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Jair Fabricio Aburto González[1], Ross Armstrong[2], Armando Monterrosa Quintero[3]

[1]Facultad de Salud y Ciencias Sociales. Universidad de las Américas (UDLA). Santiago, Chile. [2]Rehabilitation and Healthy Lives Group. Institute of Health. University of Cumbria. Carlisle, England. UK. [3]Altius Performance Laboratory. Programa de Educación Física y Deporte. Universidad Surcolombiana. Colombia

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Correspondence: Armando Monterrosa Quintero. Altius Performance Laboratory. Programa de Educación Física y Deporte. Facultad de Educación. Universidad Surcolombiana. Neiva, Huila. Colombia
e-mail: armando.monterrosa@usco.edu.co

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ABSTRACT

Introduction: surveys play a crucial role in evaluating the quality of food in populations, especially in healthcare settings, helping identify important characteristics of food descriptions and improving efficiency in the collection and management of data in dietary surveys.

Objective: the primary aim of this study was to analyze the internal consistency of the New Index of Global Food Quality (NIGFQ) instrument and assess its applicability to sociodemographic variables and levels of physical activity (IPAQ-S) in a specific region of Chile.

Methods: a descriptive, comparative, and correlational study that utilizes the online platform of Google Forms for data collection using the New Index of Global Food Quality (NIGFQ) and IPAQ-S instruments, in addition to considering sociodemographic variables, in a sample of 1,331 participants from the metropolitan region of Chile.

Results: the study shows an improvement in the reliability of the NIGFQ (Cronbach's alpha: 0.63 to 0.71). Findings reveal significant inverse correlations between fruits ($r = -0.31$; $p \leq 0.05$) and legumes ($r = -0.34$; $p \leq 0.05$) with body mass.

Conclusions: it is concluded that values above 52.5 points are considered healthy on the new evaluation scale of the index, supported by statistical reliability tests. Similarly, the components of the adjusted New Index of Global Food Quality, particularly fruits and vegetables in greater proportion, show a beneficial relationship with daily consumption in reducing body mass index and body weight.

Keywords: Nutrition. Diet. Surveys. Metabolic task. Reliability.

RESUMEN

Introducción: las encuestas desempeñan un papel crucial en la evaluación de la calidad de los alimentos en las poblaciones, especialmente en entornos de atención médica, ayudando a identificar características importantes de las descripciones de alimentos y mejorando la eficiencia en la recopilación y gestión de datos en encuestas dietéticas.

Objetivo: el objetivo principal de este estudio fue analizar la consistencia interna del instrumento Nuevo Índice de Calidad Global de Alimentación (NICGA) y evaluar su aplicabilidad a variables sociodemográficas y niveles de actividad física (IPAQ-S) en una región específica de Chile.

Métodos: estudio descriptivo, comparativo y correlacional que utiliza la plataforma en línea de Google Forms para la recopilación de datos utilizando los instrumentos NICGA e IPAQ-S, además de considerar variables sociodemográficas, en una muestra de 1,331 participantes de la región metropolitana de Chile.

Resultados: el estudio muestra una mejora en la confiabilidad del NICGA (alfa de Cronbach: 0,63 a 0,71). Los hallazgos revelan correlaciones inversas significativas entre frutas ($r = -0,31$; $p \leq 0,05$) y legumbres ($r = -0,34$; $p \leq 0,05$) con el peso corporal.

Conclusiones: se concluye que los valores por encima de 52,5 puntos se consideran saludables en la nueva escala de evaluación del índice, respaldados por pruebas estadísticas de fiabilidad. De manera similar, los componentes del Nuevo Índice de Calidad Alimentaria Global ajustado, en particular las frutas y verduras en mayor proporción, muestran una relación beneficiosa con el consumo diario en la reducción del índice de masa corporal y el peso corporal.

Palabras clave: Nutrición. Dieta. Encuestas. Tarea metabólica. Confiabilidad.

