.; UCHIDA, S. Hyperkalemia in patients undergoing hemodialysis: Its pathophysiology and management. **Therapeutic Apheresis and Dialysis**, [*s. l.*], vol. 26, no. 1, p. 3–14, 1 Feb. 2022. https://doi.org/10.1111/1744-9987.13721.

SILVA, M. R. B. da; BARBOSA, V. de A.; SOUSA, B. S. de; SILVA, A. M. D. da. Avaliação do estado nutricional e consumo alimentar de pacientes renais crônicos em hemodiálise / Nutritional status avaliation and fook intake of renal chronic patients in hemodialysis. **Brazilian Journal of Development**, [*s. l.*], vol. 7, no. 4, p. 40853–40868, 20 Apr. 2021. https://doi.org/10.34117/bjdv7n4-512.

STEIBER, A. L. Chronic kidney disease: Considerations for nutrition interventions. **JPEN**, [*s. l.*], vol. 38, no. 4, p. 418–426, 2014. https://doi.org/10.1177/0148607114527315.

TARSITANO, F.; LEMOS, C. C. da S.; NÓBREGA, A. M.; SILVA, M. I. B.; CRASTO, M. do C.; NUCERA, A. P.; SOUZA, E. R. M.; BREGMAN, R. Comparação de Doença Renal Crônica em Pacientes Com e Sem Transplante Renal. **J Bras Nefrol**, [*s. l.*], vol. 27, no. 4, p. 174–178, 2005.

VALENZUELA, R. G. V.; GIFFONI, Â. G.; CUPPARI, L.; CANZIANI, M. E. F. Estado Nutricional de Pacientes com Insuficiência Renal Crônica em Hemodiálise no Amazonas. **Rev Assoc Med Bras**, [*s. l.*], vol. 49, no. 1, p. 72–80, 2003.

VIANA, L. B. dos R. **Perfil nutricional de nefropatas em hemodiálise em um hospital universitário de São luís- MA**. 2014. Monografia de TCC – Universidade Federal do Maranhão, São Luís, 2014.

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