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Effect of a nutritional counseling activities, by using a social network, in coping with obesity

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Abstract

Innovative strategies need to be adopted to combat the growing prevalence of obesity. Thus, the aim of this study is to evaluate the effect of a nutritional counseling activity using a social network in coping with obesity. This is a before-and-after experimental study, including 60 overweight individuals enrolled in a Primary Care Center. It was carried out from June to October 2020. Educational actions (sharing information about healthy eating and health and agreeing on challenges) were carried out through the WhatsApp® application, weekly, for 16 weeks. Sociodemographic, economic, clinical, anthropometric, food consumption, and biochemical data were collected. Data were compared by the Wilcoxon or Kappa test. Most participants were female and 36.4% had a diagnosis of hypertension. After the intervention, there was a reduction in waist circumference (before:107.3±11.4; after:105.6±11.5 cm, p=0.004), total cholesterol (before:205.9±48, 3; after:191.5±34.3 mg/dL, p<0.001), and LDL-c (before:132.4±37.8; after:120.2±29.3 mg/dL, p<0.001). The activity was able to promote reductions in body markers of obesity and metabolic imbalances associated with obesity, demonstrating the importance of innovative interventions that can add to other interventions and facilitate public adherence.

Keywords: Obesity control. Primary Health Care. Internet-Based Intervention. Information and Communication Technologies Projects.

INTRODUCTION

Obesity is a multifactorial disease with increasing prevalence worldwide. There is a strong association between the presence of obesity and an increased risk for cardiovascular disease, diabetes, cancer, musculoskeletal disorders, and several other clinical disorders[1]. In Brazil, the prevalence of obesity grew exponentially from 2010 to 2020, with an increase from 13.9% to 20.3% in the capitals[2,3].

In the municipalities of the interior of Goiás, the reality is no different. In a population-based study with individuals over 18 years old in Senador Canedo in 2016, obesity was observed among 37.9%[4]. In Ipameri, a study showed that in adults treated at a primary care center in 2021, the predominant nutritional status was obesity, reaching 56.8%[5]. In Firminópolis, over 13 years (2002-2015) of monitoring a cohort study, the prevalence of obesity increased from 49.15 to 69.8%[6]. According to Food and Nutrition Surveillance System (FNSS) data, the prevalence of obesity in São Luís dos

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Montes Belos (city under study) was 33.15% in 2020[3]. Therefore, obesity constitutes an important public health problem.

Behavioral transitions that have occurred in recent decades may explain the increase in obesity. Bad eating habits and sedentary lifestyle stand out mainly[2,3]. With regards to diet, there is a pattern of reduced consumption of fresh foods and preference for ultra-processed products, with high levels of sodium, sugar, and saturated fat[4,1]. This is highlighted by the results of the 2017-2018 Household Budget Surveys (HBS) compared to the 2008-2009 POF, in which the trend analyses showed, regardless of gender, age, and income range, a decrease in the consumption of rice, beans, beef, breads, fruits, dairy products, processed meats, and soft drinks, and an increased intake of sandwiches[7].

There are several treatments for obesity, ranging from diet therapy combined with physical activity to bariatric surgery[8]. However, even with the different therapeutic resources, the number of overweight and obese patients continues to increase[1]. In view of this, the need for new methodological approaches for this public is exposed, with a focus on better adherence to healthy life practices, including healthy and adequate food.

One way of approaching the development of these strategies are actions carried out through social networks, such as WhatsApp®, which facilitate the development of educational actions in groups even when it is impossible for individuals to gather in the same place and at the same time[9,10,11]. Over time, these tools have been consolidated as a good strategy for linking them to health education actions due to the wide access of different population segments[9,10,11,12]. This event seems to have been accentuated in the context of the pandemic caused by the COVID-19 virus that was declared in 2020 and required social isolation[9].

The Food Guide for the Brazilian Population is also an important tool in promoting adequate and healthy food. It has language accessible to the entire population, in addition to having a pedagogical nature, with clear guidelines on consumption that promotes health and nutrition[13]. It is noteworthy that dietary treatment is more successful when combined with a behavioral modification program that involves an increase in energy expenditure and also motivation strategies for a sustainable change in lifestyle[8]. Thus, the integration of these two tools can be favorable to the treatment and follow-up of individuals with obesity in order to promote health and prevent complications.