INTRODUCTION

In the world, more than 821 million people suffer from hunger due to factors such as demographic growth, urbanization, climate change, and the excessive use of natural resources and ecosystems, among others (1). Despite agricultural food systems and recommendations from the Food and Agriculture Organization (FAO) of the United Nations, the current demands for food for the global population are not being met (2). Currently, various methods exist to assess the quality of food, using self-perception of the consumer and in the literature, several methodologies comprehensively address the quality of the diet in a population (3). Among them, the Healthy Eating Index (HEI), developed by the Center for Nutrition Promotion of the United States Department of Agriculture in 1995, is recommended. Its main objective is to determine the degree of adherence of the U.S. population to the Dietary Guidelines (4).

To analyze eating behaviors, various surveys have been used, such as consumption trends or 24-hour recall (5), where dietary consumption, specific food groups, and nutrients are analyzed. Additionally, the degree of adherence to intake recommendations for the population is measured (5). To achieve a comprehensive diagnosis of nutrition, in recent years,

various global diet quality indices have been developed. These are constructed from algorithms that determine how healthy the dietary pattern is (6). The proposed indices are based on current nutritional knowledge and the dietary guidelines of a specific country, allowing for the identification of key dietary risk factors associated with non-communicable chronic diseases (7).

Surveys play a crucial role in evaluating the quality of food in populations, especially in healthcare settings (8). They also help identify important characteristics of food descriptions, improving the efficiency of data collection and management in dietary surveys (5). These surveys often use anthropometric and food consumption indicators such as food records and 24-hour dietary recalls, commonly used to assess nutritional and health status (9). Consumers also rely on surveys to assess the quality, safety, and environmental impact of food, with freshness, taste, and appearance being key factors (10).

The caloric content of foods, due to their varied contents, has been on the rise, leading to overweight and obese in individuals furthermore, malnutrition is considered, evident in various social classes across all countries, and when combined with physical inactivity, it is associated with a deterioration of physical health and the development of cardiovascular diseases (11).

In Latin America, which is composed of 33 countries with approximately 650 million people, of which 42.5 million are children aged 0 to 19 years, and there is a prevalence of those classified as overweight and obese, which is becoming a public health burden due to the consequences of non-communicable chronic diseases (NCDs) affecting the population of all ages and genders (12). This public health problem results in an increase in economic health costs and has a growing incidence in all regions of the countries (13).

The purpose of this study was to assess the reliability of the survey titled "Proposal for a New Index of Global Food Quality (NIGFQ)", originally

developed by Ratner et al. (2017) within the Chilean context and adapted from Kennedy et al. (1996). This assessment involved a comparison with similar research conducted in various populations (14). Specifically, the study aimed to analyze the internal consistency of the instrument. Furthermore, it evaluated the applicability of the index to different sociodemographic variables and levels of physical activity within a specific population from the Chile region.

MATERIALS AND METHODS

Procedures

This study is considered descriptive, comparative, and correlational because it determines relationships or effects between the study variables. For data collection, the study utilized the online platform of Google Forms, accessible through the following link (https://tinyurl.com/mrmdkykh). The application of instruments took place from June 1st to July 12th, 2020, with the inclusion criterion being the acceptance of informed consent and voluntary participation. The self-perceived survey remained online for 42 days, and the response time ranged from approximately 8 to 15 minutes. The instrument included sociodemographic variables, the International Physical Activity Questionnaire (IPAQ-S), and New Index of Global Food Quality.

The sociodemographic variables included in the study were: gender, age, height, weight, geographical origin, socioeconomic level, as well as questions from IPAQ-S and NIGFQ. After the specified dates, the results were downloaded into Excel spreadsheets, tabulated, and examined to initiate the statistical procedure. Participants who did not complete the survey in its entirety or those with higher levels of outliers were excluded from the study.

The study was approved by the Ethical-Scientific Evaluation Committee of the Santiago Campus of the Universidad Mayor, dated June 29, 2020. The analysis of the documentation considered the recommendations and

norms contained in the following legal bodies and international declarations, specifically related to the proposed research type: Law No. 19.628 "On the Protection of Privacy," dated August 18, 1999. Circular No. A15/15 dated April 18, 2013, from the Ministry of Health of Chile, providing guidelines on obtaining consent from individuals participating in scientific research.

