JHGD
Journal of Human Growth and Development

www. jhgd.com.br

ORIGINAL ARTICLE

Consumption of minimally processed and ultra-processed foods by individuals on hemodialysis in southeastern Brazil

Nina Mara Paterlini Marques[a], Monica Cattafesta[b], Fabíola Lacerda Pires Soares[a], Glenda Blaser Petarli[b], Mirian Patrícia Castro Pereira Paixão[c], Cleodice Alves Martins[a], Edson Theodoro dos Santos Neto[b], Luciane Bresciani Salaroli[a, b]

Open acess

[a]Graduate Program in Nutrition and Health, Health Sciences Center, Universidade Federal do Espírito Santo, Brazil;

[b]Graduate Program in Collective Health, Health Sciences Center, Universidade Federal do Espírito Santo, Vitória, Espírito Santo, Brazil;

[c]Centro Universitário Salesiano, Vitória, Espírito Santo, Brazil

Corresponding author
lucianebresciani@gmail.com

Manuscript received: may 2021
Manuscript accepted: december 2021
Version of record online: october 2022

Abstract

Introduction: the individuals with chronic kidney disease show low adherence to a diet rich in vegetables.

Objective: to evaluate the association of minimally processed and ultra-processed food consumption with socioeconomic factors, lifestyle habits, and clinical characteristics of hemodialysis service users in southeastern Brazilian.

Methods: cross-sectional study with 1,024 individuals on hemodialysis from southeastern Brazil. The individuals answered a questionnaire of sociodemographic data, lifestyle habits, and food consumption. After stipulating the frequency of consumption, we classified the foods as minimally processed and ultra-processed. We investigated the association between independent variables and the consumption of minimally processed and ultra-processed foods through the binary logistic regression model with Odds Ratio (OR) and their confidence intervals (95%CI).

Results: users with less than eight years of education (OR=1.706; 95%CI1.125–2.589) and with income less than two minimum wages (OR=1.349; 95%CI1.007–1.806) had lower consumption of minimally processed foods. However, individuals aged 19 to 29 years (OR=2,857, 95%CI1.464–5.576), smokers (OR=2.349; 95%CI1.237–4.462), drinkers (OR=1.835; 95%CI1.122–3.001), and with more than 6 years on hemodialysis (OR=1.975; 95%CI1.227–3.180) were more likely to have higher consumption of ultra-processed foods. Individuals that did not practice physical activity were less likely to this consumption (OR=0.638; 95%CI0.459–0.888).

Conclusion: being younger, smoking, consuming alcohol, and having been on hemodialysis for more than 6 years increased the chances of greater consumption of ultra-processed foods. In addition, we associated less education and lower income with a lower consumption of minimally processed foods.

Keywords: chronic kidney disease, hemodialysis, food consumption, minimally processed foods, ultra-processed foods.

Suggested citation: Marques NMP, Cattafesta M, Soares FLP, Petarli GB, Paixão MPCP, Martins CA, Neto EDS, Salaroli LB. Consumption of minimally processed and ultra-processed foods by individuals on hemodialysis in southeastern Brazilw. *J Hum Growth Dev. 2022; 32(3):237-251.* DOI: http://doi.org/10.36311/jhgd.v32.13856

Authors summary

Why was this study done?
The study was carried out with the objective of promoting further clarification on the diet of individuals with chronic kidney disease on hemodialysis, since this subject is scarce in the literature.

What did the researchers do and find?
In our study we evaluated the association of minimally processed and ultra-processed food consumption with socioeconomic factors, lifestyle habits and clinical characteristics of users of hemodialysis services in southeastern Brazil. The individuals answered a questionnaire about sociodemographic data, life habits and food consumption. And we identified that being younger, smoking, consuming alcohol and being on hemodialysis for more than 6 years increased the chances of greater consumption of ultra-processed foods. In addition, we associated lower education and lower income with lower consumption of minimally processed foods.

What do these findings mean?
The data presented here reflects the dietary intake scenario of hemodialysis patients because the study was developed with almost the entire referred population. Assessing this population's food consumption makes it possible to identify vulnerability to food excesses and deficiencies and, thus, to adjust and propose intervention measures to guarantee the health of individuals on hemodialysis. However, future studies on the impact of dietary intake and associated factors in hemodialysis patients should be encouraged to determine optimal nutritional strategies.

INTRODUCTION

Chronic kidney disease (CKD) stands out among chronic noncommunicable diseases due to the significant increase in its incidence and prevalence rates (1), affecting more than 10% of the world's population (2). Of 139,691 individuals with CKD undergoing renal replacement therapy in Brazil in 2019, 93.2% were on hemodialysis (3).

Although hemodialysis increases survival rates, mortality among these individuals is still high (4). It is worth mentioning that most individuals with CKD undergoing hemodialysis have inadequate nutrient intake, which compromises their nutritional status (5). In this context, the changes in the Brazilian dietary pattern that are closely related to the nutritional transition are important to highlight (6). These changes have led to a reduction in the regular consumption of foods rich in fiber, vitamins, and minerals, in contrast to the increased consumption of processed and ultra-processed foods (7).

The population with kidney disease shows low adherence to a diet rich in vegetables (8-10), with about 20% of Brazilians with CKD reporting consuming unhealthy foods on a regular basis (red meat, sugary drinks, alcoholic and sweet drinks, salty meats) (11). Diet is, therefore, the main determinant of most chronic noncommunicable diseases (12), and dietary choices are influenced by sociodemographic and lifestyle determinants (13-15).

Machado et al. (16) observed that, alongside comorbidities, such as arterial hypertension and diabetes mellitus, sociodemographic characteristics, such as gender and education, influence dietary patterns (16). Likewise, sociodemographic and geographic conditions influence the diets of individuals with CKD (17).

Regarding the global scenario of changes in dietary patterns and in how food and beverages are processed, we proposed a new system for food classification. In this new classification, known as NOVA, we grouped food items according to the extension and purpose of processing and distributed them into four categories: unprocessed or minimally processed foods, processed culinary ingredients, processed foods, and ultra-processed foods (18-20).

Processed foods are becoming progressively accessible to all age groups, being sold pre-made or ready-to-eat (18). Increase in consumption of processed foods and beverages has been considered one of the factors contributing to the prevalence of chronic noncommunicable diseases (21). A growing number of epidemiological studies supports the idea that ultra-processed foods are harmful to human health, (22,23) although this issue has been rarely addressed in individuals with kidney disease.

Two recent studies have addressed dietary intake in this population. In 2019, the authors of a Brazilian study observed two distinct dietary patterns associated with CKD treatment. The non-dialysis-dependent groups adhered to the unhealthy pattern, while individuals with renal transplantation adhered to a better quality diet (11). Another study found a worse dietary pattern in the group of older adults in hemodialysis when compared with the group without CKD (24).

Considering that several factors influence one's diet, the scarcity of food consumption data in individuals with CKD on hemodialysis, (25,26) the lack of studies that assess food consumption in a kidney disease context considering the NOVA approach, and the importance of this matter for public health justify this study. It might generate data and a scientific basis for future interventions, thus favoring a more adequate consumption of minimally processed foods, contributing to the health status of these individuals.

This study evaluated the association between the consumption of minimally processed and ultra-processed foods and socioeconomic factors, lifestyle, and clinical characteristics of hemodialysis individuals in southeastern Brazil.

METHODS

Study Design

This is a cross-sectional observational and analytical study.

Study Location and Period

We conducted this study from January 2019 to September 2019 with individuals from all 11 hemodialysis centers in a metropolitan area of southeastern Brazil.

Study Population and Eligibility Criteria

Individuals of both genders, over 18 years old, and with a diagnosis of CKD in their medical record were included in the study. Those under contact precautions who did not live in the region and had acute or chronic conditions that limited their ability to understand and answer questions were excluded.

