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Diet quality and associated factors in adult and elderly patients treated in a nutrition outpatient clinic in the city of Recife, Pernambuco

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Abstract

Current food consumption, characterized by increased intake of high-density foods and low nutritional value can negatively influence nutritional status and the emergence of health problems. This study aimed to evaluate the quality of the diet and associated factors in adult and elderly patients treated in a nutrition outpatient clinic. This is a cross-sectional study conducted from May to October 2021 at the Nutrition Outpatient Unit of the Fernando Figueira Institute of Integral Medicine in Recife, Pernambuco. The information of the sociodemographic and economic profile, lifestyle, clinical variables, and nutritional status was collected at the time of nutritional consultation (first consultation and/or follow-up consultation). The evaluation of food consumption was performed through the analysis of the Diet Quality Index - Revised (DQI-R). The sample consisted of 102 patients, and there was a higher frequency of overweight/obesity and very high cardiovascular risk. Regarding DQI-R, 72.6% of the sample has a healthy diet. The follow-up time was positively correlated with the quality of the diet (ρ 0.199; p <0.045); and regarding fasting blood glucose, there was a negative correlation with the consumption of total cereals (ρ -0.229; p <0.050) and a positive correlation with the consumption of milk and derivatives (ρ 0.265; p <0.023). Regarding anthropometric variables, negative correlations with the consumption of whole grains and cereals was demonstrated. Food consumption is considered complex and requires the evaluation of factors that may interfere with it. Nutritional monitoring, modifying, and improving the quality of food, favors the adoption of a healthier lifestyle, which relates to the prevention and/or control of chronic non-communicable diseases and their complications.

Keywords: Food intake. Noncommunicable Diseases. Nutritional status. Foods. Diet and Nutrition. Healthy diet.

INTRODUCTION

Inadequate eating habits when associated with physical inactivity and deleterious practices such as alcoholism and/or smoking contribute to the emergence of chronic non-communicable diseases (CNCD), negatively impacting public health worldwide[1]. These diseases include cardiovascular disease (CVD), chronic respiratory disease, cancer, and diabetes, and are associated with high mortality rates[2]. In Brazil, about 730,000 deaths in 2019 were caused by the CNCD[3].

According to Pernambuco's latest epidemiological report in 2016, there was an 87.6% increase in the hospitalization rate resulting from the CNCD which reflect upon high public health costs and social damage to family members and the individuals themselves, considering the disabilities caused by these diseases[4].

The decrease in the risk of CNCD is directly related to healthy eating, through which benefits emerge like the prevention

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of diseases from the combination of integrated nutrients of the food itself. Vigitel data (2019) show that in the adult population (≥ 18 years) there was a drop in the recommended frequency of fruits and vegetables by 22.9%. Furthermore, the consumption of five or more ultra-processed food groups was 18.2% and the regular consumption of sweetened beverages was 15.0%[3].

Through the dietary quality index (DQI) it is possible to monitor and evaluate food consumption based on the nutritional recommendations pertinent to the studied population. Following the development of the 2008 Food Guide for the Brazilian Population[5] together with the 2005 Health Eating Index update (Hei)[6], Previdelli *et al.*[7], elaborated the Diet Quality Index - Revised (DQI-R). The DQI-R is composed of 12 items, of which nine are food groups, two nutrient groups, and one group reports the energy value from solid fats, alcohol, and added sugars. The DQI-R is a reliable and valid tool, as well as being advantageous in assisting in the monitoring and elaboration of health promoting activities[7].

Therefore, in view of the complexity of food consumption, it is necessary to know both the overall quality of the diet and the different food groups consumed by adults and the elderly and, thus, direct nutritional interventions to inadequate items, if necessary. Thus, the objective of this study was to evaluate the revised diet quality index and its components, and to compare this data with the biochemical and nutritional profiles of adult and elderly patients attended at the Nutrition Outpatient Clinic in Recife, PE.

METHODS

This is an analytical study of transverse character, conducted from May to October 2021, at the Nutrition Outpatient Clinic of the Fernando Figueira Institute of Integral Medicine (IMIP), in Recife, PE, which has a monthly average of 300 appointments, provided from Monday to Friday in the morning, in which each day of the week corresponds to the care of a specific audience. The nutritional care of patients diagnosed with chronic diseases such as diabetes mellitus, systemic arterial hypertension, and chronic liver disease, or that have some risk factor for their development, are performed on Thursdays. These patients receive referrals by the multiprofessional team of the service. Nutritional care occurs individually and with quarterly follow-up.

Rational sampling or convenience was used, and all patients who were attended at the nutritional outpatient clinic in the study period who matched the inclusion and exclusion criteria, totaled 102 patients. Individuals of both sexes, aged 20 years or over were included, and patients who had degenerative diseases, with physical, mental, or visual difficulty, patients who missed their follow-up of nutritional treatment, those with edema and/or ascites, and amputees that in who anthropometric evaluations and/or anamnesis evaluations were impossible, were excluded. The level of consciousness was evaluated through the ability to answer the questions in the data collection questionnaire.

