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Promotion of healthy eating via social network among university students

Promoção da alimentação saudável via rede social entre universitários

Keila Regina Barroso Dutra[1], Thamires Ueislla de Castro Véras[2], Natália Cristina de Oliveira Vargas e Silva[3], Nyvian Alexandre Kutz[4], Narcisio Rios Oliveira[5], Marcia Maria Hernandes de Abreu de Oliveira Salgueiro[6]

[1,2] Nutrition student at Centro Universitário Adventista de São Paulo (UNASP), São Paulo (SP), Brazil. [3] Professor of the Undergraduate and Professional Masters Courses in Health Promotion at Centro Universitário Adventista de São Paulo (UNASP), São Paulo (SP), Brazil. [4] Professor of the Nutrition Course and Professional Master's Degree in Health Promotion, Coordinator of the Postgraduate Program in Clinical and Hospital Nutrition at the Adventist University Center of São Paulo (UNASP), São Paulo (SP), Brazil. [5] Professor of the Nutrition Course at Centro Universitário Adventista de São Paulo (UNASP), São Paulo (SP), Brazil. [6] Professor of the Nutrition Course and Professional Master's Degree in Health Promotion, Coordinator of the Food, Food and Health Promotion Research Group at the Adventist University Center of São Paulo (UNASP), São Paulo (SP), Brazil.

Corresponding author: Marcia Maria Salgueiro. *E-mail*: marciasalgueironutricionista@yahoo.com.br

ABSTRACT
This study aimed to verify the effects of an educational action via social network on food consumption, knowledge of food and nutrition and factors facilitating and hindering the adoption of healthy eating, among university students of a University Center in São Paulo. This was an intervention study, with the application of a questionnaire containing the study variables before and after the educational action. Participants were 141 university students between 18 and 56 years old and socioeconomic class B (46,81%). 39.72% were overweight, 76.60% were classified as "Attention" regarding food consumption and more than 50% had moderate knowledge on nutrition. The main obstacle to healthy eating was the high cost of food. The effects of the educational action were positive in reducing the Body Mass Index, increasing the score of food consumption and knowledge on nutrition. There was an increase in appropriate behavior for eight issues of food consumption.

Keyword: Health promotion. Food guide. Healthy diet. Social network.

RESUMO
Este estudo objetivou verificar os efeitos de uma ação educativa via rede social no consumo alimentar, conhecimento em alimentação e nutrição e nos fatores que facilitam e dificultam a adoção de uma alimentação saudável entre universitários de um Centro Universitário de São Paulo. Trata-se de estudo de intervenção, com aplicação de questionário contendo as variáveis de estudo antes e depois da ação educativa. Participaram 141 universitários entre 18 e 56 anos e classe socioeconômica B (46,81%). 39,72% estavam com excesso de peso, 76,60% foram classificados em "Atenção" referente ao consumo alimentar e mais de 50% tinham moderado conhecimento em nutrição. O principal dificultador para se ter uma alimentação saudável foi o custo elevado dos alimentos. Conclui-se que os efeitos da ação educativa foram positivos na redução do Índice de Massa Corporal, aumento na pontuação do consumo alimentar e do conhecimento em nutrição. Houve aumento de comportamento adequado para oito questões do consumo alimentar.

Palavras-chave: Dieta saudável. Guia alimentar. Promoção da saúde. Rede social.

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INTRODUCTION

Healthy eating plays a key role in maintaining health. The promotion of healthy eating must integrate public policies in the search for healthy environments, development of personal skills for the organization, acquisition and preparation of food that integrate the human right to healthy eating in a scenario of health promotion[1].

It is through good food sources that the body obtains most of the nutrients required to protect itself from various diseases, among which, non-communicable chronic diseases (NCDs), which are currently one of the main public health problems[2]. In this sense, the healthy diet proposed by the Food Guide for the Brazilian population proposes current recommendations and guidelines considering regional, social and cultural differences, valuing the empowerment of individuals for healthy eating that can at the same time meet nutritional needs so that there are no excesses nor lack of nutrients[1].