Data Collection and analysis

Each patient was approached during their stay in their hemodialysis units, so the staff at the clinics scheduled the days and times for the study.

Data collection took place as follows: during the hemodialysis session, the patient answered a semi-structured questionnaire on sociodemographic characteristics, lifestyle, and diet. Physical activity was evaluated by asking questions about the performance of the informed activity, in addition to its frequency and duration. The variable was classified as "yes" in every individual who accumulated at least 30 minutes of physical activity per day, at least 5 days a week, of moderate intensity, performed continuously or accumulated, and "no" in those who did not fit these characteristics (27). Data collection was carried out by four nutritionists, two professors (also nutritionists), and students of the nutrition program, who were duly trained for this purpose.

To analyze the diet of the participants, we applied a questionnaire in which the list of foods included was based on the Surveillance of Risk and Protective Factors for Chronic Diseases by Telephone (VIGITEL) (28) survey, of the Brazilian Ministry of Health, which annually evaluates the eating habits in the country's state capitals. This instrument is standardized in Brazilian nutritional surveys and does not assess the population's dietary pattern, but rather the consumption of these foods. The indicators of food and beverage consumption used by the VIGITEL system are reproducible and accurate (29). The questionnaire examined 14 food items by frequency of consumption of isolated foods and/or food groups or categories. The following foods were classified as minimally processed: beans, raw and cooked vegetables, red meat, white meat, fruit, natural juice, and milk; and the following foods were classified as ultra-processed foods: artificial juice, soft drinks, sausages, cookies, fried snacks, and sweets. That way it was possible to measure the consumption of minimally processed versus ultra-processed foods.

Six frequency categories were stipulated for each food: never, hardly ever, once or twice a week, three to four times a week, five to six times a week, or every day (including Saturdays and Sundays). The frequency of food consumption was determined using the method proposed by Cade *et al.* (30), so all food items had the same unit. The reported consumption frequency was converted into daily frequency to better fit the study. Daily frequency values were multiplied by the serving size of each item consumed, revealing the number of servings consumed daily.

After calculating the weight of the frequency of consumption of each food item, they were grouped according to the criteria proposed by Monteiro *et al.* (18) in the NOVA classification.

To evaluate the reliability of the questions and the reproducibility of the food consumption questionnaire (VIGITEL) in this population, a pilot test was conducted in October 2018 with individuals of a different hemodialysis service. Data collection happened twice, with a 15-day difference between the first and second tests. The first time, it was performed with 57 individuals, with an average age of 56.22 ± 22.16 years, and later, it was repeated with the same 57 individuals, in order to verify inconsistencies regarding the answers and the reproducibility of the instrument.

Data analysis

The pilot study analysis was performed by the overall kappa coefficient, adjusted kappa, McNemar's test, frequencies, and their respective 95% confidence intervals and 95% significance level. WinPepi and IBM SPSS version 22.0 (IBM Corp, Armonk, NY, USA) were used. The adjusted kappa results ranged from 0.76 to 0.98, showing agreement and, therefore, reliability of the instrument. McNemar's test did not result in significant disagreement, and all questions obtained k>0.6, characterizing a good reproducibility.

Absolute values and percentages were used for the statistical analysis of variables, and the Chi-square (X^2) test was used for the analysis of differences between proportions. The significance level was set at 5%.

The distribution of consumption of minimally processed and ultra-processed foods was evaluated in quartiles (from the first to the fourth quartile) to identify differences between two groups. The first (Q1) and second quartiles (Q2) corresponded to the lowest consumption, while the third (Q3) and fourth quartiles (Q4) corresponded to the highest consumption of a particular food group.

The association between independent variables and the consumption of minimally processed and ultra-processed foods was investigated through the binary logistic regression model. Variables that showed statistical significance up to 10% in the X^2 test were analyzed by regression, with the two lowest quartiles (Q1 and Q2) versus the two highest quartiles (Q3 and Q4).

Ethical and Legal Aspects of the Research

This study and the pilot study were approved by the Research Ethics Committee, under number 3,002,709 and CAAE 68528817.4.0000.5060. The participation of individuals was voluntary and written consent was given by signing the informed consent form, in accordance with the principles of the Declaration of Helsinki.

RESULTS

The total number of individuals on hemodialysis in this metropolitan area at the time of data collection was 1,351; however, 304 individuals were excluded for not meeting the inclusion criteria. Only 23 (2.2%) individuals refused to participate in the study. Thus, the study population consisted of 1,024 hemodialysis individuals (Supplementary Figure 1).

Of the 1,024 individuals, most were men (56.7%, n=581), mixed-raced (49.1%, n=496), between 30 and 59 years old (51.5%, n=528), living with a partner (55.7%, n=570), had less than 8 years of education (51.6%, n=523),

and earned less than two minimum wages (56.2%, n=555). Of the total, most were retired or on sick leave (54.2%, n=547), lived with three people or less (71%, n=727), and lived in the same city where they underwent treatment (62.8%, n=642). We also observed that 793 individuals did not perform physical activity (77.5%), 593 individuals never smoked (58.3%), 929 individuals did not drink alcohol (90.7%), 525 individuals had CKD for less than 5 years (51.5%), and 697 individuals had three or more self-reported diseases (68.1%).

We analyzed sociodemographic variables, lifestyle, and medical history according to the quartiles of minimally processed food consumption (Table 1). An association between age and minimally processed food consumption was identified (p=0.026) with a lower frequency of hemodialysis individuals aged between 30 and 59 years in the highest quartile of minimally processed food consumption when compared with those of other age groups.

We associated education with the consumption of minimally processed foods (p=0.010), which was lower in hemodialysis individuals who had 8 years of education or less. Regarding socioeconomic status, we observed that individuals who reported an income less than or equal to two minimum wages (p<0.001) consumed less minimally processed foods.

Table 1: Sociodemographic variables, lifestyle habits and medical history according to consumption of minimally processed foods by users of HD services in a metropolitan region in Southeastern Brazil, 2019.

Variables	Q1		Q2		Q3		Q4		p-value
	n	%	n	%	n	%	n	%	
Gender									
Female	113	25.5	122	27.5	105	23.7	103	23.3	0.789
Male	146	25.1	160	27.5	126	21.7	149	25.6	
Age Group									
19 to 29 years old	15	25.4	11	18.6	10	16.9	23	39.0	0.026
30 to 59 years old	141	26.7	147	27.8	130	24.6	110	20.8	
60 years or older	103	23.6	124	28.4	91	20.8	119	27.2	
Marital Status									
With partner	135	23.7	164	28.8	132	23.2	139	24.4	0.521
Without partner	124	27.3	118	26	99	21.8	113	24.9	
Education[1]									
≤ 8 years of schooling	151	28.9	153	29.3	103	19.7	116	22.2	0.010
> 8 to ≤ 11 years	74	22.3	90	27.1	77	23.2	91	27.4	
> 11 years	31	19.6	37	23.4	49	31	41	25.9	
Race/color[2]									
White	53	19.3	76	27.7	76	27.7	69	25.2	0.101
Black	69	28.6	61	25.3	52	21.6	59	24.5	
Brown[*]	134	27.0	142	28.6	101	20.4	119	24.0	
Income[3, **]									
≤ 2 minimum wages	170	30.6	154	27.7	114	20.5	117	21.1	<0.001
> 2 minimum wages	85	19.6	114	26.3	110	25.4	124	28.6	
Profession[4]									
With work activity	93	26.7	87	25.0	83	23.9	85	24.4	0.535
Retired or on sick leave	134	24.5	151	27.6	124	22.7	138	25.2	
No paid work	30	26.3	39	34.2	20	17.5	25	21.9	
Number of people living in the household[5]									0.258
≤ 3 people	196	27.0	200	27.5	159	21.9	172	23.7	
≥ 4 people	63	21.4	81	27.5	72	24.4	79	26.8	

Continuation - Table 1: Sociodemographic variables, lifestyle habits and medical history according to consumption of minimally processed foods by users of HD services in a metropolitan region in Southeastern Brazil, 2019.

