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# Multiprofessional intervention and telenursing in the treatment of obese people in the COVID-19 pandemic: a pragmatic clinical trial

*Intervenção multiprofissional e telenfermagem no tratamento de obesos na pandemia de COVID-19: ensaio clínico pragmático*

*Intervención multiprofesional y teleenfermería en el tratamiento de obesos en la pandemia de Covid-19: ensayo clínico pragmático*

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## ABSTRACT

**Objectives:** to analyze the effects of a multiprofessional remote intervention and telenursing in the treatment of obesity. **Methods:** pragmatic clinical trial of intervention, conducted with obese adults. The multiprofessional remote intervention with a nurse occurred for 16 weeks through a messaging application. The application analyzed body composition, hemodynamic and laboratory variables, comparing the results obtained with the group that participated in face-to-face multiprofessional intervention without a nurse. The study investigated the effects of the intervention comparing the intervention groups and the moments through the ANOVA test for repeated measures. **Results:** Group 1 obtained significance in the variables: percentage of body fat (p = 0.008); blood glucose (p = 0.014); insulin (p = 0.001); abdominal and waist circumference; and HDL cholesterol (p = 0.000). **Conclusions:** the effects of multiprofessional remote intervention and telenursing significantly decreased the risk variables for metabolic syndrome in the treatment of obesity.

**Descriptors:** Obesity Management; Telenursing; Telemonitoring; Patient Care Team; Primary Health Care.

## RESUMO

**Objetivos:** analisar os efeitos de uma intervenção remota multiprofissional e da telenfermagem no tratamento da obesidade. **Métodos:** ensaio clínico pragmático de intervenção, realizado com adultos obesos. A intervenção remota multiprofissional com enfermeiro ocorreu durante 16 semanas mediante um aplicativo de mensagens. Analisaram-se variáveis de composição corporal, hemodinâmicas e laboratoriais, realizando a comparação dos resultados obtidos com o grupo que participou de intervenção multiprofissional presencial sem enfermeiro. A análise dos efeitos da intervenção foi feita comparando os grupos de intervenção e os momentos por meio do teste ANOVA para medidas repetidas. **Resultados:** o Grupo 1 obteve significância nas variáveis: porcentagem de gordura corporal (p = 0,008); glicemia (p = 0,014); insulina (p = 0,001); circunferência abdominal e de cintura; e colesterol HDL (p = 0,000). **Conclusões:** os efeitos da intervenção remota multiprofissional e da telenfermagem diminuíram significativamente as variáveis de risco para a síndrome metabólica no tratamento da obesidade.

**Descritores:** Manejo da Obesidade; Telenfermagem; Telemonitoramento; Equipe de Assistência ao Paciente; Atenção Primária à Saúde.

## RESUMEN

**Objetivos:** analizar efectos de una intervención remota multiprofesional y teleenfermería en el tratamiento de la obesidad. **Métodos:** ensayo clínico pragmático de intervención, realizado con adultos obesos. La intervención remota multiprofesional con enfermero ocurrió durante 16 semanas mediante un aplicativo de mensajes. Analizadas variables de composición corporal, hemodinámicas y laboratoriales, realizando comparación de resultados obtenidos con el grupo que participó de intervención multiprofesional presencial sin enfermero. Análisis de efectos de la intervención fue hecha comparando los grupos de intervención y los momentos por medio del test ANOVA para medidas repetidas. **Resultados:** el Grupo 1 obtuvo significación en las variables: porcentaje de gordura corporal (p = 0,008); glucemia (p = 0,014); insulina (p = 0,001); circunferencia abdominal y de cintura; y colesterol HDL (p = 0,000). **Conclusiones:** los efectos de la intervención remota multiprofesional y teleenfermería disminuyeron significativamente las variables de riesgo para la síndrome metabólica en el tratamiento de la obesidad.

**Descriptores:** Manejo de la Obesidad; Teleenfermería; Telemonitorización; Grupo de Atención al Paciente; Atención Primaria de Salud.

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## INTRODUCTION

The world is in a pandemic situation of COVID-19, an infectious disease that affects humans, caused by the new coronavirus, called SARS-CoV-2. This virus was unknown before the outbreak began in Wuhan, China, in December 2019[1].

Among the risk factors for the evolution of the severe form of the disease and death, obesity has deserved a prominent role. A study conducted in 181 countries with 4,670,832 cases of COVID-19 and 311,384 deaths observed that obesity is the main modifiable risk factor associated with SARS-CoV-2 infection[2].