The study adhered to the Declaration of Helsinki of the World Medical Association, on ethical principles for medical research involving human participants, in its version approved at the 64th General Assembly in October 2013.

For the data collection protocol, two surveys with open, closed, and alternative questions were used. This was based on the study by Ratner et al. (2017), along with sociodemographic questions and the International Physical Activity Questionnaire IPAQ-S, in its Spanish version.

To conduct the analysis of this research, a factorial design was employed, comprising five study variables:

1. Gender factor, divided into two levels (male and female).
2. Body mass index (BMI) factor, subdivided into three levels (underweight, normal, and overweight).
3. Quality of food factor, three levels (unhealthy, needs changes, and healthy).
4. Physical Activity factor, subdivided into three levels (low, moderate, and high).
5. Age category factor, subdivided into three levels (18 years to > 30 years).

Participants

A total of 1,331 participants enrolled in the study from various communities in the Metropolitan Region, from both rural and urban areas. Inclusion criteria such as not having pathologies, being self-

sufficient, and being 18 years old were applied. A total of 93 surveys were excluded due to lack of information or incompleteness, resulting in a total of 1,238 study participants. (51.29 % female, 48.71 % male). The age range varied from 18 to 65 years, (mean 30.2 ± 8.6 years).

The sample selection utilized social media platforms such as Facebook and Instagram, where the link and invitation to participate were openly and publicly shared, following the concept of "Snowball Sampling" proposed by Atkinson & Flint (2001).

To characterize the population segmentation, social indicators were considered goods or attributes whose value is primarily expressed in relation to occupation, education, and family composition. These indicators included marital status, level of education, occupation, number of people in the household, and classification in relation to average income.

Body mass index evaluation

To assess the body condition, self-reports of total mass (kg) and height (cm) were requested to calculate the body mass index (BMI) and classify the participants' status according to global health parameters. The use of self-reported information (total mass and height) was employed, as it is a variable already validated with good reliability (15). In the guidelines for this evaluation, it should be considered that the difference between self-reported and actual mass should not exceed 2.4 kg, and for height, a variation not exceeding 3.5 cm, demonstrating a high degree of accuracy in the self-reports of these parameters (16).

New Index of Global Food Quality

To measure the quality of nutrition, a questionnaire called the New Index of Global Food Quality was administered to university students in a national sample, following the dietary guidelines of the Ministry of Health in Chile (17). The instrument consists of 14 questions, divided into two

sections: the first comprises 10 multiple-choice questions regarding eating habits, and the second part includes 4 questions with responses based on the frequency of food consumption. The questionnaire is composed of three sections, distributed into 12 variables, each with six possible responses ranging from 1 to 10. The ideal score, according to dietary guidelines, is 10, while the least healthy score is 1. Establishing the maximum score with all 12 variables studied at 120, it was classified according to the following criteria: healthy: 90-120 points; needs changes: 60-89 points; unhealthy: < 60 points.

Levels of physical activity

This assessment was conducted through self-reporting of physical activity (PA) and sedentary time over the past 7 days, as determined by the abbreviated version of the IPAQ (International Physical Activity Questionnaire). The data were reported in minutes per day (min/day) for each of the domains, and to estimate the total physical activity (PA) performed, the reported time was adjusted by the metabolic equivalent (METs), which corresponds to 3.3 METs for light intensity (walking), 4 METs for moderate, and 8 METs for vigorous intensity. The total Physical Activity was reported as the sum of METs for each intensity. Additionally, the IPAQ-SF algorithm was used to transform continuous data into categorical data (low, moderate, and high physical activity). The results were calculated as the weekly metabolic equivalent for exercises and tasks in minutes (MET-minutes/week). Everything was done according to the scoring protocols and recommendations for physical activity levels in IPAQ, which are low (< 600 MET-minutes/week), moderate (> 600 MET-minutes/week), and high (> 3000 MET-minutes/week) to determine the values according to METS.