Variables	Q1		Q2		Q3		Q4		p-value
	n	%	n	%	n	%	n	%	
City of residence and HD treatment									
Living in the same city	164	25.5	167	26.0	146	22.7	165	25.7	0.501
Does not live in the same city	95	24.9	115	30.1	85	22.3	87	22.8	
Physical activity[6]									
Yes	49	21.3	65	28.3	49	21.3	67	29.1	0.212
No	209	26.4	217	27.4	182	23	185	23.3	
Smoking[7]									
Never smoked	149	25.1	162	27.3	133	22.4	149	25.1	0.866
Previous smoker	93	25.0	102	27.4	87	23.4	90	24.2	
Current smoker	16	30.2	17	32.1	8	15.1	12	22.6	
Drinking									
No habit of consuming alcoholic beverages	233	25.1	252	27.1	218	23.5	226	24.3	0.189
With the habit of consuming alcoholic beverages	26	27.4	30	31.6	13	13.7	26	27.4	
Self-reported diseases									
None or one	43	61.6	47	43.8	33	42.6	47	52.0	0.648
Two	37	23.6	37	23.6	45	28.7	38	24.2	
Three or more	179	25.7	198	28.4	153	22	167	24.0	
Time of CKD[8]									
< 5 years	122	23.2	141	26.9	118	22.5	144	27.4	0.172
≥ 5 years	135	27.3	138	27.9	113	22.9	108	21.9	
Time to HD[9]									
0 to 2 years	84	22.8	99	26.9	85	23.1	100	27.2	
3 to 5 years	69	27.4	72	28.6	51	20.2	60	23.8	0.921
6 to 10 years	51	25.8	51	25.8	46	23.2	50	25.3	
Over 10 years	39	26.2	43	28.9	34	22.8	33	22.1	

Q1: quartile 1. Q2: quartile 2. Q3: quartile 3. Q4: quartile 4. HD: Hemodialysis. CKD: Chronic kidney disease. N=1024. n¹ = 1013. n2= 1023; n3= 988. n4= 1009. n5= 1022. n6= 1023. n7= 1018; n8= 1019; n9= 967. Chi-square test. Statistically significant values (p<0.05). Description of results considering 100% for each line, in order to evaluate the consumption in quartiles in each category of variables.

* Brown is one of the five ethnic color groups that make up the Brazilian population, according to the classification of the Brazilian Institute of Geography and Statistics (IBGE). According to this classification, would be the person who is considered mixed-race, as he or she presents a marked mixture between one or more ethnicities, having, as a consequence, a brownish skin tone.

** The minimum wage is the lowest wage a company can pay an employee according to the number of hours worked. It is established by law and is re-evaluated every year based on the cost of living of the population, its creation was based on the minimum amount a person spends to ensure their survival. In the year 2021 a minimum wage was R$ 1100 and two minimum wages were R$ 2200. About 46 million Brazilians have their income based on the minimum wage. Taking into consideration that at the end of 2021 a dollar cost approximately US$ 5.50, a minimum wage in Brazil generated around US$ 200.

Gender-wise, the analysis (Table 2) revealed that men consumed ultra-processed foods more often than women. The quartile with the highest consumption of ultra-processed foods was also significantly higher (p<0.001) between the ages of 19 and 29 years. In addition, we associated marital status and consumption of ultra-processed foods (p=0.032), which was lower in individuals who lived with a partner.

Individuals with unpaid employment (p<0.001) consumed less ultra-processed foods. We also identified a lower quartile of consumption among individuals who did not perform physical activity (p<0.001). When evaluating the variables smoking (p=0.008) and alcohol intake (p<0.001), we observed an association with the highest consumption of ultra-processed foods of individuals who reported the habit of consuming alcohol and current smokers.

We also associated none or only self-reported diseases with the higher consumption of ultra-processed foods (p=0.006), as well as time with CKD (p=0.011) and time on hemodialysis (p<0.001) the quartiles of consumption of ultra-processed foods of which individuals with CKD for less than 5 years had a lower prevalence of consumption of ultra-processed foods. On the other hand, those on hemodialysis for longer periods (over 10 years) were more frequently in the quartiles with the highest consumption of ultra-processed foods.

Table 2: Sociodemographic variables, lifestyle habits and medical history according to consumption of ultra-processed foods by users of HD services in a metropolitan region in southeastern Brazil, 2019.

Variables	Q1		Q2		Q3		Q4		p- value
	n	%	n	%	n	%	n	%	
Gender									
Female	167	37.7	117	26.4	66	14.9	93	21.0	0.003
Male	171	29.4	138	23.8	128	22.0	144	24.8	
Age Group									
19 to 29 years old	8	13.6	13	22	11	18.6	27	45.8	<0.001
30 to 59 years old	153	29.0	132	25	111	21.0	132	25.0	
60 years or older	177	40.5	110	25.2	72	16.5	78	17.8	
Marital Status									
With partner	188	33	149	26.1	119	20.9	114	20.0	0.032
Without partner	150	33	106	23.3	75	16.5	123	27.1	
Education[1]									
≤ 8 years of schooling	189	36.1	128	24.5	92	17.6	114	21.8	0.279
> 8 to ≤ 11 years	100	30.1	85	25.6	70	21.1	77	23.2	
> 11 years	44	27.8	38	24.1	31	19.6	45	28.5	
Race/color[2]									
White	83	30.3	76	27.7	56	20.4	59	21.5	0.647
Black	76	31.5	58	24.1	47	19.5	60	24.9	
Brown	175	35.3	117	23.6	88	17.7	116	23.4	
Income[3]									
≤ 2 minimum wages	191	34.4	142	25.6	99	17.8	123	22.2	0.434
> 2 minimum wages	131	30.3	108	24.9	89	20.6	105	24.2	
Profession[4]									
With work activity	90	25.9	78	22.4	83	23.9	97	27.9	<0.001
Retired or on sick leave	200	36.6	147	26.9	94	17.2	106	19.4	
No paid work	45	39.5	26	22.8	14	12.3	29	25.4	
Number of people living in the household[5]									0.456
≤ 3 people	242	33.3	186	25.6	129	17.7	170	23.4	
≥ 4 people	95	32.2	69	23.4	65	22.0	66	22.4	
City of residence and HD treatment									
Living in the same city	200	31.2	168	26.2	130	20.2	144	22.4	0.185
Does not live in the same city	138	36.1	87	22.8	64	16.8	93	24.3	
Physical activity[6]									
Yes	60	26.1	47	20.4	49	21.3	74	32.2	<0.001
No	278	35.1	208	26.2	145	18.3	162	20.4	
Smoking[7]									0.008
Never smoked	213	35.9	139	23.4	102	17.2	139	23.4	
Previous smoker	108	29.0	108	29.0	74	19.9	82	22.0	
Current smoker	15	28.3	6	11.3	17	32.1	15	28.3	

Continuation - Table 2: Sociodemographic variables, lifestyle habits and medical history according to consumption of ultra-processed foods by users of HD services in a metropolitan region in southeastern Brazil, 2019.