Promoting health is giving support so that individuals have the autonomy to make choices that provide a better quality of life[3]. Health promotion is superior to the health/disease biomedical relationship, as it allows the developed actions to provide better quality for individuals and communities, transforming living conditions and reducing diseases arising from social, economic and environmental circles[4].

Data from the Surveillance System for Risk and Protective Factors for Chronic Diseases by Telephone Survey (VIGITEL) from 2018 demonstrate that the rates of obesity, overweight and diabetes have grown in a way that, increasingly, professionals, managers and organizations have recognized the need to develop actions that promote the improvement of people's quality of life[2]. Intersectoral actions are required to promote healthy eating patterns, which must occur at the individual and collective level, understanding food as a process of social and cultural dimensions of eating practices[1].

As the search for information about food has grown gradually in recent times, it can be said that an effective action to encourage good eating practices can be implemented through the internet. It is noteworthy that this form of social communication can be positive when the exchanges established by individuals and social groups are based on scientific knowledge[5].

As an instrument to spread information about the importance of healthy eating, having social networking applications such as WhatsApp, which is a simple and secure instant messaging application used all over the world[6],

becomes an interesting communication tool. This form of communication produces an information exchange network, because the interested parties share common knowledge[5].

The advantage of this application over others is the ease of accessing it anywhere and at any time, regardless of the low internet access available, in addition to allowing quick sharing and reception of files such as images, audio, videos or documents[7]. Thus, using this application common to most of the population can be of great relevance to promote health in the most diverse situations.

Therefore, using an easily accessible technology such as the WhatsApp application, which is present on cell phones of the majority of the population as a tool to share information to encourage healthy eating practices, is a way of not only spreading knowledge, but also monitoring its possible effects.

This study aimed to verify the effects of an educational action via social network on food consumption and other lifestyle habits, knowledge of nutrition and factors facilitating and hindering the adoption of healthy eating among university students of a University Center in the city of São Paulo.

METHODOLOGY

The study was carried out at a University Center in the city of São Paulo, in the second half of 2020. The research was submitted and approved by the Research Ethics Committee (CAAE: 32661720.7.0000.5377) and by the Academic Board of the Higher Education Institution.

This was an intervention study with a convenience sample with university students aged 18 years or over, duly enrolled in courses: Administration, Systems Analysis and Development, Architecture and Urban Planning, Biological Sciences, Computer Science, Accounting, Law, Computer Engineering, Pedagogy, and Advertising and Propaganda.

A total of 1,705 university students were invited, of which 210 agreed to participate in the study, from which 52 participants were excluded due to inadequate completion of the questionnaires and 17 due to repeated submission of data. Finally, 141 participants remained for this study. At all stages of the research, contact with university students was carried out through the social network - WhatsApp. The invitation, the Informed Consent Form (ICF) and two questionnaires were sent by a link on Google Forms. This format adopted for the research sought to adapt to health standards to prevent the dissemination of COVID-19.

The request to participate in the study was made through an invitation letter

to the class representatives together with a video with explanations about the research.

The first questionnaire contained the participant's name, self-reported information about age, weight and height, variables for socioeconomic classification and food intake and other lifestyle habits.

To classify the nutritional status, the Body Mass Index (BMI) of the World Health Organization (WHO) was used. BMI is the ratio of weight to square height, which classifies the nutritional status of adults as: underweight for BMI <18.5 kg/m^2; eutrophy between 18.5 and 24.9 kg/m^2; overweight between 25 and 29.9 kg/m^2 and obesity values equal to or greater than 30 kg/m^2 [8]. Similarly, the BMI was used for individuals under 20 years of age, following the WHO classification for adolescents with following cutoff points: Percentile < 5: (underweight); ≥ Percentile 5 and < Percentile 85: (Eutrophic) and ≥ Percentile 85 (Overweight)[9].

The socioeconomic classification involved household consumer goods (appliances, automobiles, among others), public services (sewage, paving) and the level of education of the head of the family. The score followed the recommendation established in the Brazilian Economic Classification Criteria, classifying them as A1, B1, B2, C1, C2 and D-E [10].