The data were collected by the researchers through individual interview that was conducted at the Nutrition Outpatient Clinic, during the first consultation and/or subsequent consultations, using a structured questionnaire with information on the sociodemographic, economic, lifestyle, and clinical variables. There was also the evaluation of food consumption through the 24h recall (24HR) and nutritional status, which included biochemical data and anthropometric evaluation.

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To characterize the sociodemographic profile, the following information was collected: age; gender; origin; marital status; nutritional monitoring time; reason for nutritional care, in which patients could choose to be more than one reason; in addition to the criteria established by the 2020 Brazilian Association of Companies and Research (BACR) for classification of socioeconomic stratum according to comfort, education, and basic sanitation items[8].

To characterize lifestyle habits, smoking (type of smoke, daily consumption, and smoking time) was classified as individuals who consumed more than 100 cigarettes during their lifetime and the last smoke was less than 30 days prior and, if a former smoker, those who have already smoked at least 100 cigarettes during their lifetime but had stopped smoking least 30 days before the interview. About alcoholism, the frequency of consumption, type of drink, and quantity ingested was questioned. Individuals who would consume more than 15 doses/week for males and over 10 doses/week for females were considered alcoholics, according to the type of drink. The individuals who did not consume alcohol for at least 6 months were considered ex-drinkers.

To evaluate the physical activity were considered the criteria established by the shortest version of the International Physical Activity Questionnaire (IPAQ) and the recommendation of the World Health Organization (WHO), individuals were classified as inactive and insufficiently active if their time of activity is less than 150 minutes per week[9,10]. Moreover, physical activity was also used as a continuous variable measure in minutes a week.

For evaluation of food consumption, the 24HR applied with the aid of the photographic album of food portions[11]. The 24HR had the following variables: meal, meal type (breakfast, lunch, dinner, and snacks), type of preparation/food, preparation, quantities in home measurements, atypical days for determine usual consumption, place where meals are held, and field of observations relevant to the study. The quantitative analysis of food consumption was performed through the Dietbox® diet analysis software, selected as a data source the Brazilian Food Composition Table (BFCT) and nutritional table of food idealized by the Brazilian Institute of Geography and Statistics (BIGE)[12].

Food consumption was analyzed through the DQI-R proposed by Previdelli *et al.*[7], based on the food guide to the Brazilian population[5]. This tool consists of nine food groups (total fruits; whole fruits; total vegetables; dark greens and orange vegetables; total grains; whole grains; milk and derivatives; meat; eggs and legumes; and oils) and two other groups of Nutrients (salt and saturated fats), and the group of calories from solid fat, alcohol, and added sugars, called AA fats. In the case of preparations that have more than one group in question, consumption was estimated from its ingredients[7].

The calculation of the quantities of food consumed was performed by transforming homemade measurements into grams and later was the quantitative evaluation of the diet. After the kilocalories were estimated, the scores of food groups and nutrients according to Previdelli *et al.*[7] were determined.

In general, each component evaluated received a maximum score, corresponding to five or ten points (except AA fats as mentioned above) when the intake was greater or equal to the recommended 1000 kcal of the respective food groups. When the consumption of a food group was absent, a score of zero was given. Intermediate values were calculated in proportion (between non-consumption and recommended minimum) in which nutrients or foods are consumed[7].

In the end, the maximum score is 100 points, of which 65 points was considered as

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an appropriate diet, score between 64 and 40 points was indicative of a need for dietary modification, and less than this was considered as an inadequate diet[13]. Table 1 describes, in a simplified way, the components of the DQI-R and their respective scores.

Table 1 - Distribution of portions and points of the revised diet quality index.

Revised DQI components	Score				
	0	5	8	10	20
Total fruit (a)	0	1.0 portion/ 1000 kcal	-	-	-
Whole fruits (b)	0	0.5 serving/ 1000 kcal	-	-	-
Total vegetables (c)	0	1.0 portion/ 1000 kcal	-	-	-
Dark greens, orange vegetables (c)	0	0.5 serving/ 1000 kcal	-	-	-
Total Grains (d)	0	2.0 portions/ 1000 kcal	-	-	-
Whole Grains	0	1.0 portion/ 1000 kcal	-	-	-
Milk and derivatives (e)	0	-	-	1.5 serving/1000 kcal	-
Meats, Eggs, and Legumes	0	-	-	1.0 portion/ 1000 kcal	-
Oils (f)	0	-	-	0.5 serving/ 1000 kcal	-
Saturated fat	≥ 15	-	10	≤ 7% TEV	-
Sodium	≥ 2.0	-	1.0	0.75g / 1000 kcal	-
AA fats	≥ 35	-	-	-	≤ 10% TEV

(a) Includes fruits and juices of natural fruits;
(b) Excludes fruit juices;
(c) Includes legumes only after the maximum score of meat, eggs and legumes is reached;
(d) Total Cereals: Includes the group of cereals, roots and tubers;
(e) Includes milk and derivatives, as well as soy-based drinks;
(f) Includes mono and polyunsaturated fats, as well as fish fat and oilseeds;
(g) AA fats: calories from solid fat, added sugars and alcohol;
(h) TEV: Total energy value.

Source: Adapted from Previdelli *et al.*, 2011.