Variables	Q1		Q2		Q3		Q4		p- value
	n	%	n	%	n	%	n	%	
Drinking									<0.001
No habit of consuming alcoholic beverages	324	34.9	235	25.3	170	18.3	200	21.5	
With the habit of consuming alcoholic beverages	14	14.7	20	21.1	24	25.3	37	38.9	
Self-reported diseases									0.006
None or one	47	27.6	37	21.8	41	24.1	45	26.5	
Two	49	31.2	32	20.4	30	19.1	46	29.3	
Three or more	242	34.7	186	26.7	123	17.6	146	20.9	
Time of CKD[8]									0.011
< 5 years	192	36.6	132	25.1	100	19.0	101	19.2	
≥ 5 years	144	29.1	123	24.9	93	18.8	134	27.1	
Time to HD[9]									<0.001
0 to 2 years	150	40.8	92	25.0	61	16.6	65	17.7	
3 to 5 years	91	36.1	63	25.0	53	21.0	45	17.9	
6 to 10 years	57	28.8	46	23.2	40	20.2	55	27.8	
Over 10 years	30	20.1	41	27.5	27	18.1	51	34.2	

Q1: quartile 1. Q2: quartile 2. Q3: quartile 3. Q4: quartile 4. HD: Hemodialysis. CKD: Chronic kidney disease. N=1024. n[1] = 1013. n2= 1023; n3= 988. n4= 1009. n5= 1022. n6= 1023. n7= 1018; n8= 1019; n9= 967. Chi-square test. Statistically significant values (p<0.05). Description of results considering 100% for each line, in order to evaluate the consumption in quartiles in each category of variables.

After adjusting the model, the individuals' education (p=0.012) and income (p=0.045) remained associated with the consumption of these foods (Table 3). Individuals with less than 8 years of education were 1.7 times (95%CI 1.125–2.589) more likely to consume less minimally processed foods (Q1 or Q2) than those with higher education. Individuals with income less than or equal to two minimum wages also consumed less processed foods (OR=1.349; 95%CI 1.007–1.806).

Table 3: Binary logistic regression analysis between lower consumption of minimally processed foods (Q1 and Q2) and associated variables in users of HD services in a metropolitan region in Southeastern Brazil, 2019.

Variable	Adjusted OR			
	P-Value	OR	CI95%	
			LI	LS
Age Group				
19 to 29 years old	0.409	0.778	0.429	1.412
30 to 59 years old	0.650	1.067	0.807	1.411
60 years or older		1		
Education				
≤ 8 years of schooling	0.012	1.706	1.125	2.589
> 8 to ≤ 11 years	0.306	1.237	0.823	1.860
> 11 years		1		
Race/color				
White		1		
Black	0.633	1.095	0.755	1.588
Brown	1.272	1.240	0.901	1.706
Income				
≤ 2 minimum wages	0.045	1.349	1.007	1.806

Continuation - Table 3: Binary logistic regression analysis between lower consumption of minimally processed foods (Q1 and Q2) and associated variables in users of HD services in a metropolitan region in Southeastern Brazil, 2019.

Variable	Adjusted OR			
	P-Value	OR	CI95%	
			LI	LS
> 2 minimum wages		1		
Drinking				
No habit of consuming alcoholic beverages		1		
With the habit of consuming alcoholic beverages	0.160	1.378	0.881	2.156
Time of CKD				
< 5 years		1		
≥ 5 years	0.118	0.813	0.627	1.054

Binary logistic regression. N=1024. HD: Hemodialysis. CKD: Chronic kidney disease. OR: Odds ratio. LI: lower limit. LS: upper limit. CI: confidence interval.* Hosmer and Lemeshow model fit = 0.818. Nagelkerke R^2=0.052. In bold: statistically significant values (p < 0.05). Cases of statistical significance p<0.10 in the chi-square test were included in the analysis.

When analyzing the variable age group and the consumption of ultra-processed foods (Table 4), we found that younger individuals were more likely to consume ultra-processed foods (19 to 29 years old: OR=2.857; 95%CI 1.464–5.576; and 30 to 59 years: OR=1.396; 95%CI 1.037–1.880) than those aged 60 years or older. As for occupation, individuals who were retired or on sick leave were 41.1% less likely to consume ultra-processed foods (OR=0.589; 95%CI 0.432–0.804). Likewise, not working also reduced the chances of individuals being in the highest quartiles of ultra-processed foods consumption in 43.4% (OR=0.566; 95%CI 0.339–0.945).

Regarding physical activity, sedentary individuals were 36.2% less likely to consume ultra-processed foods (OR=0.638; 95%CI 0.459–0.888). As for smoking, current smokers had a 2.3 times higher risk of consuming ultra-processed foods (OR=2.349; 95%CI 1.237–4.462) than non-smokers. Similarly, those who consume alcohol were 1.8 times more likely to consume these foods (OR=1.835; 95%CI 1.122–3.001). When analyzing the time on hemodialysis, individuals with more than 6 years of treatment were almost twice as likely to consume ultra-processed foods (OR=1.975; 95%CI 1.227–3.180) than those with less time on hemodialysis.

Table 4. Binary logistic regression analysis between higher consumption of ultra-processed foods (Q3 and Q4) and associated variables in users of HD services in a metropolitan region in Southeastern Brazil, 2019.

Variables	Adjusted OR			
	P-Value	OR	CI95%	
			LI	LS
Gender				
Female		1		
Male	0.086	1.313	0.963	1.790
Age Group				
19 to 29 years old	0.002	2.857	1.464	5.576
30 to 59 years old	0.028	1.396	1.037	1.880
60 years or older		1		
Marital Status				
With partner		1		
Without partner	0.676	0.940	0.705	1.255
Profession				
With work activity		1		
Retired or on sick leave	0.001	0.589	0.432	0.804
No paid work	0.029	0.566	0.339	0.945
City of residence and HD treatment				
Living in the same city		1		
Does not live in the same city	0.976	0.996	0.748	1.325
Physical activity				

Continuation - Table 4. Binary logistic regression analysis between higher consumption of ultra-processed foods (Q3 and Q4) and associated variables in users of HD services in a metropolitan region in Southeastern Brazil, 2019.

Variables	Adjusted OR			
	P-Value	OR	CI95%	
			LI	LS
Yes		1		
No	0.008	0.638	0.459	0.888
Smoking				
Never smoked		1		
Previous smoker	0.226	1.203	0.892	1.622
Current smoker	0.009	2.349	1.237	4.462
Drinking				
No habit of consuming alcoholic beverages		1		
With the habit of consuming alcoholic beverages	0.016	1.835	1.122	3.001
Self-reported diseases				
None or one		1		
Two	0.489	1.185	0.733	1.916
Three or more	0.407	0.852	0.585	1.243
Time of CKD				
< 5 years		1		
≥ 5 years	0.610	1.114	.736	1.687
Time to HD				
0 to 2 years		1		
3 to 5 years	0.269	1.224	0.855	1.751
6 to 10 years	0.005	1.975	1.227	3.180

Binary logistic regression. N=1024. HD: Hemodialysis. CKD: Chronic kidney disease. OR: Odds ratio; LI: lower limit. LS: upper limit. CI: confidence interval.* Hosmer and Lemeshow model fit = 0.453. Nagelkerke R^2=0.157. In bold: statistically significant values (p<0.05). Cases of statistical significance p<0.10 in the chi-square test were included in the analysis.

DISCUSSION

This study investigated the association between sociodemographic characteristics, lifestyle habits, and clinical history with the consumption of minimally processed and ultra-processed foods in individuals on hemodialysis. Among the main findings, we can highlight the strong association between education and income with the lower consumption of minimally processed foods, while younger individuals, smokers, alcohol consumers, and those on hemodialysis for longer periods reported a higher consumption of ultra-processed foods. Our study stands out for presenting an overview of food consumption and for identifying, in the CKD population on hemodialysis, which factors influenced the outcome, using the NOVA classification by Monteiro et al. (18).

Diet is a risk factor in this population and demands attention because of its consequences. A study showed that vegetable-based diets help prevent the metabolic complications of CKD and can be useful in reducing its occurrence, (8,31) as well as hemodialysis individuals should reduce the consumption of ultra-processed foods and sodium (32).