Categorization and inclusion criteria

To characterize the population segmentation, social indicators were considered goods or attributes whose value is primarily expressed in relation to occupation, education, and family members comprising the family group. The calculation of the sample was based on the representativeness of the participants under study, from a universe characterized mainly by the metropolitan region (Santiago, Chile). The sample size was calculated using the equation for finite populations through a sample calculator (https://www.netquest.com/en/panel/sample-calculator/statistical-calculators) with a universe population of 5,455,464 individuals; 2,756,945 males (50.4 %) and 2,698,519 females (49.7 %), the sample size was determined. The calculation considered a confidence level of 95 %, using a margin of error of 5 %. The following inclusion and exclusion criteria were applied:

1. Being under 18 years old.
2. Having disabilities associated with reduced mobility (musculoskeletal injuries).
3. Having pathologies and/or being pregnant.
4. Being under pharmacological treatment.
5. Having any physical or mental disability.

Statistical analysis

All analyses were conducted using Jamovi Software® version 1.6. Sociodemographic data and results are presented as percentages for qualitative variables through contingency tables and as mean ± standard deviation for quantitative variables. The normality and homogeneity of variance of the data were verified using the Kolmogorov-Smirnov test and Levene's test. Subsequently, the interaction between variables was analyzed through the analysis of variance (ANOVA) with a mixed component, complemented with Tukey's post hoc tests to identify significant differences between groups.

Multivariate analysis of variance (MANOVA) was conducted to explore in-depth the variables that compose eating habits. Effect size measurement followed Cohen's proposal (1997). Spearman's correlation was used to identify relationships between variables. The internal consistency of the instrument was evaluated using the Cronbach's Alpha test with a significance level of $p \leq 0.05$ in all analyses.

RESULTS

Reliability and scoring criteria

The reliability of the proposed instrument for the New Index of Global Food Quality, composed of 14 questions, was assessed through the calculation of the Cronbach's alpha coefficient, yielding a value of 0.63. This result is considered undesirable according to the criteria established by (18). To enhance the internal consistency of the instrument, an additional analysis focused on seven specific variables was conducted: vegetables, fruits, milk and dairy products, legumes, fish, sugar, and fried foods, determined by the variables that showed an increase in the Cronbach's coefficient when added or removed. The resulting Cronbach's alpha coefficient for these variables was 0.71, indicating good internal consistency (19). The research findings revealed a maximum possible score of 70 points for the index. A new classification based on percentiles (25, 50, and 75) was established, dividing scores into the following ranges:

Score (points)	**Classification**
52.5 to 70	Healthy
40 to 52.4	Needs improvement
< 40	Unhealthy

Population Characteristics (χ^2)

The sociodemographic data of the participants were categorized by gender and presented in terms of number and percentages for nominal and ordinal variables. For continuous data, mean and standard deviation values were provided (Table I).

No significant differences or associations were found between gender and the values of morphological information, BMI, physical activity level, age category and eating habits ($p > 0.05$).

Significant inverse correlations were found in almost all components of the new food quality index when compared to mass and BMI (Table II) with coefficients ranging from small (r = 0.1 to 0.29) to moderate (r = 0.3 to 0.5) according to Hopkins (2002).

Trivial (r = 0.0 to 0.1) and small (0.1 to 0.3) positive and inverse correlations were identified between the New Index of Global Food Quality and body composition variables (Table III). The scale of correlation coefficients was determined according to the proposed classification by Hopkins (2002).

In table IV the results are reported according to the eating habits vs. study variable (sex, marital status, education level, socioeconomic status, BMI level, self-perceived overweight, physical activity level, and age category) and analyzed using the MANOVA test (Pillai’s Trace) and ANOVA (Tukey).