In view of this information and the high prevalence of obesity in inland municipalities, the present study sought to evaluate the effect of a nutritional counseling activity using a social network in coping with obesity.

METHODOLOGY

Ethical aspects and financing

The present study is an integral part of the project "Matrix Support of Health Promotion Actions in the Obesity Care Line", approved by the Ethics and Research Committee of the Hospital das Clinicas of the Federal University of Goias under opinion no. 408472/2017-0. All participants signed the Informed Consent Form. The research was funded by the National Council for Scientific and Technological Development (CNPq), process number: 408472/2017-0.

Design and data collection

The matrix research, a cross-sectional study, was conducted in a territory assigned to a Primary Care Center (PCC), in a medium-sized municipality in the western region of

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Goias. A household survey was carried out in a representative sample of the 2,059 families enrolled at the PCC to identify individuals aged 18 to 59 who were obese. The sample calculation of 324 families was performed using the EpiInfoTM 7 software, considering a prevalence of 27.9% of obesity for the state of Goias[3], an absolute error of 5%, with a confidence level of 95%, and a loss of 30%. The calculated final sample was 332 families for the matrix study. This moment of the study took place between July and October 2018. All family members were included, totaling 533 individuals in this study, of which 162 (30.4%) were obese. Obese individuals identified in this phase were considered for the intervention study. More details can be found in a previous publication.

Next, for the experimental quantitative prospective study with a before and after intervention[14], a sample was calculated from the following parameters: a difference in weight loss of 2.72, a standard deviation (SD) of 6.0[15], an effect size 0.50, for an alpha of 0.05 and beta 0.2, reaching a minimum total of 41 individuals. Considering a 45% loss for intervention studies, 60 individuals were randomly drawn, with a maximum of one from each family visited in the previous stage. Upon refusal or impossibility of contact, new individuals were randomly selected until 60 participants were included. Individuals of both sexes were included, who in the previous stage of the research had a Body Mass Index (BMI) between 30 and 40 kg/m^2 and were aged between 18 and 59 years old. Individuals who did not have a cell phone were excluded. This stage of the study took place between June and October 2020.

At the beginning of the intervention, in order to update the information, a standardized form was applied again with sociodemographic questions (age, sex, color/race, education, presence of a partner, number of people residing with the volunteer), economic questions (paid work, hours of work per day, family income), and clinical questions (diagnosis of chronic non-communicable diseases, regular use and type of medication, family history of chronic diseases, history of weight loss, past obesity treatment, self-perception of reasons for being overweight). Furthermore, anthropometric information (weight, height, BMI, Waist Circumference – WC), data on physical activity, food consumption, and biochemical parameters (lipid profile and fasting glucose) were collected.

Anthropometric evaluation, investigation of food consumption and biochemical tests were performed before and after the intervention. The anthropometric assessment was carried out as follows:

-Weight: A Welmy® portable scale with a capacity of 200 kg (kilograms) and divisions of 50 g (grams) were used according to the standardization proposed by Lohman *et al.*, 1998[16].

-Height: measured with a tape measure fixed to a wall without a level baseboard at a height of 50 cm from the floor, after performing the plumb line test according to the standardization proposed by Lohman *et al.*, 1998[16].

-Body mass index (BMI): Calculated using the formula: [BMI= weight (kg)/height (m)^2]. To classify nutritional status, the cutoff points proposed by the World Health Organization[17] and Lipschitz[18] were used.

-Waist circumference (WC): Performed with an inextensible measuring tape and precision of 0.1 cm. The evaluation and classification were performed according to the World Health Organization[17], which recommends the measurement at the midpoint between the last rib and the iliac crest. Classification was used for risk of metabolic complications associated with obesity, according to sex. Measurements greater than 94 cm for men

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and greater than 80 cm for women represent an increased risk.

Physical activity was assessed using the International Physical Activity Questionnaire (IPAQ) in its short version with questions related to the daily practice of vigorous and moderate physical activity and walking. Individuals were classified according to the intensity of these activities as very active, active, irregularly active A and B, and sedentary[19].

The assessment of food consumption was obtained through the application of two 24-hour food recalls (24HR), before and after the intervention. The multiple-pass technique was used, which consists of five steps: (1) listing all foods and beverages consumed on the previous day; (2) quick listing review; (3) questioning the names of each meal; (4) details of the preparations, such as the type of preparation and additional products (5) review of the 24HR[20].