In 2019, the authors of a study in Brazil observed that those not dependent on dialysis showed low adherence to the unhealthy pattern, while individuals with kidney transplant adhered to a better quality diet (11). Similarly, also in Brazil, protein intake was inversely related to glomerular filtration rate (16).

A study investigating dietary quality and consumption of ultra-processed foods by hemodialytic older adults found a worse dietary pattern in their group when compared with the group without CKD (24). Also, more than half of Brazilians with CKD report regularly consuming healthy foods and about 20%, unhealthy foods (17).

In this study, less education and income influenced the consumption of minimally processed foods. A number of studies confirmed our findings, as these factors hinder the access to healthy food, thus worsening the quality of the diet (33-39).

Darmon and Drewnowski carried out a study in the United States confirming that the quality of the diet tended to be better with increasing income or education (36). They observed that diets with high energy content and low nutritional quality are usually consumed by socially disadvantaged groups, who tend to opt for less healthy foods because of the cost, the false feeling of satiety they provide, their easy access, and the lack of knowledge they

have about these items and their health impact.

The literature is consistent in stating that diet is strongly influenced by income level (40-44). Income guarantees access to quality food, which is related to cost, especially in developing countries (such as Brazil) (19). According to Santana et al. (45), more than 90% of individuals with CKD on hemodialysis earned only one minimum wage, which may imply limited access to an adequate diet. The percentage of hemodialysis individuals with income below the minimum wage was similar to that observed in our study.

Considering the lack of studies on kidney disease, one can refer to the results of the National Health Survey (44) carried out with the Brazilian population regarding their levels of education, which revealed a higher prevalence of consumption of healthy foods in segments with a higher level of education (44). Similar results were reported in the VIGITEL (28) survey, also carried out in Brazil, which found that the frequency of regular consumption of fruits and vegetables tended to increase with the level of education.

We also observed that younger individuals, smokers, alcohol consumers, and those on hemodialysis for longer periods consumed more ultra-processed foods. Two Brazilian studies previously reported the relation between age group and consumption of ultra-processed foods, which showed that the consumption of ultra-processed foods tended to decrease and that of minimally processed foods to increase with age (28,46). A possible explanation could be that older individuals (from different generations) formed their eating habits when industrialized food consumption was less accentuated and the traditional food culture was more preserved, while younger individuals are more exposed to this new standard (47). Still, regarding the general population, the regular intake of sweets, foods with high sodium content, and alcoholic beverages was significantly lower in the older adults' group than in individuals aged between 18 and 39 years (48).

We also found an association between individuals who were retired or on sick leave, as well as those who were not working (mostly older adults), with the low consumption of ultra-processed foods, supporting the study by Calixto Andrade et al. (49). This can be explained because these individuals have more free time to purchase and prepare food (50), as they have a more flexible routine, with meals being eaten at home more often and with healthier foods (51).

Individuals with CKD have a lower tolerance to physical activity and a lower functional capacity when compared with healthy individuals or individuals with less severe kidney disease (52). However, several studies (53-56) state the importance of physical activity for these individuals, particularly for those undergoing hemodialysis, whose level of physical activity is lower than that of healthy sedentary individuals (57-59). We associated an increase in physical activity with a reduction in the risk of mortality (60). In addition, we considered physical activity an independent predictor of mortality in hemodialysis individuals. A sedentary lifestyle, in addition to contributing to secondary CKD, hypertension and diabetes mellitus, negatively influences cardiovascular diseases and the quality of life, contributing to high mortality rates in CKD (61).

In this study, individuals who reported a sedentary lifestyle consumed less ultra-processed foods. This outcome was unexpected, as a study by Machado et al. (62) carried out in Australia with healthy adults showed that sedentary individuals were more likely to consume ultra-processed foods62. In addition, a few studies showed a higher prevalence of regular consumption of these foods among individuals who reported sedentary behavior for more than 2 hours a day (63,64). These results can be explained by compensatory eating behaviors that accompany the sedentary behavior of the population, as seen in a study in which sedentary behavior in older women was accompanied by a spontaneous reduction in energy intake (mainly glucose derived from industrialized foods) (65).

The occurrence of consumption of foods of poor nutritional quality was also detected in smokers, such as high consumption of coffee, alcoholic beverages, and sweets—the latter to eliminate the odor of smoke (66). Reduction of taste and smell influence the eating habits of smokers, which makes them consume less vegetables and fruits, and often overload on spices and salt. This study observed that smokers doubled their consumption of ultra-processed foods compared to non-smokers. Zhong et al. found similar results (67), demonstrating a frequent association between smoking and low fruit consumption.

Similarly, those who often consumed alcoholic beverages also had a greater probability of consuming ultra-processed foods, compromising the nutritional quality of their diet. Individuals who consume a high percentage of calories in the form of alcohol often display severe deficiencies of vitamins and minerals, as well as protein energy malnutrition, having a supply of empty calories that always compromises the nutritional quality of their diet (68).

Individuals on hemodialysis are a risk group for protein energy malnutrition, with the length of treatment interfering with the patient's dietary profile. In this study, we found a higher consumption of ultra-processed foods in individuals on hemodialysis for longer periods (6 years or more) who were almost twice as likely to consume this food group, which is worrying because of the complex treatment. There is, however, a lack of studies demonstrating this relation. This worsening in the dietary pattern can be explained by individuals adhering to the diet when they start hemodialysis treatment and abandoning it afterward. A study carried out in Brazil (69) found similar results, with individuals on hemodialysis for longer periods (≥3 years) having an increase in the average consumption of ultra-processed foods (70).

Unlike other studies that analyzed isolated foods, we employed a classification that groups foods according to purpose and extent of processing (18). Despite the scarcity of data on this topic, we must highlight that the data presented here reflect the reality of individuals with CKD, as ours was a representative sample. The sample was considered representative because it covered almost the entire CKD population of a part of southeastern Brazil. Nevertheless, the consumption of healthy and unhealthy

foods by individuals with CKD is similar to that of Brazilians without CKD (70,71).

The analysis should consider the limitations common to cross-sectional studies, such as reverse causality, and in food consumption surveys, which may imply bias from the participant's memory and by underestimation or overestimation of the consumption of certain types of food, since the respondent seeks to match the eating patterns considered healthy, and by the difficulty in measuring the consumption. Therefore, it focused on consumption profiles detrimental to food quality. The main strength of the study is the sample size, in addition to this being the first study to assess consumption according to food processing in a population using a hemodialysis service.

CONCLUSION

The results suggest that young age, smoking, alcohol intake, and having a hemodialysis time of more than 6 years increased the chances of a greater consumption of ultra-processed foods. However, individuals who were retired or on sick leave, who did not work, and those sedentary were less likely to consume ultra-processed foods. Furthermore, the study associated less schooling and lower income with a lower consumption of minimally processed foods. Evaluating food consumption through these food groups becomes necessary, as it identifies the population's vulnerability to food excesses, and thus adjusts and proposes intervention measures to ensure the health of hemodialysis service users.

ORCID

Nina Mara Paterlini Marques: 0000-0003-4834-2029
Monica Cattafesta: 0000-0002-8973-622X
Fabíola Lacerda Pires Soares: 0000-0002-0244-5754
Glenda Blaser Petarli: 0000-0002-6828-1238
Mirian Patrícia Castro Pereira Paixão:0000-0001-5537-4323
Cleodice Alves Martins: 0000-0002-9883-3507
Edson Theodoro Dos Santos Neto: 0000-0002-7351-7719
Luciane Bresciani Salaroli: 0000-0002-1881-0306

Author Contributions

All authors contributed to the manuscript.

Nina Mara Paterlini Marques: Principal Project Leader, conceived study, participated in design and coordination, read and approved the final manuscript; Participated in design and coordination, undertook interviews, helped to draft manuscript, read and approved the final manuscript and Analysed the data, helped to draft manuscript and approved the final manuscript.