Coping with obesity represents a need for a multiprofessional and transdisciplinary approach since it is a multifactorial, recurrent, and often silent disease that contributes to other chronic conditions[3-4]. In recent years, multiprofessional intervention programs, including physical exercises, nutritional, psychological, and clinical counseling, have proved very effective for weight control and control of obesity-related comorbidities[5].

To that end, it is noteworthy that among the members of the multiprofessional health team, nurses have a fundamental role, being able to implement programs for evaluation and monitoring of chronic health problems and help people (e.g., obese) to self-manage their health problems[6]. Despite this, a study that conducted a systematic review of publications about the multiprofessional treatment of obesity in Brazil[7] showed that 17 of the 26 studies selected involved the broadest range of health fields (physical education, nutrition, psychology, and medicine), but among all the studies analyzed, only one reported the participation of the nursing professional.

With the sudden need for social distancing, it is essential for the general population's health not to interrupt or completely change the lifestyle of people during this period and maintain an active lifestyle at home[8]. In this context, for the performance of nursing, especially in this period of social distancing, telenursing has been available, which deals with the interaction nurses to health professional, nurses to nurses or nurses to patients, carried out through devices that overcome the barriers of distance and time[9].

In Brazil, the study on telenursing is still in the beginning, and most of the research that uses this technology was carried out in developed countries such as Germany, the United States of America, Spain, and England[10].

As a complex disease, obesity requires the definition of care strategies that demand an integrated, equitable, and comprehensive structure for the population with a person-centered approach. The recommendations are for immediate action across the entire spectrum of obesity, starting from prevention to treatment in the context of COVID-19. Among the recommendations is that the treatment of this disease should be accessible to all people affected and that, for such, new treatment strategies should be developed, including telemedicine[11].

Given the need to treat obese individuals continuously and integrally, this study offers an immediate return to the population served since the actions provide early diagnosis and immediate multiprofessional treatment to the participants. In addition, if effective, the method can be replicated for the treatment of obesity in other locations.

## OBJECTIVES

To analyze the effects of a multiprofessional remote intervention and telenursing in the treatment of obesity.

## METHODS

### Ethical aspects

The study has approval from the Research Ethics Committee according to resolutions 466/2012 and 510/2016; and the Brazilian Registry of Clinical Trials (REBEC), a platform of the Ministry of Health.

### Design of study

This is a pragmatic clinical trial of intervention, carried out and described based on the CONSORT 2010 framework[12]. This study is part of the integrated project entitled "effectiveness of a multiprofessional program in the evaluation of cardiometabolic risk factors and treatment of abdominal obesity in two municipalities in northwestern Paraná".

### Period of study

The research was disseminated through social networks, printed and spoken media, and basic health units (BHU) in September and October 2019. The promotion informed the phones, e-mail address, website, and address of the Research Center of the University of this study. And the interested parties were informed about the initial screening for evaluation of the study participants, carried out in the period from November 4th to 8th, 2019.

The pre-intervention evaluations took place in February 2020, and the intervention took place from March to June 2020.

### Place of study

The study investigated the population of the municipality of Paranavaí and Maringá, State of Paraná, Brazil.

### Population

Obese adult individuals[13] with waist circumference ≥ 88cm for women or ≥ 102cm for men[14].

### Criteria of inclusion and exclusion

The inclusion criteria were: individuals residing in the studied municipality, mobile phone holders with access to the WhatsApp® application with availability for evaluations and participation in the intervention.

The exclusion criteria were: previous bariatric surgery; reported eating disorder; individuals with reduced or impaired mobility. As discontinuity criteria, the study discontinued people who did not participate in the group activities for seven days in a row and/or informed their withdrawal.

After the initial analysis of the anthropometric and body composition parameters of the subjects, the eligibility criterion was BMI ≥ 30.

## Study protocol

### *Protocol and common instruments for the two intervention groups*

The study assessed the participants before and after 16 weeks of conducting anthropometric measurements and body composition: weight (m), body mass (kg); body mass index (kg/m$^2$); lean body mass (kg); fat mass (kg); body fat percentage; lean body mass (kg/m$^2$); fat mass index (kg/m$^2$); lean-to-fat ratio (kg/lb.). In addition, participants went under laboratory evaluations to determine biochemical parameters (glycemia, insulinemia, glycated hemoglobin, total cholesterol, HDL-c, LDL-c, triglycerides, and ultrasensitive C-reactive protein).

For height measurement, the evaluator positioned the participant with his back to the stadiometer (in the center and leaning against the equipment). At the sign of the evaluator, the subject performed a deep inspiration followed by expiration and took the measure at the end.