The disparity in educational levels reveals a significant impact, with a large effect size (ES: 1.46). When contrasting both levels, an unhealthy trend is observed in individuals without higher education. The identified differences in socioeconomic status highlight a large effect size between low and high levels (ES: 1.0). Likewise, concerning body mass index (BMI), a significant difference is observed, especially between low and overweight levels (ES: 1.0). Cohen's results show that disparities in self-

perception of overweight have a small effect (ES: 0.3). Regarding levels of physical activity, a small effect size is notable, especially between low and very active activity levels (ES: 0.31). Similarly, age presents large effects when comparing ages 18 to 25 with those over 30 years old (21).

DISCUSSION

The fundamental objectives of this research were established with two main purposes. Firstly, the aim was to validate the reliability of the instrument used, the New Index of Global Food Quality. Secondly, a detailed analysis of the overall NIGFQ was undertaken, considering its comparison and relationship with sociodemographic variables and levels of physical activity in a representative sample of the Chilean population. To facilitate a more comprehensive understanding of the manuscript, the discussion was structured into two sections, allowing for a detailed analysis of the findings achieved throughout this study.

Reliability of the New Index of Global Food Quality

Four similar studies have been identified with variations in some variables, wherein no evidence of reliability testing is apparent. It is pertinent to address this gap found in the literature for a better understanding of the results. Numerous studies have explored the reliability of surveys in assessing food quality, emphasizing the importance of this factor in response reliability. An illustrative example comes from a study revealing that satisfaction surveys with food service for patients in medical settings are generally valid and of acceptable quality. In this context, food quality emerged as a key predictor of overall satisfaction (8). Other studies have developed specific indices, such as the Main Meal Quality Index, demonstrating its internal validity and reliability in assessing the nutritional quality of meals (22). Similarly,

Kang & Namkung (2022) contributed to the landscape by creating and validating a scale to measure service quality in fresh food delivery platforms. This tool addresses crucial factors such as information quality and delivery. and they examined the reliability and validity of a simplified food frequency questionnaire, concluding that it was acceptable for use in epidemiological studies in adults undergoing physical examinations. In our study, 14 variables that make up the food quality index were analyzed, and the analyses did not yield reliability values. Considering the literature, the number of questions was reduced to seven, improving the Cronbach's alpha (24).

Regarding the reliability assessment, it is essential to highlight the crucial role of the Cronbach's alpha test. However, its interpretation and application can be complex, as the survey design characteristics may influence the reliability of scores, leading to mixed results (25). Furthermore, the literature warns against overreliance on Cronbach's alpha, as it does not always reflect the instrument's quality (26), While other studies have developed a system to assess questionnaire reliability using Cronbach's alpha (27). Although Cronbach's alpha remains a widely used measure of reliability in psychometric tests, it is crucial to recognize that a value higher than 0.70 indicates good reliability (19). Despite its limitations, Cronbach's alpha maintains its relevance, with reported average coefficients ranging between 0.70 and 0.82 (28). However, addressing misconceptions about this test, including its origin by Cronbach, its equivalence to reliability, and the assumption that a high value indicates internal consistency, is crucial (29).

Applicability to other study variables

The findings of our study align with the majority consulted in scientific literature, where results indicate that a smaller percentage of the studied population, both in males (26.7 %) and females (25.7 %), exhibit a healthy diet (Table I). Simultaneously, higher values are observed in

the need for changes or the presence of an unhealthy diet (17,30). It is noteworthy that these results may vary significantly by region, with Western and Latin American regions showing higher scores for healthy dietary patterns, while Asia and Sub-Saharan Africa obtained the highest scores for unhealthy dietary patterns (31). Another study has examined these differences in more detail, finding variations in the intake of food groups and diet quality scores among different ethnic groups (32). However, data gaps were identified, particularly in the coverage of specific and sensitive nutrition interventions (33).