Food intake and other lifestyle habits (physical activity and reading of industrialized food labels) were assessed using the Ministry of Health questionnaire: How is your diet? Consisting of 18 multiple-choice questions addressing aspects of food intake contained in the Food Guide: How to have a healthy diet. The questions have two to four alternatives, with scores ranging from 0 to 4, classifying food intake and other lifestyle habits as appropriate and inappropriate. Answers with a score of 0, 1 or 2 will be classified as inappropriate behavior and answers with a score of 3 or 4 as appropriate behavior. Questions 5, 15 and 18, referring to daily intake of meat and water and reading food labels, answers with a score of 0 or 1 will be classified as inappropriate behavior and answers with a score of 2 or 3 as appropriate behavior. For question 4, about the consumption of cereals, breads and other complex carbohydrates, scores 0, 1, 2 or 4 will be classified as inappropriate behavior and 3 as appropriate behavior[11].

The sum of all questions totaled the final score of the questionnaire, which can range from 1 to 58, considering up to 28 points for individuals who need to make their diet and lifestyle habits healthier; between 29 and 42 points, those who should pay more attention to their diet and lifestyle habits and those with 43 points or more are on the way to a healthy way of life[11]. In this study, the following terms were adopted: "Need to improve", "Attention" and "Congratulations", respectively, to analyze the three

categories related to the quality of food intake and other lifestyle habits.

The second questionnaire consisted of information about knowledge in nutrition, through the Nutrition Knowledge Scale[12]. Questions were also included (objective and easy to understand) related to the perception of facilitating and hindering factors for having a healthy diet for the family[13].

The nutrition knowledge scale makes it possible to assess general knowledge in nutrition, it was translated and adapted to the Brazilian reality and validated through a study with adolescents and adult women. The instrument has 3 parts: the first contains four questions about the relationship between diet and diseases, two of which refer to cancer (questions 1 to 4); the second part has seven questions about fiber and lipid content in foods (questions 5 to 11); and the third consists of a question about the number of servings of fruits and vegetables that a person should consume (question 12) [12].

In the questionnaire, total scores between 0 and 6 indicate low knowledge in nutrition; between 7 and 10 indicate moderate nutritional knowledge and above 10 indicate high nutritional knowledge [12].

During 2 weeks (except on Saturdays and Sundays) after completing the two questionnaires, informative messages were sent individually through videos of less than one minute, to promote healthy eating among university students.

These videos contained information about the "Ten steps to adequate and healthy eating" from the Food Guide for the Brazilian Population[1]. This food and nutrition education strategy sought to expand knowledge for choosing, organizing and adopting healthier eating practices, considering questions about physical and financial availability when buying food, eating together and the involvement of friends and family for development and exchange of recipes[1]. The steps were sent sequentially, in a total period of ten days, together with a practical activity in the form of a challenge, according to the model below:

Box 1. Messages sent via social network – WhatsApp - in two weeks of educational action, from a University Center in the city of São Paulo, 2020

Week 1	**Information**	**Challenge**
Step 1 (Monday)	Make fresh or minimally processed foods the basis of the diet.	Try to include in meals throughout the day, fresh and/or minimally processed foods as main ingredients.
Step 2 (Tuesday)	Use oils, fats, salt and sugar in small amounts.	
Step 3 (Wednesday)	Limit consumption of processed foods.	
Step 4 (Thursday)	Avoid consuming ultra-processed foods.	Quiz with multiple-choice and true-or-false question on steps 1 (fresh food), 2 (use of oils and fats), 3 (processed food) and 4 (ultra-processed food).
Step 5 (Friday)	Eat regularly and carefully, in appropriate environments and, whenever possible, with company.	During the weekend, share with the public on your social networks photos of a meal with people who are good for you.
Step 6 (Monday)	Shop in places that offer fresh or minimally processed food varieties.	Make the week's shopping list, and, if you can, make such purchases at street markets, grocery stores, among others.
Step 7 (Tuesday)	Develop, exercise and share cooking skills.	Share recipes you like in groups and social networks.
Step 8 (Wednesday)	Plan how to use the time to give food the space it deserves	Develop the menu of the week and leave it in sight.
Step 9 (Thursday)	Give preference, when away from home, to places that serve freshly prepared meals.	
Step 10 (Friday)	Be critical of information, guidance and messages about food in commercial advertisements.	Final quiz with multiple-choice and true-or-false questions on the 10 Steps to Healthy Eating from the Food Guide.