The amounts of food consumed were expressed in household measurements and converted into grams or milliliters using the national table of household measurements and food composition[13]. Additionally, supermarket and industry websites were consulted to obtain weight values and information on industrialized product labels. Culinary preparations were broken down into ingredients to calculate the nutritional value. To analyze the nutritional composition of the 24HR, the Avanutri software, version 3.1.5, was used. The results were entered into a database, classified according to the degree of processing of the NOVA classification[21,22]. Energy consumption from ultra-processed foods was evaluated, in addition to macro and micronutrients from the 24HR.

In addition, the frequency of food consumption was evaluated using the SISVAN form[23]. The frequency is presented in a table format where the interviewer marks the respondent's response in relation to how many days in the last seven days, he/she ate some foods and drinks (salad, vegetables, fruits, beans, milk and dairy products, potatoes, hamburgers, crackers, sweet biscuits, soft drinks).

As for the biochemical tests, blood was collected after a 12-hour fast in a private laboratory, adopting the measures standardized by that establishment. The following were evaluated: the serum lipids profile (total cholesterol – TC, HDL-c – high density lipoprotein cholesterol; and triglycerides and then calculated LDL-c – low density lipoprotein cholesterol; VLDL-c – very low-density lipoprotein cholesterol) by enzymatic colorimetric method[17]; and fasting glycemia by the enzymatic colorimetric method[24].

Intervention

The intervention consisted of educational health actions carried out through the WhatsApp® application. Participants were randomly divided into two groups of 30 participants to facilitate interaction. Weekly activities were the same for both groups and occurred for 16 weeks. The proposed themes were based on previous experiences with groups of individuals with obesity at the PCC of the municipality. The Food Guide for the Brazilian Population[6] served as a reference for some content. In addition, themes suggested by the participants were incorporated.

The topics addressed were:

1.Hunger or desire to eat?

2.Emotional hunger x physiological hunger

3.How is your dish? What should be consumed in a healthy dish?

4.Putting together a balanced meal

5.Practice exercises

6.The threat of ultra-processed foods

7.Importance of sitting down to eat and eating slowly

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8.Organization in food preparation and ease of consumption

9.Stop Deceiving Yourself: Sabotaging Thoughts

10.Hydrate: How to create the habit of drinking more water. Culinary Workshop (healthy substitutions)

11.Alcoholic beverages

12.Social Life: Learning to eat away from home

13.Keep exercising: Physical education as a way to combat obesity

14.Dealing with discouragement: Why is the weight loss process slow?

15.Remember your trajectory

The resources used to work on the contents were videos and infographics with guidelines. All the audiovisual material was produced by the researchers using tools such as: the cell phone for recording the videos, Power-point® and the Canva® application. The leaders of the activities also sent/answered messages to resolve any questions that arose on the part of the participants.

Participation was encouraged through weekly challenges and goals to be met in relation to each topic. For example: in the meeting that addressed how to put together a healthy dish, participants were challenged to send a photo of their dishes in the group. In addition, conductors sent thought-provoking and motivational questions daily to encourage participation by group members. There were no awards of any kind.

Conducting the group and constructing the themes were carried out by two academics from a nutrition course in the municipality, previously trained, by the nutritionist supervising the research who also worked in the Multiprofessional Primary Care Team (MPCT) (formerly Expanded Center for Family Health and Primary Care) and by two professors from the Faculty of Nutrition at the Federal University of Goias. It also had the support of physical education professionals, a physical therapist, and a psychologist from the Multidisciplinary Primary Care Team.

Statiscal analysis

The effect of the intervention was measured by the changes that occurred between the beginning and end of the intervention for anthropometric, physical activity, biochemical, and food consumption variables. Descriptive analysis was performed for categorical variables presented in absolute (n) and relative (%) frequencies. For continuous variables, mean and standard deviation of the mean (SD) were used. The Shapiro Wilk test was performed to verify the normality of the data and from that, non-parametric statistics were applied with the Wilcoxon test. To verify the agreement between classifications of categorical variables before and after the intervention, the Kappa test was used. The significance level used for all tests was 5%. STATA® software version 14.0 was used in this analysis.