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Nutritional status evaluation was performed through weight and height measurements to define body mass index (BMI), and classification was defined according to WHO (1997) for adults[14] and the Pan American Health Organization (PAHO) for the elderly[15]. The arm circumference (AC) and waist circumference (WC) were measured following the techniques advocated by the Ministry of Health and all measurements were performed at the time of consultation. The AC measurement took place with the help of an inextensible tape, and the classification table proposed by Frisancho (1990)[16] was used with the percentiles and classifications according to Blackburn *et al.* (1977)[17]. WC was measured at the height of the umbilical scar and the cutoffs to determine cardiovascular risk used were those proposed by WHO[18].

Biochemical data such as glycemic profile (fasting blood glucose and glycated hemoglobin (HbA1c)) and lipid profile (total cholesterol, high density lipoprotein (HDL), low density lipoprotein (LDL), and triglycerides) were harvested from the patient's medical records, considering reference values advocated by the Brazilian Society of Diabetes (2020)[19] and Brazilian Society of Cardiology (SBC) (2017)[20]. The examinations of the previous six months were considered at the time of consultation not requiring new exams.

Data were entered in the Excel Program for Windows® and were analyzed in the Statistical Package for the Social Sciences (SPSS) version 25.0. Continuous variables were tested for normality by the Kolmogorov-Smirnov test, those having a Gaussian distribution were presented in the form of means and standard deviation, and the non-Gaussian distributions were in the form of medians and interquartile intervals.

DQI-R components were described as means, standard deviations, minimum, maximum, and 25th, 50th, and 75th percentiles. The categorical variables were presented as proportions. To analyze the relationship between two continuous variables, the Spearman correlation test was used and the coefficients were classified into nonlinear (<0.3), weak (0.3-0.5), moderate (0.5-0.7) and strong (> 0.7) correlations 21. And in the comparison between two medians, the Mann-Whitney U test was used. A 5% significance level was adopted.

The present study was approved by the Ethics Committee of the Professor Fernando Figueira Institute of Integral Medicine (IMIP) on April 14, 2021, with a certificate of presentation of ethical appreciation 45229321.2.0000.5201, under opinion number: 4.649.808. After approval, all participants signed the Informed Consent Form (ICF) ensuring their participation in the study voluntarily and authorizing the use of the obtained data, of which a copy was given to the participant.

RESULTS

The sample consisted of 102 patients, mostly adults, with an average age of 50.6 ± 15.62 years old, median monitoring time was 3.5 months, and were predominantly female. Table 1 describes the sociodemographic characterization of the sample, which was mostly of married individuals or those in a stable union, predominance of the low social class (C1 and C2), and people were residents of the metropolitan region of Recife, PE.

In addition, 59.8% of patients were being followed because of the control of comorbidities and 52.9% for weight control. 78.4% of the sample had a nutritional diagnosis of overweight or obese and 83.3% had very high cardiovascular risk. A predominance of a sedentary lifestyle was also verified representing 63.7% of the sample as well as deleterious smoking and

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drinking habits in 4.9% and 11.8%, respectively (Table 1).

Table 2 presents the description with average and median values of the biochemical examinations. It is important to note that there was a loss of information due to missing reports in the medical records of the following variables: 28 of fasting glucose, 29 of total cholesterol and HDL, 30 of LDL, 32 of triglyceride, 38 of glycated hemoglobin, and 88 of albumin.

The DQI-R of the studied population obtained an average of 71.13 ± 13.37 points, in which 72.6% of the sample had a healthy diet. Individuals residing in urban areas had a higher DQI-R compared to residents of rural areas with statistical difference (76.5% vs. 69.2%, respectively; p <0.046); however, there was no statistical difference between the other socioeconomic variables and DQI-R. Regarding the consumed TEV, there was an average of 2,143.41 ± 576.32 kcal/day. It was observed in relation to the sample analyzed that about 34.3% consumed most of the meals outside the home. Table 3 presents the descriptive values of the DQI-R components, in which the average consumption of portions/1000kcal of the milk and derivatives group was reduced while the consumption of oils, sodium, saturated fat, and AA fats exceeded that recommended by the Food Guide for the Brazilian Population[5].

Regarding the analysis of DQI-R and the anthropometric, biochemical, and lifestyle variables of the patients treated, a positive, nonlinear correlation was observed only between follow-up time (months) and DQI-R (Table 4).

In Tables 5 and 6, the correlation between DQI-R components and biochemical markers demonstrated a positive, nonlinear correlation between fasting glucose and the consumption of the milk and derivatives group, and a nonlinear negative correlation was observed with the total grains group.

And finally, Table 7 demonstrates the correlation between DQI-R components and anthropometric variables, in which BMI increased as the consumption of dark green vegetables, fruits, and whole grains decreased. WC increased according to the decrease in the intake of total fruits, whole fruits, total vegetables, and whole grains. Furthermore, the percentage of AC adequacy demonstrated a nonlinear, negative correlation with whole fruits and whole grains.

Table 1- Sociodemographic characterization of patients treated at the Nutrition Outpatient Clinic of the Professor Fernando Figueira Institute of Integral Medicine, Recife, Pernambuco, May-October 2021.