After sending the last step and completing the challenge, the participants received a questionnaire to assess food intake and other lifestyle habits, knowledge in nutrition, self-reported weight and height, and factors facilitating and hindering the adoption of healthy eating by the family.

At the end of data collection and all stages of the study, a conversation was held via the Zoom platform with researchers and participants about the learning acquired and main difficulties during the project.

The meeting ended with the delivery of a certificate of participation to university students and an e-book designed, organized and produced by the authors, containing 13 preparations divided into 3 sections: section 1- snacks (5

recipes), section 2- drinks (5 recipes) and section 3-salads (3 recipes).

The collected data were tabulated in Excel and analyzed with descriptive statistics using SPSS v.24 for Windows. Data normality was assessed using the Kolmogorov-Smirnov test. Comparisons between groups (before and after the educational action/above or below the median of the "Food Consumption" instrument/above or below the median of the "Nutrition Knowledge Scale" instrument) were tested using the paired Student's t-test or Wilcoxon test. Associations between variables were performed using Pearson's or Spearman's correlation test, and classified as follows: 0.0 to 0.19 - very weak correlation; 0.2 to 0.39 - weak correlation; 0.4 to 0.69 - moderate correlation; 0.7 to 0.89 - strong correlation; 0.9 to 1.0 - very strong correlation. In all cases, the significance level set was 5%.

Additionally, a multiple linear regression model was fitted to predict the influence of study variables on food intake and other lifestyle habits and on nutrition knowledge

RESULTS

A total of 141 university students aged 18 to 56 years were evaluated, with a mean age of 25.28 ± 8.74 years, most of them female (70.21%) and predominant socioeconomic class B (46.81%) (Table 1).

Table 1. Sociodemographic characterization and course year of university students (n=141) of a University Center in the city of São Paulo, 2020

Variables	n (%)
Gender	
Female	99 (70.21%)
Male	42 (29.79%)
Socioeconomic classification	
A	6 (4.26%)
B	66 (46.81%)
C	61 (43.26%)
D-E	08 (5.67%)
Course year	
1	36 (25.53%)
2	46 (32.63%)
3	45 (31.91%)
4	14 (9.93%)

The food intake and other lifestyle habits both before and after the educational action was predominantly classified in "Attention" (76.60%), which indicates the need to improve diet and other lifestyle habits. The assessment of knowledge in nutrition indicated that, before the educational action, no one (0.00%) had

high knowledge in nutrition, and then it was found that 13.47% obtained this classification. As for the classification of nutritional status by BMI, more than 35% participants were overweight (overweight and obese) before and after the educational action (Table 2).

Table 2. Characterization of food intake and other lifestyle habits, knowledge in nutrition and BMI classification, before and after the educational action of university students (n=141) of a University Center in the city of São Paulo, 2020

	Before n (%)	**Before mean ± SD**	**After n (%)**	**After mean ± SD**	**p**
Food intake and other lifestyle habits					
		33.97 ± 5.69		36.81 ± 5.54	p<0.00
Need to improve	26 (18.44%)		10 (7.09%)		
Attention	108 (76.60%)		108 (76.60%)		
Congratulations	7 (4.96%)		23 (16.31%)		
Knowledge in nutrition					
		7.93 ± 2.08		8.47 ± 1.98	p<0.00
Low	28 (19.86%)		28 (19.86%)		
Intermediate	113 (80.14%)		94 (66.67%)		
High	0 (0.00%)		19 (13.47%)		
BMI					
		24.84 ± 4.46		24.66 ± 4.44	0.03
Underweight	3 (2.13%)		3 (2.13%)		
Eutrophic	82 (58.15%)		83 (58.87%)		
Overweight	32 (22.70%)		34 (24.11%)		
Obesity	24 (17.02%)		21 (14.89%)		

As for the mean values of BMI before and after the educational action, 24.84 kg/m^2 ± 4.46 and 24.66 kg/m^2 ± 4.44, respectively, there was a statistically significant reduction (p=0.03). In the mean score of food intake and other lifestyle habits before (33.97 ± 5.69) and after the educational action (36.81 ± 5.54), there was a significant improvement in the questionnaire score (p<0.00). In the mean score of knowledge in nutrition, there was also a significant increase in the score after the educational action (7.93 ± 2.08 versus 8.47 ± 1.98) (p=0.00).