The examiners instructed the participants to keep the waist region free of clothing and to remain standing, barefoot, with the blouse raised, arms flexed and crossed in front of the chest, feet apart, abdomen relaxed, and breathing normally to measure the waist circumference (WC) and abdomen (AC). They used a non-flexible tape measure directly on the skin. For the WC, the measurement was performed in the region between the last rib and the iliac crest, and the reading was made at the time of expiration, having as a parameter the value of ≥ 88 cm for women and ≥ 102 cm for men[14].

Body mass (kg) was evaluated using a multifrequency octapolar bioimpedance apparatus for height analysis (m); body mass (kg); body mass index (kg/m2); lean body mass (kg); fat mass (kg); body fat percentage; lean mass index (kg/m2); fat mass index (kg/m2); lean to fat ratio (kg/kg).

The participants received the instruction to urinate about 30 minutes before the evaluation, not to consume alcohol or caffeinated beverages in the last 48 hours, avoid vigorous physical exertion in the previous 24 hours before, not to ingest diuretics seven days before the exam, be in total fasting for at least four hours. Participants who were in the menstrual period rescheduled to another day[15].

The examiner used an automatic arm blood pressure monitor (model: HEM-7113, Omron®) to measure hemodynamic parameters (systolic blood pressure and diastolic blood pressure). The participant had to remain seated with his back resting on the back of the chair, his legs parallel (semi-flexion forming a 90° angle), and his feet resting on the ground. The pressure was measured on the left arm, with the palm facing up: the examiner positioned the clamp, putting the marking of the instrument artery on the line of the brachial artery[16].

The collection of the material for the biochemical tests was carried out in a private laboratory, and the participants had to go through a period of fasting of eight hours for the collection of the tests[17].

The researcher carried out the collection of data through the service sheets organized in Excel spreadsheets®. Membership in the group was controlled and supervised by the researcher through participation in the WhatsApp® group.

### *G1 - Remote Multiprofessional intervention with Nurse*

The intervention took place in the municipality of Paranavaí. After the disclosure of the study, 118 individuals attended the screening site for the evaluation of the following parameters: body mass, height, body mass index (BMI), waist circumference (WC), blood pressure, and body composition (bioimpedance). Therefore, the eligible individuals were invited to perform laboratory tests: glycemia, insulinemia, glycated hemoglobin, total cholesterol, HDL-c, LDL-c, triglycerides, and ultrasensitive C-reactive protein to allow the verification of the prevalence of each factor and/or risk behavior.

Of the 118 individuals, 104 went under the laboratory tests requested, of which 53 were classified with BMI equal to or greater than 30 (indication of obesity) and were invited to participate in the multiprofessional intervention. Of the 53, were 39 accepted, and all allocated to Group 1 (G1) – Remote Multiprofessional Intervention with Nurse. During the intervention, 17 individuals gave up; therefore, 22 individuals participated in the final evaluation.

The multiprofessional intervention model for the treatment of overweight and reduction of risk factors for metabolic syndrome, added to the nursing intervention using telenursing, was performed with the participants through guidance and interventions of professionals from the areas of nursing, physical education, psychology and nutrition, three times a week, for 16 weeks.

The professionals organized remotely the activities through the WhatsApp® application as follows: in common, on Mondays, Wednesdays, and Fridays, participants received guidance from physical educators, but specifically, they also received psychological guidance on Mondays; nutritional direction on Wednesdays; and nursing guidance on Fridays.

They organized the participants into two WhatsApp® groups. The first, "Warnings," only the group administrators (professional team) had access to send messages. This group was useful for the multiprofessional team to pass on the guidelines so that they would not get missed with the participants' conversations. The second group, "participants" allowed everyone to send messages, enabling interaction between the participants of the group and the professionals.

Before starting the intervention, the professionals explained to the participants about the dynamics of remote monitoring, solving their doubts.

Physical education professionals recorded videos with guidelines and examples lasting one hour for participants to perform moderate/intense physical activity. They sent these videos on fixed days, three times a week (Mondays, Wednesdays, and Fridays), at a pre-defined time (18: 30) by the participants.

During the 16 weeks, participants received weekly guidance through videos, texts, and audios via WhatsApp® from the professional psychologist on the following topics: body recognition, perception, goal-setting, expectations, self-esteem, self-love, self-awareness, and self-assessment, the process of change, motivations, emotions and eating habits, anxiety, recognition of emotions, emotional eating, food industry.