Variables	n	%
Sex		
Male	19	18.6
Female	83	81.4
Age group		
20-59 years	68	66.7
≥60 years	34	33.3
Marital status		
Married / stable union	48	47.0
Divorced	4	3.9
Single	43	42.2
Widow	7	6.9

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continuation table 1...

Variables	n	%
Social class[a]		
B2	11	10.8
C1	24	23.5
C2	38	37.3
D-E	29	28.4
Origin		
RMR	82	80.4
Interior	19	18,6
Others	1	1.0
Reason for Consulta[b]		
Comorbidities control	61	59.8
Weight control	54	52.9
Lactose intolerance	3	2.9
Others	10	9.8
Lifestyle		
Smoking	5	4.9
Alcoholism	12	11.8
Physical Activity (IPAQ)[c]		
Inactive and insufficiently active	65	63.7
Active	37	36.3
Abdominald circumference		
Without cardiovascular risk	6	5.9
High risk	11	10.8
Very high risk	85	83.3
BMI[e]		
Low weight/ thinness	7	6.9
Eutrophy	15	14.7
Overweight/ Obesity	80	78.4
DQI-R[f]		
Inadequate diet	5	4.9
Diet that needs modification	23	22.5
Healthy diet	74	72.6

N: 102 patients; RMR: Recife Metropolitan Region; IPAQ: International Physical Activity Questionnaire; BMI: body mass index; DQI-R: Revised diet quality index; ABEP 2020 (upper social class (A1 and A2), middle (B1 and B2), low (C1 and C2), and very low (D and E); B one or more of one reason; Physical activity greater than 150 minutes per week); D Waist Circumference (WC) with cardiovascular risk (CVR): male (<94 cm: no risk;> 94cm: high risk;> 102cm: very high risk); female (<80 cm: No risk;> 80 cm: high risk;> 88 cm: very high risk); and World Health Organization 1997 (individuals ≥ 20 years: thinness <18.5kg/m²; eutrophy 18.5- 24.9kg /m²; overweight 25- 29.9kg/m²; Obesity> 30kg/m²); PAHO 2002 (individuals ≥ 60 years: thinness <23kg/m²; eutrophy 23- 28kg/m²; overweight> 28kg/m²); Fisberg et al., 2004: inadequate diet <40 points; diet that needs modification: 41-64 points; adequate diet ≥65 points).

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Table 2 - Characterization of biochemical examinations of glycemic and lipid profile of patients treated at the Nutrition Outpatient Clinic of the Professor Fernando Figueira Institute of Integral Medicine, Recife, Pernambuco, May-October 2021.

Biochemical variables	Mean	SD
Total cholesterol (mg/dl) (n: 73)	198.3	45.1
Low density lipoprotein (mg/dl) (n: 72)	125.8	43.7
-	**Median**	**QI**
Triglyceride (mg/dl) (n: 70)	128.0	94.8 – 198.5
High Density Lipoprotein (mg/dL) (N: 73)	47.0	41.0 – 59.0
Fasting glucose (mg/dL) (n: 74)	98.0	88.8 – 117.0
Glycosylated Hemoglobin (%) (n: 64)	6.0	5.5 – 6.8

SD: Standard deviation; QI: Interquartile interval.

Table 3 - Description of the components of the Revised Diet Quality Index (DQI-R) in portions of patients treated at the Nutrition Outpatient Clinic of the Professor Fernando Figueira Institute of Integral Medicine, Recife, Pernambuco, May-October 2021.

Food group	Mean ± SD	Min	Max	P25	P50	P75	Recommended values (portions)[1]
Total fruit (per/1000kcal)[a]	1.02 ± 0.93	0.00	5.79	0.23	1.02	1.43	
Whole fruits (per/1000kcal)[b]	0.67 ± 0.70	0.00	3.81	0.00	0.60	1.02	1.5
Total vegetables (per/1000kcal)	0.78 ± 1.33	0.00	10.27	0.34	0.46	0.72	
Dark greens, orange vegetables (by/1000kcal)[c]	4.37 ± 2.79	0.00	15.38	3.15	4.05	5.25	1.5
Total grains (per/1000kcal)[d]	2.24 ± 0.57	0.65	3.60	1.88	2.21	2.60	
Whole grains (per/1000kcal)	0.85 ± 0.57	0.00	2.82	0.41	0.80	1.24	3

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continuation table 3...

Food group	Mean ± SD	Min	Max	P25	P50	P75	Recommended values (portions)[1]
Milk and derivatives (per/1000kcal)[e]	0.35 ± 0.42	0.00	2.30	0.04	0.28	0.42	1
Meats, eggs, and legumes (per/1000kcal)	1.35 ± 0.53	0.54	3.70	0.99	1.36	1.54	1
Oils (per/1000kcal)[f]	2.84 ± 1.14	0.85	6.89	1.88	2.76	3.55	1
Sodium (g/1000kcal)	1.04 ± 0.52	0.30	2.70	0.66	0.92	1.30	≤0.7
Saturated fat (%)	8.61 ± 3.77	3.00	22.0	5.71	8.10	10.08	7%
AA Fats (%)	19.54 ± 7.74	5.00	50.0	14.97	18.71	23.12	<10%

[1]Daily consumption advocated by the Food Guide for Brazilian Population adapted to 1,000 kcal/ day[5]
[a] Includes fruits and juices of natural fruits;
[b] Excludes fruit juices;
[c] Includes legumes only after the maximum score of meat, eggs and legumes is reached;
[d] Total grains: Includes cereal groups, roots, and tubers;
[e] Includes milk and derivatives, as well as soy-based drinks;
[f] Includes mono and polyunsaturated fats, as well as fish fat, and oilseeds;
SD: Standard deviation; Min: Minimum; Max: maximum; Fats AA: calories from solid fats, added sugars, and alcohol.