RESULTS

Although 60 participants started the study, one withdrew due to moving to another city and four due to personal reasons, thus the proposed intervention had a 91.7% adherence rate. At the end of the study, the age range of the participants was 27 to 60 years old, and the mean was 45.9 years (SD=8.8).

The highest frequency was female, brown or black, who had at most an incomplete high school education, and lived with a partner. For those who reported paid work, the average number of hours worked daily

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was 8.3 (SD=4.2). The most frequent family income was 1 to 3 monthly minimum wages and most households had 1 to 3 people living together (Table 1).

As for the health of the participants, more than a third reported a prior diagnosis of arterial hypertension and one in ten of dyslipidemia, with almost 70% reporting regular use of some medication. Most drugs were used for the treatment of Chronic Non-Communicable Diseases (Table 1).

As for family history, the most reported diseases/conditions were high blood pressure (78.2%), diabetes (63.6%), acute myocardial infarction (43.6%), and obesity (34.5%). With regards to weight, 18 participants reported weight loss prior to the intervention. Of these, 14 had follow-ups, but only two were in the public healthcare service, and three lost weight without any type of follow-up. Among the weight loss strategies used, three reported follow-ups with nutritionists and three with a doctor, two underwent bariatric surgery, eight went on a diet on their own, two performed physical activity, three used medications, one of which used it on their own, and only one followed up in a group (more than one strategy could have been adopted by each volunteer).

There were reports of abandonment of weight loss strategies by 10 of the 14 participants. The reasons for this abandonment included personal discouragement (5 cases), financial condition (4 cases), and death of a family member (1 case). Regarding self-perception of the reasons for obesity, 49.1% of individuals reported changes in their emotional state, followed by poor eating habits (47.3%), sedentary lifestyle (29.1%), life events (10.9%), and hereditary factors (9.1%).

In Figure 1, in panels A and B, the classification changes that occurred from the moment before to after the study are shown. The numbers are the absolute frequencies of individuals. Darker box colors and ascending lines represent improved rating; lighter color and descending lines are worsened rating; and the absence of color and horizontal lines, maintenance of classification throughout the intervention time. Thus, what can be seen is that after 16 weeks of intervention, despite the absence of significant changes in mean weight and BMI, a transition between BMI classifications could be seen, with a reduction in the frequency of those classified as obese and an increase in of those classified as overweight, while only two patients had worse nutritional status at the end of the intervention, compared to the beginning ($p<0.001$, Table 2, Figure 1A). It was also possible to show a transition between the categories of physical activity level, with an improvement in the level of physical activity in 12 individuals, including an increase in the frequency of very active volunteers and a reduction in the sedentary volunteers; on the other hand, there was a worsening in the level of physical activity in 13 patients ($p<0.001$, Table 2, Figure 1B).

For the WC measurement, it was possible to verify a significant reduction of the measurement with the intervention. Similarly, there were significant reductions for TC and LDL-c (Table 2). Respectively, 69.09%, 67.27%, 65.45% had reduced WC, TC and LDL-c between the moments before and after the intervention.

In the assessment of micronutrient consumption, a statistically significant decrease in the mean intake of vitamin A and folate before and after the intervention was observed (Table 3).

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Table 1 – Sociodemographic, economic, and health-related characterization of obese individuals. Sao Luís dos Montes Belos, Goias, Brazil, 2020.

Characteristics	n(%)
Sociodemographic and economic	
Sex	
Female	41(74.5)
Male	14(25.4)
Color/Race	
White	17(30.9)
Brown or Black	36(65.5)
Yellow	4(3.6)
Education	
Incomplete Elementary	5(9.1)
Complete Elementary or Incomplete Middle School	18(32.7)
Complete Middle School or Incomplete High School	4(7.3)
Complete High School or Incomplete Higher Education	13(23.6)
Complete Higher Education	15(27.3)
Presence of partner	
Yes	32(58.2)
No	23(41.8)
Paid work	
Yes	24(43.6)
No	31(56.4)
Family income (minimum wages)	
Up to 1	16(29.1)
1 to 3	28(50.9)
4 or more	11(20.00)
People residing at home	
Lives alone	7(12.7)
1 to 3 people	33(60.0)
4 to 7 people	15(27.3)
Related to health	
Diagnosis of comorbidity	
Arterial hypertension	20(36.4)
Dyslipidemia	5(9.1)
Type 2 diabetes mellitus	4(7.3)
Cancer	1(1.8)
Regular use of medication	37(67.3)

Note: Values presented in absolute frequencies (relative frequencies %); n=55.