Food intake and other lifestyle habits were also assessed for appropriate and inappropriate behavior in each question. There was a significant improvement (p<0.05) in adopting appropriate behavior in questions 1, 4, 6 and 11 after the educational action. In question 14, there was a significant increase in the adoption of inappropriate behavior after the educational action (Table 3).

Table 3. Food intake and other lifestyle habits assessed by question of appropriate and inappropriate behavior, before and after the educational action of university students (n=141) of a University Center in the city of São Paulo, 2020

	Appropriate behavior n (%)		Inappropriate behavior n (%)		
Questions	**Before**	**After**	**Before**	**After**	**p**
1. What is, on average, the amount of fruit you eat per day? *	25 (17.73%)	50 (35.46%)	116 (82.27%)	91 (64.54%)	<0.00
2. What is, on average, the amount of vegetables you eat per day?	19 (13.48%)	21 (14.89%)	122 (86.52%)	120 (85.11%)	NS
3. What is, on average, the amount of the following foods you eat: beans of any type or color, lentils, peas, chickpeas, soybeans, seeds or nuts?	86 (60.99%)	96 (68.09%)	55 (39.01%)	45 (31.91%)	NS
4. How much, on average, do you consume per day of carbohydrate-rich foods such as rice, corn and other cereals? *	45 (31.91%)	57 (40.43%)	96 (68.09%)	84 (59.57%)	0.03
5. What is, on average, the amount of meat (cattle, pork, poultry, fish and others) or eggs you eat per day?	64 (45.39%)	67 (47.52%)	77 (54.61%)	74 (52.48%)	NS
6. Do you usually remove the apparent fat from meat, chicken skin or any other type of bird? *	97 (68.79%)	107 (75.89%)	44 (31.21%)	34 (24.11%)	0.01
7. How often do you eat fish?	8 (5.67%)	9 (6.38%)	133 (94.33%)	132 (93.62%)	NS
8. What is, on average, the amount of milk and dairy products (yoghurts, dairy drinks, curds, cream cheese, cheese and others) that you eat per day?	22 (15.60%)	22 (15.60%)	119 (84.40%)	119 (84.40%)	NS
9. What type of milk and milk derivatives do you usually consume?	22 (15.60%)	25 (17.73%)	119 (84.40%)	116 (82.27%)	NS
10. Think of the following foods: fried foods, fried snacks or in packages, salted meats, hamburgers, hams and sausages, mortadella, salami and others. How often do you eat any of them?	85 (60.28%)	85 (60.28%)	56 (39.72%)	56 (39.72%)	NS
11. Think of the following foods: sweets of any kind, cakes filled with frosting, sweet cookies, soft drinks and industrialized juices. How often do you eat any of them? *	78 (55.32%)	96 (68.09%)	63 (44.68%)	45 (31.91%)	0.00
12. What type of fat is most used in your home for cooking food?	116 (82.27%)	124 (87.94%)	25 (17.73%)	17 (12.06%)	NS
13. Do you usually add more salt to food when it is already served on your plate?	125 (88.65%)	129 (91.49%)	16 (11.35%)	12 (8.51%)	NS
14. Think about your weekly routine: how many meals do you usually eat each day? *	29 (20.57%)	19 (13.48%)	112 (79.43%)	122 (86.52%)	0.02

15. How many glasses of water do you drink a day? Include natural fruit juices or teas in your calculation (except coffee, black tea and mate tea). Quantos copos de água você bebe por dia? Inclua no seu cálculo sucos de frutas naturais ou chás (exceto café, chá preto e chá mate).	40 (28.37%)	46 (32.62%)	101 (71.63%)	95 (67.38%)	NS
16. How often do you consume alcoholic beverages (whiskey, sugarcane spirit, wine, beer, brandy, etc.)?	99 (70.21%)	96 68.09%)	42 (29.79%)	45 (31.91%)	NS
17. Do you do regular physical activity, i.e. at least 30 minutes a day, every day of the week, during your free time?	27 (19.15%)	34 (24.11%)	114 (80.85%)	107 (75.89%)	NS
18. Do you usually read the nutritional information on the label of processed foods before buying them?	13 (9.22%)	16 (11.35%)	128 (90.78%)	125 (88.65%)	NS