Monica Cattafesta: Conceived study, participated in design and coordination, read and approved the final manuscript; Participated in design and coordination, undertook interviews, helped to draft manuscript, read and approved the final manuscript and Analysed the data, helped to draft manuscript and approved the final manuscript.

Fabíola Lacerda Pires Soares: Conceived study, participated in design and coordination, read and approved the final manuscript Analysed the data, helped to draft manuscript and approved the final manuscript.

Glenda Blaser Petarli: Conceived study, participated in design and coordination, read and approved the final manuscript Analysed the data, helped to draft manuscript and approved the final manuscript.

Mirian Patrícia Castro Pereira Paixão: Conceived study, Participated in design and coordination, undertook interviews, helped to draft manuscript, read and approved the final manuscript.

Cleodice Alves Martins: Analysed the data, helped to draft manuscript and approved the final manuscript.

Edson Theodoro Dos Santos Neto: Participated in design and coordination, undertook interviews, helped to draft manuscript, read and approved the final manuscript and Analysed the data, helped to draft manuscript and approved the final manuscript.

Luciane Bresciani Salaroli: Principal Project Leader, conceived study, participated in design and coordination, read and approved the final manuscript; Participated in design and coordination, undertook interviews, helped to draft manuscript, read and approved the final manuscript and Analysed the data, helped to draft manuscript and approved the final manuscript.

Funding

This study received financial support from the Espírito Santo Research and Innovation

Support Foundation (FAPES) n° 35081.543.19306.18042018. Notice no. 03/2018 –

Research Program for the SUS (PPSUS). Cty: Vitória, State: Espírito Santo and Country: Brasil.

Acknowledgments

Research Support Foundation of Espírito Santo (FAPES)

Conflicts of Interest: The authors report no conflict of interest.

REFERENCES

1. Abreu IS, Nascimento LC, Lima RAG, Santos CB. Children and adolescents with chronic kidney disease in haemodialysis: perception of professionals. Rev Bras Enferm. 2015; 68(6):1020-1026. DOI: 10.1590/0034-7167.2015680604i
2. Bello AK, Levin A., Tonelli M. Assessment of global renal health status. JAMA. 2017; 317:1864-1881. DOI: 10.1001/jama.2017.4046
3. Neves PDMM, Sesso RCC, Thomé FS, Lugon JR, Nasicmento MM. Brazilian dialysis census: analysis of data from the decade 2009-2018. Braz J Nephrol. 2020; 42(2):191-200. DOI: 10.1590/2175-8239-JBN-2019-0234

4. United States Renal Data System. USRDS annual data report: Epidemiology of kidney disease in the United States. National Institutes of Health, National Institute of Diabetes and Digestive and Kidney Diseases, Bethesda, MD; 2016.
5. Chen J, Peng H, Zhang K, Xiao L, Yuan Z, Chen J, et al. The Insufficiency Intake of Dietary Micronutrients Associated with Malnutrition-Inflammation Score in Hemodialysis Population. Moysés RMA, ed. PLoS ONE. 2013; 8(6):e66841. DOI:10.1371/journal.pone.0066841
6. Soares LR, Pereira MLC, Mota MA, Jacob TA, Nakaoka VY, Silva E, et al (2013). The transition from malnutrition for obesity. BJSCR 5 (1): 64-68.
7. Hruby A, Hu FB (2015). The Epidemiology of Obesity: a big picture. FarmacoEconomia 33(7):673-689.
8. Liu HW, Tsai WH, Liu JS, Kuo KL (2019). Association of Vegetarian Diet with Chronic Kidney Disease. Nutrients. 11(2):279. DOI: 10.3390/nu11020279
9. Fernandes AS, Ramos CI, Nerbass FB, Cuppari L (2018). Diet Quality of Chronic Kidney Disease Patients and the Impact of Nutritional Counseling. Journal of Renal Nutrition. 28(6):403-410. DOI: 10.1053/j.jrn.2017.10.005
10. Liu HW, Tsai WH, Liu JS, Kuo KL (2019). Association of Vegetarian Diet with Chronic Kidney Disease. Nutrients. 11(2):279. DOI: 10.3390/nu11020279
11. Santin F, Canella D, Borges C, Lindholm B, Avesani C (2019). Dietary patterns of patients with chronic kidney disease: The Influence of Treatment Modality. Nutrients. 11(8):1920. DOI: 10.3390/nu11081920
12. Anderson CA, Nguyen HA, Rifkin DE (2016). Nutritional interventions in chronic kidney disease. Med Clin North Am. 100:1265-1283. DOI: 10.1016/j.mcna.2016.06.008
13. Gazan R, Béchaux C, Crépet A, Sirot V, Drouillet-Pinard P, Dubuisson C, et al (2016). Dietary patterns in the French adult population: a study from the second French cross-sectional national dietary survey (INCA2) (2006-2007). Br J Nutr.116(2):300-315. DOI: 10.1017/S0007114516001549
14. Naska A, Fouskakis D, Oikonomou E, Almeida MDV, Berg MA, Gedrich K, et al (2006). Dietary patterns and their sociodemographic determinants in 10 European countries: data from the DAFNE database. Eur J Clin Nutr. 60(2):181-190. DOI: 10.1038/sj.ejcn.1602284
15. Sánchez-Villegas, A., Delgado-Rodríguez, M., Martínez-González, M. Irala-Estévez J, Navarra group (2003). Gender, age, socio-demographic and lifestyle factors associated with major dietary patterns in the Spanish SUN Project (Seguimiento Universidad de Navarra). Eur J Clin Nutr 57(2): 285-292. DOI: 10.1038/sj.ejcn.1601528
16. Machado AD, Anjos FSN, Domingos MAM, Molina MDCB, Marchioni DML, Benseñor IJM, et al (2018). Dietary intake of patients with non-dialysis chronic kidney disease: the PROGREDIR study. A cross-sectional study. São Paulo Med J. 136(3):208-215. DOI: 10.1590/1516-3180.2017.0177141217
17. Santin F, Canella DS, Avesani CM (2019). Dietary Intake in Chronic Kidney Disease: Association with Sociodemographic and Geographic Variables and Comparison with Healthy Individuals. Journal of Renal Nutrition. 29(4):333-342. DOI: 10.1053/j.jrn.2018.10.010
18. Monteiro CA, Cannon G, Levy RB, Moubarac JC, Jaime P, Martins AP, et al (2016). NOVA. The star shines. Classification of foods. Public Health. World Nutrition. 7 (1-3): 28-40.
19. Monteiro CA, Levy RB, Claro RM, Castro IRR, Cannon G (2010). A new classification of foods based on the extent and purpose of their processing. Cad Saúde Pública. 26(11):2039-2049. DOI: 10.1590/S0102-311X2010001100005
20. Brasil. Ministério da Saúde. Guia alimentar para a população brasileira [Food guide for the Brazilian population]. 2. ed. Brasília, DF. 2014. Avaliable in: https://bvsms.saude.gov.br/bvs/publicacoes/guia_alimentar_populacao_brasileira_2 ed.pdf [Accessed March 15, 2022].
21. World Health Organization (WHO). Diet, Nutrition and the Prevention of Chronic Disease. World Health Organization Technical Report Series, 916: 1-149, backcover, 2003.
22. Baker, P; Friel, S (2016). Food Systems Transformations, Ultra-Processed Food Markets and the Nutrition Transition in Asia. Globalization and Health 12 (1): 80.
23. Monteiro CA, Cannon G, Levy RB, Moubarac JC, Louzada ML, Rauber F, et al (2019). Ultra-processed foods: what they are and how to identify them. Saúde Pública Nutr. 22(5):936-941. DOI: 10.1017/S1368980018003762
24. Martins AM, Moreira ASB, Canella DS, Rodrigues J, Santin F, Wanderley B, et al (2017). Elderly Patients on Hemodialysis Have Worse Dietary Quality and Higher Consumption of ultra-processed Food than Elderly without Chronic Kidney Disease. Nutrition. 41:73-79. DOI: 10.1016/j.nut.2017.03.013
25. Wendling AL, Balbino KP, Ribeiro PVM, Epifânio APS, Marota LD, Hermsdorff HHM (2020). Processed and ultra-processed food consumption is related to metabolic markers in hemodialysis subjects. Rev Nutr. 33. DOI: 10.1590/1678-9865202033e190138