Table 4 - Relationship between Revised Diet Quality Index (DQI-R) and anthropometric, biochemical, and lifestyle variables of patients treated at the Nutrition Outpatient Clinic of the Professor Fernando Figueira Institute of Integral Medicine, Recife, Pernambuco, May-October 2021.

Variables	DQI-R	
	ρ	p[a]
Monitoring time (months) (n: 102)	0.199	0.045
Physical Activity Time (min/week) (N: 102)	0.042	0.678
Sedentary time (min/week) (n: 102)	-0.064	0.521
Body mass index (kg/m^2) (n: 102)	-0.150	0.133
AC adequacy (%) (n: 102)	-0.106	0.288
Waist circumference (cm) (n: 102)	-0.155	0.119
Fasting glucose (mg/dl) (n: 74)	-0.184	0.117
Glycosylated Hemoglobin (%) (n: 64)	-0.012	0.928
Albumin (g/dl) (n: 14)	0.350	0.220
Total cholesterol (mg/dL) (n: 73)	0.076	0.523
Triglycerides (mg/dL) (n: 70)	-0.098	0.421
LDL (mg/dL) (n: 72)	-0.013	0.913

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Variables	DQI-R	
	ρ	p[a]
HDL (mg/dL) (n: 73)	0.207	0.079
Total energy value (kcal/day) (n: 102)	0.029	0.773

BMI: body mass index; AC: Arm circumference; LDL: low density lipoprotein; HDL: High Density Lipoprotein; mg/dL: milligram by deciliter; g/cL: grass by deciliter; kcal/day: kilocalories per day.
[a]Spearman correlation.

Table 5 - Correlation between the components of the Revised Diet Quality Index (DQI-R) and the biochemical markers of glycemic profile of patients treated at the Nutrition Outpatient Clinic of the Professor Fernando Figueira Institute of Integral Medicine, Recife, Pernambuco, May-October 2021.

DQI-R Components	FG (n:74)		HbA1c (n:64)	
	ρ	p[a]	ρ	p[a]
Total fruit (per/1000kcal)	-0.047	0.689	0.028	0.827
Whole fruits (per/1000kcal)	-0.051	0.668	-0.079	0.534
Total vegetables (per/1000kcal)	-0.109	0.356	-0,114	0.372
Dark-green, orange vegetables (per/1000kcal)	0.180	0.125	0.054	0.671
otal grains (per/1000kcal)	-0.229	0.050	-0.142	0.262
Whole grains (per/1000kcal)	-0.125	0.287	-0.090	0.481
Milk and derivatives (per/1000kcal)	0.265	0.023	0.224	0.075
Meats, eggs, and legumes (per/1000kcal)	0.143	0.223	0.157	0.216
Oils (by/1000kcal)	0.017	0.885	-0.006	0.960
Sodium (by/1000kcal)	-0.022	0.849	-0.017	0.893
Saturated fats percentage	0.164	0.163	0.041	0.748
AA fat percentage	0.212	0.069	0.049	0.699

[a]Spearman correlation;
HbA1c: Glycosylated hemoglobin; AA Fats: calories from solid fats, added sugars, and alcohol.
FG: Fasting Glucose .

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Table 6 - Correlation between the components of the Revised Diet Quality Index (DQI-R) and the biochemical markers of lipid profile of patients treated at the Nutrition Outpatient Clinic of the Professor Fernando Figueira Institute of Integral Medicine, Recife, Pernambuco, May-October 2021.

DQI-R Components	TC (n:73)		TG (n:70)		LDL (n:72)		HDL (n:73)	
	ρ	p[a]	ρ	p[a]	ρ	p[a]	ρ	p[a]
Total fruits (per/1000kcal)	0.168	0.154	0.010	0.932	0.176	0.139	0.130	0.272
Whole fruits (per/1000kcal)	0.041	0.730	-0.129	0.286	-0.009	0.943	0.114	0.339
Total vegetables (per/1000kcal)	0.189	0.109	0.001	0.992	0.155	0.194	0.007	0.950
Dark-green, orange vegetables (per/1000kcal)	0.105	0.376	0.032	0.793	0.043	0.721	0.054	0.649
Total cereals (per/1000kcal)	0.102	0.392	0.017	0.889	0.050	0.676	0.184	0.119
Whole grains (per/1000kcal)	-0.013	0.913	-0.147	0.224	-0.125	0.297	0.145	0.220
Milk and derivatives (per/1000kcal)	0.210	0.075	0.156	0.198	0.148	0.216	0.092	0.437
Meats, eggs and legumes (per/1000kcal)	0.011	0.928	0.160	0.185	-0.009	0.941	-0.197	0.096
Oils (by/1000kcal)	-0.094	0.429	-0.100	0.409	-0.010	0.933	-0.050	0.676
Sodium (by/1000kcal)	0.008	0.947	0.065	0.592	-0.044	0.714	0.008	0.944
Percentage saturated fats	0.055	0.645	0.058	0.632	0.069	0.566	-0.033	0.784
Percentage fat AA	-0.021	0.862	-0.006	0.959	-0.014	0.906	-0.090	0.449