The relationships identified in our study (Tables II and III) indicate that the consumption of fruits and vegetables is associated with a decrease mass and the risk factor for NCDs due to normal BMI values. The results show that both males and females fall within a non-risk index (18.5 to 24.9). Scientific literature has demonstrated a complex relationship between food quality and weight and body mass index (BMI). It has been found that diets rich in carbohydrates, especially those with a low glycemic load and high consumption of whole grains, are associated with lower BMI (34). Furthermore, it has been observed that better diet quality in early and middle childhood is associated with increased height, weight, and fat-free mass index, but not with body adiposity (35) Similarly, it has been found that food security is a significant determinant of diet quality, especially in impoverished urban environments (36), Additionally, it has been demonstrated that higher diet quality can mitigate the genetic predisposition to obesity, emphasizing the importance of a healthy diet in obesity prevention (37).

Analyzing the differences revealed by the ANOVA test (Table IV), we are particularly struck by the unhealthy eating habits that individuals with no university education may exhibit. The research consistently shows that educational level significantly influences nutrition quality because older adults with lower educational levels rely on different sources for nutrition information, potentially leading to poorer dietary choices (38).

Similarly, higher educational levels have consistently been demonstrated to be associated with better nutrition, linked to healthier food choices such as increased consumption of fruits, vegetables, and fish. This underscores the importance of incorporating nutritional education into school curricula (39), highlighting the role of education in promoting healthy eating habits and overall well-being.

We believe that our proposal could have a positive impact on instruments assessing food quality due to a reduced number of components and demonstrated reliability through statistical tests. Further research is expected to corroborate these results by replicating the study and thereby reinforcing the support for the proposed data. In addition to nutrition, we consider the importance of healthy lifestyle habits, coupled with variables such as physical activity levels, to reduce risk factors contributing to non-communicable chronic diseases among global populations (40).

CONCLUSIONS

The main objective of our study is to validate and apply the New Index of Global Food Quality in a population according to sociodemographic variables in the southern region of Chile. It is concluded that values above 52.5 points are considered healthy on the new evaluation scale of the index, supported by statistical reliability tests. Similarly, the components of the adjusted New Index of Global Food Quality, particularly fruits and vegetables in greater proportion, show a beneficial relationship with daily consumption in reducing BMI and mass Moreover, our findings indicate a greater effect among populations according to their educational level, where individuals with higher education are more likely to have better food quality. We recommend interpreting this information with caution and conducting new studies with populations in person to apply the values of this proposed new index.

Implications for research and practice

In our evaluation, we believe that the New Index of Global Food Quality by Ratner et al. (2017) could benefit from modifications aimed at enhancing its reliability through simpler statistical tests and the introduction of a new scoring scale. Additionally, we emphasize the importance of increasing the consumption of fruits and vegetables, given their positive impact on reducing body mass index, a factor closely linked to non-communicable chronic diseases. Furthermore, we highlight the pressing need to implement nutrition education programs in school environments. These programs would play a key role in reducing nutritional knowledge gaps and preventing the consumption of unhealthy foods. Finally, we underscore the importance of conducting new studies that act as repeatability tools, improving the scores of the scales presented in this work. This approach will contribute to strengthening the validity and applicability of the obtained results.

Limitations

Our study presents certain limitations related to the use of online surveys that must be considered. While online surveys offer advantages such as rapid data collection and access to large samples, they also pose challenges such as selection bias, non-response bias, and the use of non-validated scales (41,42). Consequently, the information collected is subject to self-report biases, as participants may provide inaccurate data due to selective memory or the desire to present a healthier image of themselves. Additionally, during pandemic lockdowns, these biases can be exacerbated, potentially influencing the results. The inability to capture cultural and social context in online surveys restricts a comprehensive understanding of dietary habits. This lack of contextualization could impact the applicability and relevance of the results. Therefore, it is crucial to consider implementing this instrument in-person in specific populations, complemented by diverse studies

evaluating repeatability. This approach will strengthen the validity and reliability of the scales proposed in this work.