26. Rey-García J, Donat-Vargas C, Sandoval-Insausti H, Bayan-Bravo A, Moreno-Franco B, Banegas JR, et al (2021). Ultra-Processed Food Consumption Is Associated with Renal Function Decline in Older Adults: A Prospective Cohort Study. Nutrients. 13(2):428. DOI: 10.3390/nu13020428
27. World Health Organization (WHO). Global strategy on diet, physical activity and health. [S.l.]: World Health Organization. 2005. Avaliable in: http://www.who.int/dietphysicalactivity/en. [Accessed April 14, 2022].
28. Brasil. Ministério da Saúde. Vigitel Brasil 2019: vigilância de fatores de risco e proteção para doenças crônicas por inquérito telefônico – estimativas sobre frequência e distribuição sociodemográfica de fatores de risco e proteção para doenças crônicas nas capitais dos 26 estados brasileiros e no Distrito Federal em 2019 [Vigitel Brazil 2019: surveillance of risk and protection factors for chronic diseases by telephone survey: estimates on frequency and sociodemographic distribution of risk and protection factors for chronic diseases in the capitals of the 26 Brazilian states and the Federal District in 2019]. Brasília: Ministério da Saúde, 2020. Avaliable in: http://bvsms.saude.gov.br/bvs/publicacoes/vigitel_brasil_2019_vigilancia_fatores_risco.pdf. [Accessed May 02, 2022].
29. Monteiro CA, Moura EC, Jaime PC, Claro RM (2008). Validity of food and beverage intake data obtained by telephone survey. Rev Saúde Pública. 42(4):582-9. DOI: 10.1590/s0034-89102008000400002
30. Cade J, Thompson R, Burley V, Warm D (2002). Development, validation and use of food frequency questionnaires - a review. Public Health Nutr. 5(4):567-587. DOI: 10.1079/PHN2001318
31. González-Ortiz A, Xu H, Avesani CM, Lindholm B, Cederholm T, Riserus U, et al (2020). Plant-based diets, insulin sensitivity, and inflammation in elderly men with chronic kidney disease. J Nephrol. 33(5):1091-1101. DOI: 10.1007/s40620-020-00765-6
32. Bortolotto LA (2008). Hypertension and chronic renal failure. Rev bras hipertens. 15(3): 152-155.
33. Martins APB, Levy RB, Claro RM, Moubarac JC, Monteiro CA (2013). Growing participation of ultra-processed products in the Brazilian diet (1987-2009). Rev Saude Publ. 47(4):656-665. DOI: 10.1590/S0034-8910.2013047004968
34. Wijtzes AI, Jansen W, Jansen PW, Jaddoe VWV, Hofman A, Raat H (2013). Maternal educational level and preschool children's consumption of high-calorie snacks and sugar-containing beverages: Mediation by the family food environment. Preventive Medicine. 57(5):607-612. DOI: 10.1016/j.ypmed.2013.08.014
35. Momm N, Höfelmann DA (2014). Diet quality and associated factors in children enrolled in a municipal school in Itajaí, Santa Catarina. Cad saúde colet. 22(1):32-39. DOI: 10.1590/1414-462X201400010006
36. Darmon N, Drewnowski A (2008). Does social class predict diet quality? The American Journal of Clinical Nutrition. 87(5):1107-1117. DOI: 10.1093/ajcn/87.5.1107
37. Gutiérrez OM, Anderson C, Isakova T, Scialla J, Negrea L, Anderson AH, et al (2010). Low socioeconomic status is associated with elevated serum phosphate levels regardless of race. J Am Soc Nephrol. 21(11): 1953-1960. DOI: 10.1681/ASN.2010020221
38. Baraldi LG, Martinez Steele E, Canella DS, Monteiro CA (2018). Consumption of ultra-processed foods and associated sociodemographic factors in the USA between 2007 and 2012: evidence from a nationally representative cross-sectional study. BMJ Open. 8(3):e020574. DOI: 10.1136/bmjopen-2017-020574
39. Lenardson JD, Hansen AY, Hartley D (2015). Rural and Remote Food Environments and Obesity. Curr Obes Rep. 4(1):46-53. DOI: 10.1007/s13679-014-0136-5.
40. Bielemann RM, Motta JVS, Minten GC, Horta BL, Gigante DP (2015). Consumption of ultra-processed foods and their impact on the diet of young adults. Rev Saude Publ. 49(28):1-10. DOI: 10.1590/S0034-8910.2015049005572
41. Bojorquez I, Unikel C, Cortez I, Cerecero D (2015). The social distribution of dietary patterns. Traditional, modern and healthy eating among women in a Latin American city. Appetite. 92:43-50. DOI: 10.1016/j.appet.2015.05.003
42. Ricardo CZ, Claro RM (2012). Cost of food and energy density of the diet in Brazil, 2008-2009. Cad Saúde Pública. 28(12):2349-2361. DOI: 10.1590/s0102-311x2012001400013
43. Drewnowski A, Darmon N (2005). The economics of obesity: dietary energy density and energy cost. The American Journal of Clinical Nutrition. 82(1):265S-273S. DOI: 10.1093/ajcn/82.1.265S
44. Medina LPB, Barros MBA, Sousa NFS, Bastos TF, Lima MG, Szwarcwald CL (2019). Social inequalities in the food consumption profile of the Brazilian population: National Health Survey, 2013. Rev bras epidemiol. 22(suppl 2):E190011. DOI: 10.1590/1980-549720190011
45. Santana RS, Carvalho ADT, Silva MAFS, Castro SR, Alcântara FR, Conceição MS et al (2020). Sociodemographic and behavioral profile of patients on hemodialysis treatment in Teresina, State of Piaui. RSD. 9(12):e42391211305. DOI: 10.33448/rsd-v9i12.11305