[a]Spearman correlation;
TC: Total cholesterol; TG: triglycerides; LDL: low density lipoprotein; HDL: High Density Lipoprotein; Fats A.A: calories from solid fats, addition sugar and alcohol.

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Table 7 - Correlation between the components of the Revised Diet Quality Index (DQI-R) and anthropometric variables of patients treated at the Nutrition Ambulatory of the Professor Fernando Figueira Institute of Integral Medicine, Recife, Pernambuco, May-October 2021.

DQI-R Components	BMI (n:102)		Waist circumference (n:102)		Adequate AC % (n:102)	
	ρ	p[a]	ρ	p[a]	ρ	p[a]
Total fruit (per/1000kcal)	-0.156	0.117	-0.252	0.011	-0.167	0.093
Whole fruits (per/1000kcal)	-0.214	0.031	-0.286	0.004	-0.205	0.039
Total vegetables (per/1000kcal)	-0.175	0.078	-0.204	0.039	-0.185	0.062
Dark-green, orange vegetables (per/1000kcal)	-0.196	0.049	-0.166	0.096	-0.153	0.125
Total grain (per/1000kcal)	0.015	0.879	0.025	0.807	0.045	0.652
Whole grains (per/1000kcal)	-0.239	0.016	-0.235	0.017	-0.231	0.019
Milk and derivatives (per/1000kcal)	-0.106	0.288	-0.102	0.305	-0.019	0.848
Meats, eggs, and legumes (per/1000kcal)	-0.097	0.331	-0.064	0.522	-0.017	0.866
Oils (by/1000kcal)	0.016	0.875	0.003	0.976	0.046	0.646
Sodium (by/1000kcal)	0.033	0.741	-0.005	0.962	0.073	0.465
Saturated Fat Percentage	-0.056	0.575	-0.056	0.576	-0.047	0.636
AA Fat Percentage	0.036	0.721	0.010	0.924	-0.013	0.898

[a]Spearman correlation;
BMI: body mass index; AC: arm circumference.

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DISCUSSION

With regards to DQI-R, the present study found satisfactory values of dietary quality, different from Souza *et al.* who, with 100 overweight patients in a nutrition outpatient clinic in Recife, found a DQI-R score of 55.9 ± 13.4 points indicating need for dietary modification[22].

Additionally, despite the absence of relationship between BMI and DQI-R, it is important to note that in this study there was a predominance of overweight/obese individuals with a DQI-R classified as a healthy diet. One possible explanation can be attributed to reverse epidemiology, which concerns the fact that individuals with overweight/obesity modify food consumption both before and during nutritional follow-up with the objective of supporting weight loss, a fact that can be reinforced by the three-month follow-up time's median.

A nonlinear correlation was observed between nutritional follow-up time and DQI-R, corroborating an open clinical trial held with 70 elderly individuals evaluating the quality of the diet in two moments (pre- and post-follow-up). The authors found that after activities from nutritional education, individuals presented better DQI-R progressing with increased consumption of vegetables and more satisfactory eating behavior[23]. In addition, in a randomized clinical trial with 50 carriers of atherosclerosis accompanied for 36 months, a positive impact was observed with better adherence to the diet demonstrating the importance of nutritional follow-up[24].

The most consumed food groups were those of dark-green, orange vegetables, and legumes, which can be justified by the fact that beans are a fundamental component of meals of the Brazilian population. On the other hand, the least consumed was the milk and derivatives group, probably due to the cost of these foods being a little higher; the low consumption of which may lead to nutritional deficiencies. This fact is a caution within the context of public policies that should involve means and actions offering a rich and varied diet.

A study of 1,147 adults participating in a population inquiry comparing a dietary quality index and anthropometric data has verified the reduction of parameters that relate to adipose mass and a better quality diet[25]. Likewise, the present study demonstrated an association between the consumption of total fruit with lower BMI and WC, probably because these foods have low caloric density and nutrients that favor weight loss which consequently decreased anthropometric measurements associated with excess fat.

Regarding biochemical examinations, most individuals had some alterations, even if subtle, especially for HbA1c, fasting blood glucose, TC, and fractions. There was a nonlinear positive correlation between milk consumption and derivatives and blood glucose. This is a controversial finding because although studies comparing milk and glycemic control are scarce, the composition of these products includes amino acids and lactose which help increase insulin synthesis and are also rich in minerals such as magnesium, calcium, and potassium[26].