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Table I. Sociodemographic values according to gender and morphological variables, marital status, educational level, socioeconomic status, BMI, physical activity, age category, eating habits

Morphological information	**Male**	**Female**
Sex	603 (48.7 %)	635 (51.2 %)
Age (years)	29.8 ± 8.61	30.5 ± 8.6
Height (cm)	170.4 ± 8.38	169.4 ± 8.25
Weight (kg)	71.8 ± 13.0	72.0 ± 12.8
BMI ($kg \cdot m^{-1}$)	24.6 ± 3.55	24.9 ± 3.42
METs	1751 ± 1375	1697 ± 1465
Marital status		
Married	285 (23.0 %)	330 (26.7 %)
Single	318 (25.7 %)	305 (24.6 %)
Education level		
College graduate	348 (57.7 %)	393 (61.9 %)
Non- College graduate	255 (42.3 %)	242 (38.1 %)
Socioeconomic status		
Low income	132 (19.5 %)	110 (17.3 %)
Middle income	432 (71.6 %)	478 (75.3 %)
Hight income	39 (6.5 %)	47 (7.4 %)
BMI level		
Underweight	40 (6.7 %)	28 (4.4 %)
Normal weight	269 (44.9 %)	297 (46.9 %)
Overweight	290 (48.4 %)	308 (48.7 %)
Self-perceived overweight		
No	542 (49 %)	565 (51 %)
Yes	61 (46.6 %)	70 (53.4 %)
Physical activity level		
Low active	115 (19.1 %)	137 (21.6 %)
Moderately active	409 (67.8 %)	409 (64.4 %)

Very active	79 (13.1 %)	89 (14.0 %)
Age category (years)		
18 to 25	216 (17.4 %)	191 (15.4 %)
25 to 30	180 (14.5 %)	207 (16.7 %)
> 30	207 (16.7 %)	237 (19.1 %)
New Index Global Food Quality		
Unhealthy	274 (45.4 %)	277 (43.7 %)
Needs changes	168 (27.9 %)	194 (30.6 %)
Healthy	161 (26.7 %)	163 (25.7 %)

BMI = body mass index.

Table II. Correlations between body composition and Components of the Global Food Quality Index

	Body mass		**BMI**	
Vegetables	-0.316	†	-0.155	†
Fruits	-0.345	†	-0.221	†
Milk	-0.198	†º	-0.071	*
Legumes	-0.147	†	-0.211	†
Fish	-0.040		-0.145	†
Sugar	-0.109	†	0.009	
Fried foods	-0.244	†	-0.173	†

*$p < 0.05$; †$p < 0.001$.

Table III. Correlations between the Global Food Quality Index and body composition variables

	GFQI		METs	AGE	BMI	Body mass
NIGFQ	—					
METS	0.123	‡	—			
AGE	-0.070	*	0.028	—		
BMI	-0.174	‡	-0.159 ‡	0.241 ‡	—	
Body mass	-0.284	‡	-0.074 †	0.289 ‡	0.846 ‡	—

*$p < 0.05$; †$p < 0.01$; ‡$p < 0.001$; NIGFQ: New Index of Global Food Quality; METs: metabolic equivalents.

Table IV. Results are reported according to the eating habits vs. study variable (sex, marital status, education level, socioeconomic status, BMI level, self-perceived overweight, physical activity level, and age category) and analyzed using the MANOVA test (Pillai's Trace) and ANOVA (Tukey)