46. Berti TL, Rocha TF, Curioni CC, Junior EV, Bezerra FF, Canella DS, et al (2019). Food consumption according to the degree of processing and sociodemographic characteristics: Pro-Health Study. Rev bras epidemiol. 22:e190046. DOI: 10.1590/1980-549720190046
47. Jaime PC, Monteiro CA (2005). Fruit and vegetable intake by Brazilian adults, 2003. Cad Saúde Pública. 2005;21(suppl 1):S19-S24. DOI: 10.1590/S0102-311X2005000700003
48. IBGE. Pesquisa de Orçamentos Familiares: 2017-2018: Nutritional Assessment Of Household Food Availability In Brazil / IBGE, Coordenação de Trabalho e Rendimento; 2020.
49. Andrade CG, Julia C, Deschamps V, Srour B, Hercberg S, Kesse-Guyot E, et al (2021). ultra-processed food consumption and its association with sociodemographic characteristics and diet quality in a representative sample of French adults. Nutrients 13 (2): 682. DOI: 10.3390/nu13020682
50. Chung S, Popkin BM, Domino ME, Stearns SC (2007). Effect of retirement on eating out and weight change: an analysis of gender differences. Obesity (Silver Spring). 15(4):1053-60. DOI: 10.1038/oby.2007.538
51. Plessz M, Guéguen A, Goldberg M, Czernichow S, Zins M (2015). Aging, retirement and changes in vegetable consumption in France: results from the prospective GAZEL cohort. British Journal of Nutrition 114 (6): 979-987. DOI: 10.1017/S0007114515002615
52. Kosmadakis GC, Bevington A, Smith AC, Clapp EL, Viana JL, Bishop NC, et al (2010). Physical Exercise in Patients with Severe Kidney Disease. Nephron Clin Pract. 115(1):c7-c16. DOI: 10.1159/000286344
53. Mafra D, Deleaval P, Teta D, Cleaud C, Arkouche W, Jolivot A, et al (2011). Influence of inflammation on total energy expenditure in hemodialysis patients. J Ren Nutr. 21(5):387-393. DOI: 10.1053/j.jrn.2010.09.006
54. Johansen KL (2005). Exercício e Doença Crónica dos Rins: Recomendações actuais. Medicina desportiva. 35(6):485-499.
55. Pintor P, Marcus RL (2013). Avaliação da Função Física e Actividade Física em Pacientes com CKD. CJASN 8(5):861-872.
56. Bogatajär, Pajek M, Pajek J, Buturović Ponikvar J, Paravlic A (2019). Exercise-Based Interventions in Hemodialysis Patients: A Systematic Review with a Meta-Analysis of Randomized Controlled Trials. J Clin Med. 9(1):43. DOI: 10.3390/jcm9010043
57. Johansen KL, Painter P, Kent-Braun JA, Ng AV, Carey S, Silva M, et al (2001). Validation of physical and disease phase to estimate end-stage renal activity. Kidney International. 59(3):1121-1127. DOI: 10.1046/j.1523-1755.2001.0590031121.x
58. Katayama A, Miyatake N, Nishi H, Uzike K, Sakano N, Hashimoto H, et al (2014). Evaluation of physical activity and its relationship to health related quality of life in patients on chronic hemodialysis. Med. Saúde Ambiental Prev. 19(3):220-225. DOI: 10.1007/s12199-014-0380-z
59. Kim JC, Shapiro BB, Zhang M, Li Y, Porszasz J, Bross R, Feroze U, et al. Daily physical activity and physical function in adult maintenance hemodialysis patients. J Cachexia Sarcopenia Muscle. 5(3):209-220. DOI: 10.1007/s13539-014-0131-4
60. Lear SA, Hu W, Rangarajan S, Gasevic D, Leong D, Lqbal R, et al (2017). The effect of physical activity on mortality and cardiovascular disease in 130 000 people from 17 high-income, middle-income, and low-income countries: the PURE study. Lancet. 390(10113):2643-2654. DOI: 10.1016/S0140-6736(17)31634-3
61. Zhang L, Luo H, Kang G, Wang W, Hu Y (2017). The association between physical activity and mortality among patients undergoing maintenance hemodialysis. International Journal of Nursing Practice. 23(1):e12505. DOI: 10.1111/ijn.12505
62. Machado PP, Steele EM, Levy RB, Louzada MLC, Rangan A, Woods J, et al (2020). Ultra-processed food consumption and obesity in the Australian adult population. Nutr Diabetes. 10(1):39. DOI: 10.1038/s41387-020-00141-0
63. Camelo L do V, Rodrigues JF de C, Giatti L, Barreto SM (2012). Sedentary leisure time and food consumption among Brazilian adolescents: the Brazilian National School-Based Adolescent Health Survey (PeNSE), 2009. Cad Saúde Pública. 28(11):2155-2162. DOI: 10.1590/S0102-311X2012001100015
64. Costa CS, Flores TR, Wendt A, Neves RG, Assunção MCF, Santos IS (2018). Sedentary behavior and consumption of ultra-processed foods by Brazilian adolescents: Brazilian National School Health Survey (PeNSE), 2015. Cad Saúde Pública. 34(3):e00021017. DOI: 10.1590/0102-311X00021017

65. Grant D, Tomlinson D, Tsintzas K, Kolic P, Onambele-Pearson G (2020). Shifting sedentary behavior with light-intensity physical activity spontaneously alters habitual macronutrient intake and improves dietary dietary qualities in older women. Nutrientes. 12 (8): 2431. DOI: 10.3390/nu12082431
66. Berto SJP, Carvalhaes MABL, Moura EC (2010). Smoking associated with other behavioral risk factors for chronic non-communicable diseases. Cad Saúde Pública. 26(8):1573-1582. DOI: 10.1590/s0102-311x2010000800011
67. Zhong G-C, Gu H-T, Peng Y, Wang K, Wu YQL, Hu TY, et al (2021). Association of ultra-processed food consumption with cardiovascular mortality in the American population: long-term results of a large prospective multicenter study. Int J Behav Nutr Phys Act. 18(1):21. DOI: 10.1186/s12966-021-01081-3
68. Moreira PFP, Martiniano Filho F (2008). Aspectos nutricionais e o abuso do álcool em idosos. Envelhecimento e Saúde 14(1): 23-6.
69. Alvarenga LA, Andrade BD, Moreira MA, Nascimento RP, Macedo ID, Aguiar AS (2017). Nutritional profile of hemodialysis patients concerning treatment time. J Bras Nefrol 39(3). DOI: 10.5935/0101-2800.20170052
70. Louzada MLC, Martins APB, Canella DS, Baraldi LG, Levy RB, Claro RM, et al (2015). Impact of ultra-processed foods on micronutrient content in the Brazilian diet. Rev Saúde Pública. 2015;49(0):1-8. DOI: 10.1590/S0034-8910.2015049006211
71. Monteiro CA, Cannon G, Moubarac J-C, Levy RB, Louzada MLC, Jaime PC (2018). The UN Decade of Nutrition, the NOVA food classification and the trouble with ultra-processing. Public Health Nutr. 21(1):5-17. DOI: 10.1017/S1368980017000234

Resumo

Introdução: os indivíduos com doença renal crônica apresentam baixa adesão à dieta rica em vegetais.

Objetivo: avaliar a associação do consumo de alimentos minimamente processados e ultraprocessados com fatores socioeconômicos, hábitos de vida e características clínicas de usuários de serviços de hemodiálise no sudeste brasileiro.

Método: estudo transversal com 1.024 indivíduos em hemodiálise da região sudeste do Brasil. Os indivíduos responderam a um questionário de dados sociodemográficos, hábitos de vida e consumo alimentar. Após estipular a frequência de consumo, classificamos os alimentos em minimamente processados e ultraprocessados. Investigamos a associação entre as variáveis independentes e o consumo de alimentos minimamente processados e ultraprocessados por meio do modelo de regressão logística binária com Odds Ratio (OR) e seus intervalos de confiança (IC 95%).

Resultados: usuários com escolaridade inferior a oito anos (OR=1,706; IC95%1,125–2,589) e com renda inferior a dois salários mínimos (OR=1,349; IC95%1,007–1,806) apresentaram menor consumo de alimentos minimamente processados. No entanto, indivíduos de 19 a 29 anos (OR=2.857, IC95%1,464–5,576), tabagistas (OR=2,349; IC95%1,237–4,462), etilistas (OR=1,835; IC95%1,122–3,001), e com mais de 6 anos em hemodiálise (OR=1,975; IC 95%1,227–3,180) apresentaram maior probabilidade de ter maior consumo de alimentos ultraprocessados. Indivíduos que não praticavam atividade física foram menos propensos a esse consumo (OR=0,638; IC95%0,459–0,888).

Conclusão: ser mais jovem, fumar, consumir álcool e estar em hemodiálise há mais de 6 anos aumentaram as chances de maior consumo de alimentos ultraprocessados. Além disso, associamos menor escolaridade e menor renda ao menor consumo de alimentos minimamente processados.

Palavras-chave: doença renal crônica, hemodiálise, consumo de alimentos, alimentos minimamente processados, alimentos ultraprocessados.