More controlled glycemic levels were associated with the proper consumption of total grains, which cover the wholegrains. Silva *et al.*[24], in a randomized clinical trial, observed improved blood glucose after the proposing a diet regarded as cardioprotective, which was justified by the fact that fiber consumption was encouraged in the proposed diet. It is known that both carbohydrate absorption and gastric emptying are slow with the proper

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consumption of soluble fibers, influencing insulin secretion.

Regarding geographical areas and DQI-R, it was evidenced that individuals who lived in urban areas had higher diet quality compared to those in the rural area, which can be justified by the growing industrialization process in the interior areas, with exposure of ultra-processed foods to these groups[27]. In contrast, Santana *et al.*[28] assessing the quality of the diet of the five demographic regions that make up Brazil, considering metropolitan and rural areas, showed that those residing in rural areas had greater DQI-R when compared to the urban area.

Among the factors that may interfere with DQI-R, the economic profile can influence social relationships and individuals' the way of life including access to a healthy diet, as the cost of food involves the process of choice to food preparation[29]. However, surprisingly, no significant association was observed in the present study.

It is noteworthy that the evaluation of food consumption presents the limitation of memory bias, and although DQI-R is an interesting tool to evaluate and monitor the quality of the diet, it possesses complexities regarding its application and analysis. Additionally, it is worth reflecting on the limited score for the maximum consumption of some food groups, such as total cereal groups, oils, sodium, and percentages of saturated fat and AA fats, where, in situations of exceeding the recommended values, a negative score could be attributed so that the effect would interfere with the final calculation. Moreover, other limitations are the inclusion of adults and the elderly in the same sample, reduced number of participants, the loss of information of biochemical exams, and the study design may have interfered with the results found.

CONCLUSION

Food consumption is considered complex and requires the evaluation of factors that may interfere with it. The findings of the present study showed that the nutritional follow-up time parameter correlated positively with DQI-R. Adherence to dietary treatment modifies the quality of food and influences the decision making to adopt a healthier lifestyle, which is related to the prevention and/or control of CNCD and complications.