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Table 2 – Assessment of anthropometric, physical activity, and biochemical parameters before and after the intervention. Sao Luis dos Montes Belos, Goias, Brazil, 2020.

Characteristics	Before the intervention	After the intervention	p-value
Anthropometry			
Weight (kg), mean (SD)	92.4(19.0)	91.5(19.3)	0.136†
BMI (kg/m²), average (SD)	34.7(5.4)	34.3(5.1)	0,215·
Nutritional status			**<0.001§**
Overweight	6(10.9)	10(18.2)	
Grade 1 obesity	28(50.9)	27(49.1)	
Grade 2 obesity	11(20.0)	10(18.2)	
Grade 3 obesity	10(18.2)	8(14.5)	
Waist circumference (cm), mean (SD)	107.3(11.4)	105.6(11.5)	**0.004†**
Physical activity			
Level of physical activity, n(%)			**<0.001§**
Very active	1(1.8)	3(5.4)	
Active	28(51.8)	23(41.8)	
Irregularly active A	14(25.9)	17(30.9)	
Irregularly active B	7(13.0)	9(16.5)	
Sedentary	4(7.5)	3(5.4)	
Biochemical exams			
Total cholesterol (mg/dL), mean (SD)	205.9(48.3)	191.5(34.3)	**<0.001†**
HDL-c(mg/dL), mean (SD)	44.8(10.7)	43.8(8.8)	0.250†
LDL-c (mg/dL), mean (SD)	132.4(37.8)	120.2(29.3)	**<0.001***
VLDL-c (mg/dL), mean (SD)	31.2(27.2)	27.5(10.4)	0.866†
Triglycerides (mg/dL), mean (SD)	161.6(153.0)	160.3 (94.8)	0.441†
Fasting blood glucose (mg/dL), mean (SD)	97.8(25.0)	96.2(26.7)	0.055†

Note: SD – standard deviation; BMI – body mass index; HDL-c – high-density lipoprotein cholesterol; LDL-c – low-density lipoprotein cholesterol; VLDL-c – very low-density lipoprotein cholesterol. Values presented as mean (standard deviation of mean); n=55; * Paired Student t-test; †Wilcoxon test; §kappa concordance test, all with 5% significance level.