NS: non-significant

Factors hindering and facilitating the adoption of healthy eating by the family were also evaluated before and after the educational action and there was no significant difference. The "high cost of food" was appointed as the main hindering factor n=68 (48.23%) before the educational action, after the action the "need to give up food considered unhealthy" n=71 (50.35%) was the main obstacle chosen. Both before and after, "concern about body image and health" was the most cited option as a facilitator for the adoption of healthy eating by the family, with n=110 (78.01%) before and n=105 (74.47%) after, as listed in Table 4.

Table 4. Factors facilitating and hindering the adoption of healthy eating before and after the educational action for university students (n=141) of a University Center in the city of São Paulo, 2020

	Before n (%)	**After n (%)**	**p**
Hindering factors			
1. High cost of foods considered healthy	68 (48.23%)	65 (46.10%)	
2. Insufficient willpower	62 (43.97%)	62 (43.97%)	
3. Need to give up food considered unhealthy	67 (47.51%)	71 (50.35%)	0.30
4. Lack of time	33 (23.40%)	53 (37.59%)	
5. Insufficient knowledge	31 (21.99%)	26 (18.44%)	
Facilitating factors			
1. Concern about body image and health	110(78.01%)	105 (74.47%)	
2. Flavor of natural foods	43 (30.50%)	45 (31.91%)	
3. Family and school encouragement	27 (19.15%)	35 (24.82%)	0.08
4. Media encouragement	13 (9.22%)	18 (12.77%)	
5. Greater access and availability of these foods	37 (26.24%)	46 (32.62%)	

The total score for food intake and other lifestyle habits was positively correlated with the total score for knowledge in nutrition both before (r= 0.22, p= 0.01) and after (r= 0.25, p= 0.00) the educational action. This means that the greater the knowledge in nutrition, the better the food intake and other lifestyle habits. The total score of food intake before the educational action (r=0.17, p=0.04) was also correlated with the number of factors facilitating the adoption of a healthy diet. After the educational action, the total food intake score was negatively correlated (r= -0.19, p= 0.02) with the number of factors hindering the adoption of healthy eating by the family, as shown in Table 5. It is noteworthy that these correlations were considered weak and significant.

Table 5. Significant correlations between the score of food intake and other lifestyle habits with the score of knowledge in nutrition and the number of factors facilitating and hindering the adoption of healthy eating by the family, before and after the educational action with university students of a University Center in the city of São Paulo, 2020

Variables	r	p
Food intake before x KN before	0.22	0.01
Food intake after x KN after	0.25	0.00
Food intake before x number of facilitating factors before	0.17	0.04
Food intake after x number of hindering factors after	-0.19	0.02

KN: Knowledge in nutrition

Multiple linear regression was used to predict the influence of the other variables on the score of food intake and other lifestyle habits. Only the variables age, knowledge in nutrition and number of facilitating factors were significant at the level of 5% in the model:

[F (7, 13) = 2.38; p < 0.03; R2 = 0.11]

These variables explained only 11.10% variability in food intake scores, and the equation that describes this relationship is:

Food intake and other lifestyle habits score = 27.59 + 0.11 (age) + 0.54 (knowledge in nutrition) + 1.34 (number of facilitating factors)

That is, for every 1-point increase in food intake and other lifestyle habits, there was an increase of 0.11 in age, 0.54 in knowledge in nutrition and 1.34 in number of facilitating factors. Therefore, age (ß = 0.17; t = 1.97; p = 0.05), knowledge in nutrition (ß = 0.20; t = 2.37; p = 0.02) and number of facilitating factors (ß = 0.20; t= 2.25; p = 0.03) are predictors of food intake and other lifestyle habits.