CRediT author statement

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REFERENCES

1. Reynolds R, Dennis S, Hasan I, Slewa J, Chen W, Tian D, et al. A sistematic rewiew of chronic disease management interventions in primary care. BMC Fam Pract. 2018; 19(1):1-13. DOI: 10.1186/s12875-017-0692-3
2. Organização Mundial Da Saúde. Relatório Mundial de Envelhecimento e Saúde 2015 [internet]. Genebra: OMS; 2015. Disponível em: https://apps.who.int/iris/bitstream/handle/10665/186468/WHO_FWC_ALC_15.01_por.pdf?sequence=6
3. Brasil. Ministério da Saúde. Secretaria de Vigilância em Saúde. Departamento de Análise em Saúde e Vigilância de Doenças Não Transmissíveis. Plano de Ações Estratégicas para o Enfrentamento das Doenças Crônicas e Agravos não Transmissíveis no Brasil 2021-2030 [recurso eletrônico] / Ministério da Saúde, Secretaria de Vigilância em Saúde, Departamento de Análise em Saúde e Vigilância de Doenças Não Transmissíveis. – Brasília: Ministério da Saúde, 2021. Disponível em: https://www.gov.br/saude/pt-br/centrais-de-conteudo/publicacoes/publicacoes-svs/doencas-cronicas-nao-transmissiveis-dcnt/09-plano-de-dant-2022_2030.pdf/
4. Brasil. Secretaria Estadual de Saúde. Secretaria Executiva de Vigilância em Saúde. Diretoria Geral de Promoção, Monitoramento e Avaliação da Vigilância em Saúde. Perfil socioeconômico, demográfico e epidemiológico: Pernambuco 2016; 1ª edição, Recife, 2016. Disponível em: http://portal.saude.pe.gov.br/sites/portal.saude.pe.gov.br/files/perfil_socioeconomico_demografico_e_epidemiologico_de_pernambuco_2016.pdf
5. Brasil, Coordenação Geral da Política de Alimentação e Nutrição, Departamento de Atenção Básica, Secretaria de Assistência à Saúde, Ministério da Saúde. Guia alimentar para a população brasileira: promovendo a alimentação saudável. Brasília: Ministério da Saúde; 2008. Disponível em: https://bvsms.saude.gov.br/bvs/publicacoes/guia_alimentar_populacao_brasileira_2008.pdf
6. Guenther PM, Reedy J, Krebs-Smith SM, Reeve BB. Evaluation of the Healthy Eating Index-2005. J Am Diet Assoc. 2008 Nov;108(11):1854-64. DOI: 10.1016/j.jada.2008.08.011. PMID: 18954575.
7. Previdelli ÁN, De Andrade SC, Pires MM, Ferreira SRG, Fisberg RM, Marchioni DM. Índice de Qualidade da Dieta Revisado para população brasileira. Rev. Saúde Pública, São Paulo, 2011; 45(4): 794-8. DOI: 10.1590/S0034-89102011005000035
8. Associação Brasileira de Empresas de Pesquisa. Alterações na aplicação do Critério Brasil, 2020. Disponível em: https://www.abep.org/criterioBr/01_cceb_2021.pdf
9. Hallal PC, Victora CG. Reliability and validity of the International Physical Activity Questionnaire (IPAQ), Med Sci Sports Exerc. 2004, 3(36): 556. DOI: 10.1249/01.mss.0000117161.66394.07
10. World Health Organization. WHO guidelines on physical activity and sedentary behaviour: at a glance [internet]. Genebra: WHO; 2020. Disponível em: https://www.who.int/publications/i/item/9789240014886
11. Lopez RPS, Botelho RBA. Álbum Fotográfico de Porções Alimentares. Editora Metha; 1ª edição (1 setembro 2013).
12. TACO- Tabela brasileira de Composição de Alimentos. UNICAMP. 4ª edição. rev. e ampl. NEPA- UNICAMP, 2011. Disponível em: https://www.nepa.unicamp.br/taco/contar/taco_4_edicao_ampliada_e_revisada.pdf?arquivo=1
13. Fisberg RM, Slater B, Barros RR, Lima FD, Cesar CLG, Carandina L, et al. Healthy Eating Index: evaluation of adapted version and its applicability. Rev. Nutr., Campinas. 2004;3(17): 301-8. DOI: 10.1590/S1415-52732004000300003.
14. Organização Mundial da Saúde. Obesidade: prevenção e controle da epidemia global. Relatório de uma Consulta de Obesidade da OMS, Genebra, 1997.
15. Organização Pan-Americana de Saúde. XXXVI Reunión del Comitê Asesor de Ivestigaciones en Salud – Encuestra Multicêntrica – Salud Beinestar y Envejecimeiento (SABE) en América Latina e el Caribe, OPAS 2002.
16. Frisancho AR. Anthropometric standards for the assessments of growth and nutritional status. University of Michigan, 1990.
17. Blackburn GL, Bistrian BR, Maini BS, Schlamm HT, Smith MF. Nutritional and metabolic assessment of the hospitalized patient. JPEN J Parenter Enteral Nutr. 1977;1(1):11-22. DOI: 10.1177/014860717700100101. PMID: 98649.
18. Organização Mundial da Saúde. Obesidade: prevenindo e controlando a epidemia global - relatório de uma consulta da OMS sobre obesidade, Genebra, OMS 2000.
19. Sociedade Brasileira de Diabetes. Diretrizes da Sociedade Brasileira de Diabetes, SBD 2020. Disponível em: http://www.saude.ba.gov.br/wp-content/uploads/2020/02/Diretrizes-Sociedade-Brasileira-de-Diabetes-2019-2020.pdf
20. Sociedade Brasileira de Cardiologia. Atualização da Diretriz Brasileira de Dislipidemias e Prevenção da Aterosclerose – 2017. Arq Bras Cardiol., SBC 2017. Disponível em: http://publicacoes.cardiol.br/2014/diretrizes/2017/02_DIRETRIZ_DE_DISLIPIDEMIAS.pdf
21. Rumsey DJJ. Statistics. 2º ed. Nova Jersey: For Dummies, 2019.
22. Souza JEP, Rodrigues IG, Arruda IKG, Diniz AS, Pinho CPS. Análise da qualidade da dieta de pacientes com excesso de peso. RBONE. 2021;14(88): 721-34. Disponível em: http://www.rbone.com.br/index.php/rbone/article/view/1367
23. Luz CR, Salomon ALR, Fortes RC. Efeitos da Educação Alimentar e Nutricional sobre qualidade da dieta e comportamento alimentar de idosos. Com. Ciências Saúde. 2021;32(01). DOI: 10.51723/ccs.v32i01.546
24. Silva AK, Weber B, Silva KC, Pinto SL. Intervenção Nutricional melhora qualidade da dieta e reduz glicemia em pacientes com aterosclerose manifesta. Rev. Cereus . 2021;13(2):17-8. DOI: 10.18605/2175-7275/cereus.v13n2p17-28
25. Silva DMC, Santos TSS, Conde WL, Slater B. Estado nutricional e risco metabólico em adultos: associação com a qualidade da dieta medida pela ESQUADA. Rev Bras Epidemiol. 2021; 24: e210019. DOI: 10.1590/1980-549720210019
26. Dall'alba V, Azevedo MJ. Papel das fibras alimentares sobre o controle glicêmico, perfil lipídico e pressão arterial em pacientes com diabetes melito tipo 2. Rev HCPA, Porto Alegre. 2010; 4(30): 363- 71. Disponível em: http://hdl.handle.net/10183/157755
27. Torreglosa CR, Sarti FM, Bersch-Ferreira AC, Weber B, Santos RHN, Chiavegatto Filho ADP. Qualidade da dieta e despesa diária com alimentação em adultos com doença cardiovascular no Brasil. Cad. Saúde Pública. 2020; 36 (10). DOI: 10.1590/0102-311X00225019.
28. Santana ABC, Sarti FM. Mapeamento da qualidade nutricional da alimentação em diferentes estados do Brasil, 2019; Confins [En ligne], 39. DOI: 10.4000/confins.18449.
29. Minuzi GA, Pommer RMG. Reflexões iniciais sobre a alimentação das classes sociais. RELACult [Internet]. 5º de maio de 2019;5(4). DOI: 10.23899/relacult.v5i4.1198.

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