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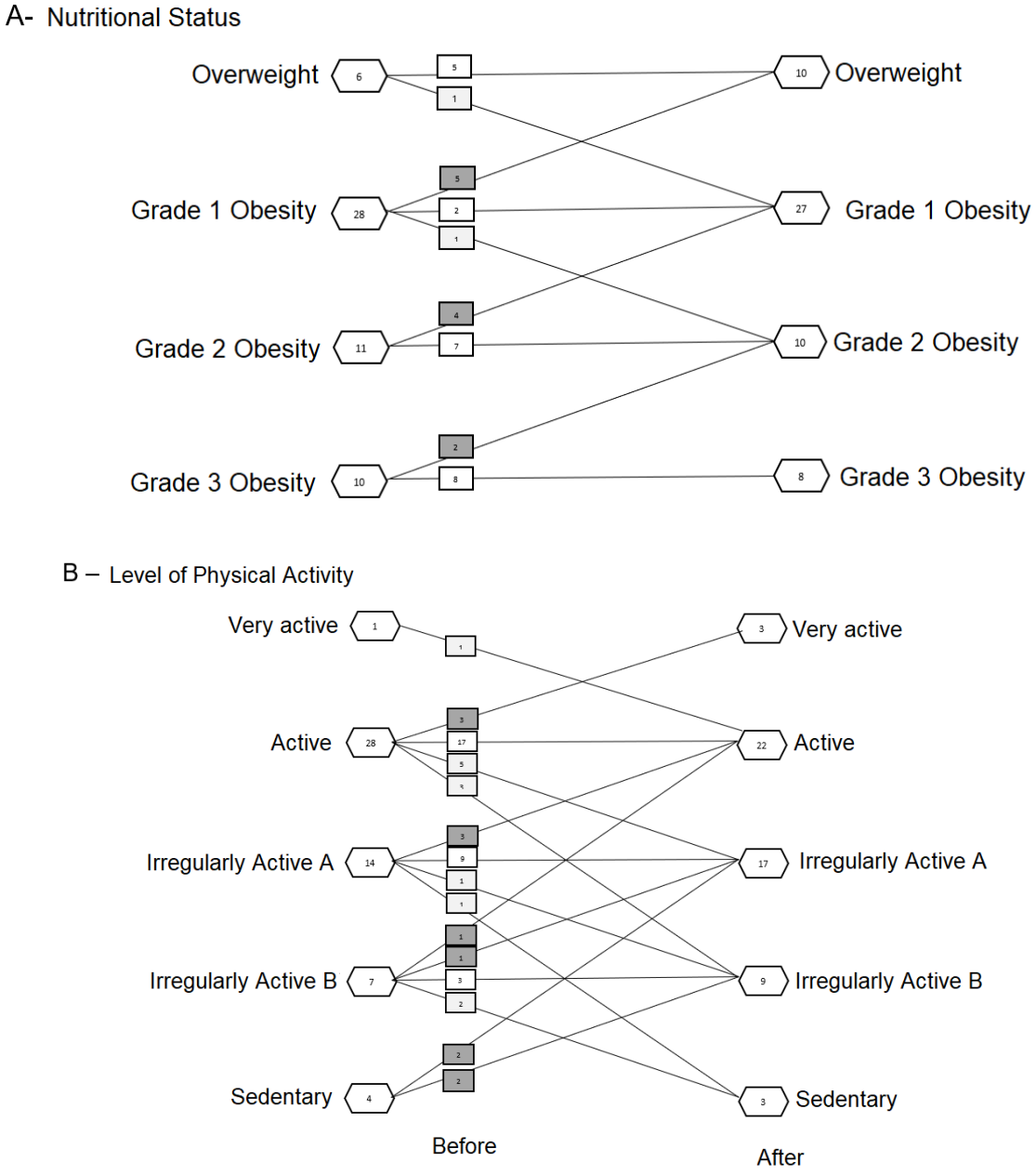

Figure 1 – Changes in classification of nutritional status (A) and physical activity level (B) before and after the intervention. Sao Luis dos Montes Belos, Goias, Brazil, 2020.
Source: Own authorship.

Note: Numbers are absolute frequencies of individuals. Darker box color and ascending lines represent improved rating; lighter color and descending lines are worsened rating; and the absence of color and horizontal lines, maintenance of classification throughout the intervention time.

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Table 3 – Assessment of daily food consumption (energy and nutrient intake) before and after the intervention. Sao Luis dos Montes Belos, Goias, Brazil, 2020.

Characteristics	Before the intervention	After the intervention	p-value†
Energy (Kcal)	1865.7 (778.3)	1726.4 (809.0)	0.240
Protein (g)	71.1(34.3)	71.5(40.6)	0.950
Protein (%)	15.3(5.2)	17.1(7.7)	0.110
Carbohydrate (g)	210.1(102.3)	182.9(101.3)	0.086
Carbohydrate (%)	45.5(10.4)	42.3(11.7)	0.150
Lipid (g)	82.3(38.2)	78.8(42.0)	0.600
Lipid (%)	39.2(7.6)	40.6(7.9)	0.400
Cholesterol (g)	273.1 (261.3)	287.8 (248.8)	0.847
Saturated Fat (g)	22.7(12.8)	23.1(15.0)	0.828
Monounsaturated fat (g)	23.9(14.4)	24.4(16.4)	0.725
Polyunsaturated fat (g)	18.8(11.6)	17.4(13.4)	0.384
Fibers (g)	9.0(5.5)	11.3(23.8)	0.147
Vitamin A (RE)	1095.2 (2862.7)	634.1 (1764.1)	0.023
Vitamin D (mcg)	11.1(14.2)	12.0(14.7)	0.393
Vitamin B1 (mg)	1.6(3.5)	1.6(3.3)	0.753
Vitamin B2 (mg)	1.3(1.8)	1.1(0.9)	0.854
Vitamin B5 (mg)	2.5(2.2)	2.3(1.5)	0.920
Vitamin B6 (mg)	1.1(0.8)	1.0(0.8)	0.424
Vitamin B12 (mcg)	9.4(28.8)	3.8(3.8)	0.933
Vitamin C (mg)	116.2 (171.3)	66.4(115.2)	0.077
Vitamin E (mg)	24.0(17.6)	20.9(18.5)	0.228
Folate (mcg)	125.0(106.5)	84.0(76.1)	0.025
Calcium (mg)	386.2 (221.6)	402.5(310.0)	0.960
Phosphorus (mg)	822.6(403.8)	843.1 (442.8)	0.760
Magnesium (mg)	145.9(88.1)	133.2(84.7)	0.339
Iron (mg)	47.3 (188.1)	67.4(417.5)	0.393
Zinc (mg)	9.4(7.2)	7.8(8.4)	0.094
Copper (mg)	1.0(1.2)	0.7(0.4)	0.181
Iodine (mcg)	25.8(33.8)	32.5(43.9)	0.600
Selenium (mcg)	53.4(35.9)	63.0(50.4)	0.254
Manganese (mg)	0.8(0.6)	0.7(0.4)	0.218
Potassium (mg)	1678.1 (1063.3)	1498.1 (934.0)	0.311
Sodium (mg)	1359.5 (1178.8)	1213.3 (989.2)	0.513