Multiple linear regression was also used to predict the influence of the other study variables on the knowledge in nutrition score. Only the variable food intake and other lifestyle habits was significant at the 5% level in the model:

[F (7, 13) = 1.36; p = 0.23; R2 = 0.07]

This variable explained only 6.70% variability in the score of knowledge in nutrition, and the equation that describes this relationship is:

Knowledge in nutrition score = 5.86 + 0.08 (food intake and other lifestyle habits)

That is, for every 1-point increase in knowledge in nutrition, there was an increase of 0.08 in food intake and other lifestyle habits. Therefore, food intake and other lifestyle habits (ß = 0.43; t= 2.64; p = 0.01), lifestyle (ß = -0.43; t= -2.96; p = 0.00) and quality of life (ß = 0.21; t= 2.37; p = 0.02) are predictors of knowledge in nutrition.

DISCUSSION

The university students in this study were predominantly female, young and from socioeconomic class B. More than one third of the sample was overweight and two thirds needed to improve food intake and other lifestyle habits. Similar results were reported by Santos et al.[14], who evaluated the quality of life and diet of 120 university students living in the central region of the city of São Paulo, where 64.16% were female with a mean age of 22.18± 3.10 years and 75% participants were eutrophic in the BMI classification.

The educational action of this study was well received by these university students, with effective participation of the vast majority. Even taking place for a short period of two weeks, it showed positively significant results in relation to food intake and other lifestyle habits, knowledge in nutrition and BMI.

The classification of nutritional status by BMI also showed a significant improvement in relation to excess weight after the educational action. However, even with the decrease in prevalence, more than 35% university students still had this condition. VIGITEL data in 2019 indicate that in 2019, 55.4% Brazilian population was overweight, and it was also found that the percentage increases with age, with a higher prevalence between 25 and 64 years old[15].

A study carried out with 357 university students from different programs, in Porto Alegre, state of Rio Grande do Sul, showed that 34.2% participants were also overweight[16]. It is noteworthy that excess weight is a predominant factor for the development of many diseases, such as diabetes,

cardiovascular diseases, respiratory difficulties and some types of cancer[17].

Regarding food intake and other lifestyle habits, 76.60% participants were classified as "Attention", both before and after the educational action, indicating that it is necessary to reassess daily eating habits. Importantly, after the educational action, out of the 18 items evaluated, there was an improvement in the adoption of healthy behavior in questions related to the consumption of fruits; cereals, tubers, breads and pasta, removing the apparent fat from meats; sweets, cookies, filled cakes, industrialized juices and soft drinks and number of daily meals.

Regarding the adequate consumption of fruits, there was a significant increase in the prevalence of appropriate behavior after the educational action in the present study. Only 13% Brazilians practice the recommendation of adequate consumption of these foods[18], which according to the WHO, is based on the daily intake of at least 400 grams of fruits and vegetables, equivalent to approximately five servings[19]. Perez et al.[20] analyzed the eating habits of 1336 students entering a public university in Rio de Janeiro, and observed a low frequency in the daily intake of these foods among the evaluated participants.

In relation to the intake of foods sources of complex carbohydrates, there was also a significant improvement in the appropriate behavior after the educational action. This result stands out in a context in which studies show that the intake of fiber-rich foods by university students is considered low[16,21]. Among the benefits of a daily consumption of between 25 and 30 g dietary fiber, the reduction in risk of cardiovascular disease, favoring glycemic control among diabetics and reducing the risk of various types of cancer[19].

The increase was also significant in the appropriate behavior after the educational action of removing the apparent fat from meat. This corroborates Macedo et al. [22] who described the dietary and clinical profile and the pattern of physical activity in 119 university students of a public university located in the city of Salvador, state of Bahia, and observed that the largest proportion of participants removed excess fat/skin from meat.

International guidelines recommend the removal of trans fats, reduction in the consumption of saturated fats and inclusion, in adequate amounts, of foods that are sources of unsaturated fats. Epidemiological studies show that both excess consumption of saturated fats and insufficient intake of polyunsaturated fats are associated with increased cardiovascular risk[23].

As for the consumption of sweets, soft drinks and industrialized juices, there was a decrease in intake after the educational action. According to VIGITEL data, in 2019 the frequency of consumption of soft drinks on five or more

days a week was 15%, being higher among men (18.3%) than among women (12.3%), thus finding a decline in this consumption. In both sexes, this decrease tended to be even more significant with age[15].