	Vegetables	**Fruits**	**Legumes**	**Milk**	**Fish**	**Fried**	**Sugar**	**NIGFQ#**
Sex								
Female	6.3 ± 2.5	4.4 ± 3.1	8.1 ± 1.98	5.2 ± 3.56	6.5 ± 3.0	5.6 ± 2.2	6.9 ± 2.7	43.3
Male	6.1 ± 2.8	4.3 ± 3.3	8.4 ± 1.69	5.0 ± 3.67	6.5 ± 3.1	5.4 ± 2.0	7.0 ± 2.5	43
Marital status								
Married	6.3 ± 2.8	4.4 ± 3.2	8.1 ± 2.2	5.6 ± 3.5	6.5 ± 3.1	5.8 ± 2.2	6.6 ± 2.9	43.2
Single	6.2 ± 2.6	4.4 ± 3.2	8.5 ± 1.3	4.7 ± 3.7	6.6 ± 3.1	5.3 ± 2.0	7.4 ± 2.3	43.2
Education level								
College graduate	7.5 ± 2.3	5.7 ± 3.3	8.3 ± 2.2	7.1 ± 2.9	6.2 ± 3.5	6.0 ± 2.4	7.5 ± 2.8	48.3*
Non-college graduate	4.4 ± 2.2	2.4 ± 1.8	8.3 ± 1.2	2.2 ± 2.3	7.1 ± 2.1	4.8 ± 1.4	6.2 ± 2.3	35.4*
Socioeconomic status								
Low income	5.3 ± 2.9	4.8 ± 3.3	8.3 ± 1.9	5.4 ± 3.9	6.1 ± 3.8	5.2 ± 2.0	6.3 ± 3.0	41.4[a]
Middle income	6.4 ± 2.6	4.0	±8.3 ± 1.8	4.8 ± 3.5	6.7 ± 2.9	5.5 ± 2.1	7.1 ± 2.5	42.8[b]

Hight income	7.4 ± 2.0	3.1 7.1 2.7	± 8.6 ± 2.5	7.7 ± 2.7	6.4 ± 2.7	7.2 ± 2.6	7.8 ± 2.5	52.2[ab]
BMI level								
Underweight	8.0 ± 1.99	8.0 2.3	± 9.7 ± 0.7	8.3 ± 3.1	5.8 ± 4.3	6.0 ± 2.0	6.7 ± 2.6	52.8[cd]
Normal weight	6.1 ± 2.9	4.5 3.4	± 8.2 ± 2.0	4.8 ± 3.4	6.8 ± 2.9	5.8 ± 2.3	6.8 ± 2.9	43.4[c]
Overweight	6.0 ± 2.4	3.8 2.7	± 8.2 ± 1.6	5.0 ± 3.6	6.3 ± 2.9	5.1 ± 1.8	7.1 ± 2.3	41.9[d]
Self-perceived overweight								
No	6.0 ± 2.7	4.2 3.2	±8.4 ± 1.8	4.8 ± 3.5	6.8 ± 2.7	5.5 ± 2.0	6.8 ± 2.6	42.8*
Yes	7.7 ± 2.2	5.1 3.2	±7.8 ± 2.1	7.7 ± 3.1	3.8 ± 3.9	5.5 ± 2.8	8.3 ± 2.2	46.1*
Physical activity levels								
Low	5.6 ± 2.8	4.3 2.9	± 8.0 ± 2.1	4.8 ± 3.7	5.4 ± 3.5	5.5 ± 2.1	7.3 ± 2.8	41[ef]
Moderate	6.3 ± 2.6	4.3 3.2	± 8.4 ± 1.5	5.2 ± 3.6	7.0 ± 2.6	5.5 ± 2.1	6.8 ± 2.5	43.6[e]
Very active	6.7 ± 2.8	4.8 3.2	± 8.3 ± 2.5	5.6 ± 3.3	6.0 ± 3.8	6.0 ± 2.3	7.1 ± 2.8	44.3[f]
Age category (years)								
18 to 25	7.1 ± 2.1	2.5	± 7.5 ± 2.5	5.5 ± 3.9	7.5 ± 2.5	5.0 ± 0.0	7.5 ± 2.5	44.1[g]

26 to 30	7.1 ± 2.1	5.0 ± 2.5	7.5 ± 2.5	4.8 ± 3.3	7.5 ± 0.0	5.0 ± 0.0	7.5 ± 2.5	43.8[h]
> 30	5.0 ± 4.6	5.0 ± 6.5	7.5 ± 2.5	5.0 ± 3.5	7.5 ± 6.5	5.0 ± 0.0	7.5 ± 2.5	41.8[gh]

Superscript characters or symbols indicate significant differences ($p \leq 0.05$); BMI: body mass index; [#]NIGFQ: New index Global Food Quality.