Note: Values presented as mean (standard deviation of the mean); n=55; †Wilcoxon test, with 5% significance level. RE= Retinol Equivalents.

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Table 4 – Assessment of daily food consumption (diet quality markers and NOVA classification) before and after the intervention. Sao Luis dos Montes Belos, Goias, Brazil, 2020.

Characteristics	Before the intervention	After the intervention	p-value†
Quality markers (days/week)			
Salad	4.8(2.6)	5.2(2.1)	0.132
Vegetables	3.4(2.5)	3.5(2.5)	0.538
Fruit	3.6(2.8)	3.6(2.7)	0.993
Beans	4.6(3.0)	5.3(2.4)	0.089
Milk and dairy products	2.9(2.8)	3.3(2.8)	0.497
Potato	0.6(0.8)	0.6(1.1)	0.555
Hamburger	0.8(1.2)	0.9(1.3)	0.404
Crackers	1.6(2.1)	1.3(2.3)	0.162
Sweet cookies	1.8(2.2)	1.4(1.8)	0.288
Soft drinks	1.2(2.0)	1.7(2.1)	0.053
NOVA classification			
In natura or minimally processed food (kcal)	893.8 (486.1)	910.2(553.0)	0.750
In natura or minimally processed food (%)	48.9(17.9)	53.2(18.4)	0.186
Cooking ingredients (kcal)	306.2(227.0)	295.1 (206.7)	0.907
Cooking ingredients (%)	16.5(8.9)	17.0(8.8)	0.503
Processed food (kcal)	266.9 (289.6)	209.6 (230.8)	0.222
Processed food (%)	14.7(14.2)	13.6(13.5)	0.648
Ultra processed food (kcal)	389.5 (519.8)	291.9(324.0)	0.160
Ultra processed food (%)	19.9(20.9)	16.3(15.1)	0.379

Note: Values presented as mean (standard deviation of the mean); n=55; †Wilcoxon test, with 5% significance level.

DISCUSSION

A virtual intervention study was carried out to face obesity in primary care. We highlight the positive results in relation to the decrease in abdominal fat, improvement in the lipid profile of the participants, and strong adherence to the presented intervention, with occasional follow-up losses. It is possible to find similar reports in the literature of positive experiences with the use of messaging applications as a food and nutrition education tool[11,25,26]. Each study worked with different groups and proposals, but all highlight WhatsApp® as a valuable health education instrument, emphasizing the practicality favored by the application as well as the greater involvement of participants.

In a study that developed an application to set goals related to interventions, diet and physical activity, and to improve interactions among 109 participants, and adherence was 82% during the 12 months of follow-up (final sample 84). Participants did not show a significant change in BMI, but demonstrated a reduction in WC, as in the present study[27]. Another study of virtual intervention, with 12 months of follow-up, with 105 obese male individuals, showed 64% of adherence and lost significant weight, but there was no change in BMI classification[28].