In the present study, there was a worsening in the adoption of appropriate behavior in relation to the number of daily meals. The instrument used to assess this behavior considers eating three main meals with small snacks between meals as an appropriate behavior. Thus, after the educational action, university students decreased the number of daily meals[11].

The assessment of knowledge in nutrition indicated that before the educational action, no one (0.0%) had high knowledge in nutrition, and then it was found that 13.5% obtained this classification. An experimental educational intervention in the area of food and nutrition was carried out with 8 university students living in student residences with the aim of identifying and expanding knowledge about diet to contribute to changing inadequate eating habits and practices of young adults, the authors identified that after the intervention, in the form of dialogues and playful and dynamic activities, university students began to incorporate healthy eating guidelines and became safer in their food choices[24].

Nutrition education practices applied through a playful approach to the themes, prove to be very effective[24], although carried out over a longer period than the present study, both had positive results, producing important effects in changing eating behavior.

The academic environment is a favorable environment for accessing and sharing knowledge in the most diverse areas. Currently, the mass dissemination of information is something apparently normal, comprising a versatility of means and, consequently, reaching enormous proportions. Within this perspective, there is an opportunity to implement the promotion of healthy habits through the insertion of basic steps for the adoption of better choices via the WhatsApp social network, which allows, in addition to reflection on the subject, the possibility of the practical activity of these steps in the environment routine and closer monitoring of the individual, respecting their limitations, possibilities and particularities.

Among the factors hindering the adoption of healthy eating by the family, the “high cost of food”, the “need to give up food considered unhealthy” and “insufficient willpower” were pointed out as the main hindering factors both before and after the educational action, followed by “lack of time” and “insufficient knowledge”.

Similar results were reported by Cardozo et al.[25], who analyzed the perception of 15 students from the Nutrition Program about the university food environment of a federal public institution of higher education in the state

of Rio de Janeiro, in which the participants highlighted hindering factors lack of time, money, lack of knowledge about how to prepare food and difficult access to products.

Both before and after the educational action, "concern with body image and health" was the most mentioned option as a factor facilitating the adoption of healthy eating by the family. This contrasts with the study by Santos et al.[26] where it was observed that most participants were not concerned with body image.

The implementation of a healthy diet is not limited to the individual's own willpower, it depends on a range of factors involving the physical, social, political, environmental and economic environment. These directly influence the population dietary pattern, either positively or negatively[1].

The present study had some limitations, as it is a convenience sample, where only students from a single private University Center in São Paulo were included. In addition, the study showed low adherence, taking into account that 1705 university students were invited, including students from all courses except the health area, resulting in a final sample of only 141 participants. It is also important to emphasize that there are very few studies conducting nutritional interventions with students, especially with university students of courses not related to the health area, making the comparative analysis of data difficult.

CONCLUSION

In conclusion, the effects of the educational action were positive in several aspects evaluated, such as the reduction in the mean BMI values, increase in the scores in the assessment of food intake and other lifestyle habits and knowledge in nutrition.

As for food consumption, there was an increase in the prevalence of appropriate behavior for the consumption of fruits, green, legumes, foods that are sources of complex carbohydrates, removal of apparent fat from meat, fish consumption, decreased consumption of sweets, soft drinks and industrialized juices, consumption of water and reading of nutritional information on the labels of processed foods.

The "concern with body image and health" was the most mentioned option as a facilitating factor for the adoption of healthy eating by the family, both before and after the educational action.

After the educational action, university students who had greater knowledge in nutrition also had better food intake and other lifestyle habits and a greater number of factors facilitating the adoption of healthy eating habits by the family. Among those who scored higher in food intake and other lifestyle habits after

the educational action, they were those who had a reduction in the number of factors hindering the adoption of healthy eating by the family.

The adoption of healthy eating practices is of great importance for the individual development, whether in the social, physical or mental environment. Promoting health within the academic environment, regardless of the area of activity, reinforces the bases for building a more aware, collaborative, citizen, autonomous in its choices and, consequently, healthier society.

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