The significant decrease in WC, in addition to representing protection against cardiovascular diseases[1], is associated with improved quality of life[29], especially concerning the physical domain, which is associa-

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ted with the willingness to carry out daily activities, better acceptance of body image, and better well-being and health perception[30]. These factors motivate the continuation of the actions proposed in the intervention, with an impact on eating habits and avoiding weight regain after the intervention, which is a challenge for the treatment of obesity[1].

Concerning weight reduction, although we did not find a significant difference after the intervention, migration between BMI categories was observed, with an increase in the number of participants classified as overweight and a decrease in those classified as obese. We believe that it was not possible to achieve eutrophy due to the intervention time, which for the treatment of obesity was short[1]. According to the Brazilian Obesity Guidelines, what determines the success of any weight loss program is the speed of weight loss, the physiological changes, and the ability to maintain behavioral changes in diet and physical activity. Furthermore, a more flexible meal plan, with a focus on re-education, as was the intervention in the present study, is generally more successful in the long term[8].

Regarding the lipid profile, there was a reduction in TC and LDL. This change is important for cardiovascular health, since high TC and LDL are responsible for a greater predisposition to cardiovascular disease and the appearance of complications such as heart attacks and vascular accidents that can lead to sequelae and higher costs for healthcare services[1,8,31,32].

As for the participants, there was a predominance of obese individuals who are women, who do not have paid work, and have low levels of education. These results are similar to those observed in other Brazilian studies with participants with obesity[33,34]. This can be explained because in women, the search for excess weight control has strong aesthetic motivations[35]. In addition, they tend to seek out more healthcare services for prevention, while men seek more for reasons of emergencies and already established illnesses[36].

With regards to diet quality, we believe that the inadequacy of some nutrients could be explained by underreporting of food consumption. However, even with this bias present in all participants, it was possible to obtain significant and positive results in terms of quality improvement, with adequate copper; zinc; and vitamins A, B2, and C levels after the intervention[31]. Despite not showing significant changes, clinically it was possible to see that there was a lower caloric intake of carbohydrates, lipids, and maintenance of protein intake. Moreover, there was an increase in the weekly consumption of salads, beans, milk, and dairy products, as well as a reduction in the energy share of ultra-processed and processed foods and an increase in in natura foods (all not significant). These modifications suggest that the short-term intervention was contrary to the increase that has been observed in the general population[37].

The COVID-19 pandemic, with the need to distance oneself from social interaction, imposed a new challenge and required a new way of working with overweight individuals. If, on the one hand, distancing increased the opportunity to use social networks, on the other hand, it increased psychosocial insecurities and, consequently, stress levels. In a literature review that aimed to analyze the scientific evidence for the effectiveness of interventions aimed at weight loss in overweight or obese people with a focus on behavioral and online interventions, the authors suggest that the effectiveness of online interventions for weight loss weight control is high enough to be used in nutritional education and weight reduction or maintenance[38].

Limitations of the present study were the assessment of food consumption based on the 24HR without standardization of the day of the week. The absence of a placebo

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group in the intervention can be considered a limitation; however, two aspects are important: i) choosing a completely effect-free method can be difficult for this type of intervention; and ii) there are pertinent ethical considerations when choosing to treat only one group and submitting the other only to follow-up, since we know that obesity can worsen the individual's health. Accordingly, the absence of a control group can also be considered a limitation since it makes it impossible to compare this method with widely used interventions such as individual counseling or face-to-face group counseling at healthcare centers; however, the establishment of new strategies with assertive methodologies is a sufficient factor to substantiate its absence, opening possibilities for greater reach of Food and Nutrition Education in the population. Finally, a limitation of the present study refers to that inherent in all group methodologies: the limitation of the approach at the individual level. However, it should be noted that the purpose of this study is not to consolidate the intervention using the social network as a single strategy, but rather to complement this treatment with a view to greater effectiveness.

CONCLUSION

Thus, it was observed that the intervention proposed through an action via the social network widely disseminated among Brazilians (WhatsApp®) had an effect in reducing body markers of obesity (abdominal fat assessed by WC) and metabolic imbalances (LDL-c and CT) associated with this condition and thus it is concluded that the proposed methodology can be used additionally for the treatment of obesity. With this, the importance of health education actions is noted, which can even be carried out virtually. Digital tools are potential aids for intervention programs, even outside the context of a pandemic, since they require lower investments, have participant adherence, and can generate relevant impacts on several health-related variables.

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