Regarding nutritional guidance, during the 16 weeks, the participants received weekly orientation through videos, texts, and audios via WhatsApp® on the following topics: goal setting and nutritional surveys, proper and healthy eating, food planning (qualitative menu), hunger and satiety, eating with mindfulness (Mindful Eating), food groups and nutrient functions, menu planning (qualitative and quantitative), food labels and trendy diets, functional foods, comorbidities associated with overweight and obesity, nutritional experience (participants share their daily menus

in the WhatsApp® group), dealing with everyday situations, how to continue healthy eating after the intervention.

As for the nurse's intervention, the nurse researcher organized the process of disseminating the study, the screening, contact with interested parties, organization of the intervention group, and the initial evaluations. In addition to the organization and coordination of activities, the nursing intervention was based on guidelines focusing on the health education of the participants carried out through telenursing.

For the fulfillment of the guidelines, the researchers adapted the script for remote nursing monitoring of obese women proposed in the study by Palmeira et al., originally developed to be carried out via telephone calls[18].

The researchers sent online posters with guidelines on the themes of each week. In addition, the original script was adapted for a duration of 16 weeks and included guidance on the questions raised by the participants before the beginning of the interventions with a focus on coping with obesity and addressed from the 12th to the 15th week.

Thus, the message of the first week seeks to clarify the proposal of telenursing and discuss the concept and the causes of obesity. From the second week, information aimed at guiding the following subjects covered each in a week: the healthy diet for health and weight controlling; complications of obesity; the role of physical activity, how to prepare the food, hydration and the consumption of water, the consumption of fruits and their properties; healthy eating habits; the risk of particular diets, and the importance of the follow-up of a health professional, the importance in controlling weight gain, improvement of the self-image concept, and prevention of high blood pressure; concept and the prevention of dyslipidemia, and the importance of the management of diabetes, its symptoms, and prevention efforts; the presentation of bariatric surgery, its risks, benefits, disadvantages, approach to the new coronavirus and its relationship with obesity; reinforce guidelines on the importance of weight control.

The WhatsApp® group also helped as a space for encouraging participants and clarifying any doubts during the intervention.

### *G2 - On-site Multiprofessional intervention without a Nurse*

The research performed this intervention in the city of Maringá, where, after the disclosure of the study, 575 individuals attended the screening, and went under the evaluation of the following parameters: body mass, height, body mass index (BMI), waist circumference (WC), blood pressure and body composition (bioimpedance). Therefore, researchers invited the eligible individuals to be tested in the laboratory (glycemia, insulinemia, glycated hemoglobin, total cholesterol, HDL-c, LDL-c, triglycerides, and ultrasensitive C-reactive protein) to verify the prevalence of each factor and/or risk behavior.

Of these, 314 went under laboratory tests requested, and 94 individuals were classified with BMI equal to or greater than 30 (an indicator of obesity) and were invited to participate in the multiprofessional intervention. Of the 94 guests, 53 accepted to participate and were allocated to the G2 - On-site Multiprofessional Intervention without a Nurse.

The activities carried out with these individuals took place in person, being supervised by physical education, nutrition, and psychology professionals. The guidelines given by the professionals of the multiprofessional team to G2 were the same as those provided to G1 (except those of the nursing professional), except for the fact to be carried out in person.

### Analysis of results and statistics

The study compared the intervention carried out in Group 1 with the results of the participants in Group 2 (G2) - Multiprofessional Intervention to analyze the effectiveness of the results in the municipality of the other research center, provided by the coordinator of the integrated project.

The statistical Package for the Social Sciences (SPSS) program, version 23, carried out the statistical analysis of the data. The Shapiro-Wilk test certified the normality of data. For the comparison between the training groups and periods (pre-session and post-session acute or chronic intervention), the study used ANOVA to check for repeated measures when the Mauchly's sphericity assumption was met, followed by Bonferroni correction, when appropriate. The level of statistical significance adopted in all analyses was $p \leq 0,05$.

## RESULTS

In the G1 intervention, 22 women completed participation, with an average age of 39 years. Regarding the BMI classification, the study classified seven as obesity grade I, seven as obesity grade II, and eight as obesity grade III. In G2, 25 women completed the intervention, with an average age of 37 years. Regarding the BMI classification, research classified ten as obesity grade I, eight as obesity grade II, and seven as obesity grade III.

**Table 1** - Effect of multiprofessional treatment of obese individuals on body composition parameters after intervention and comparison between groups G1 (n = 22) and G2 (n = 25), Paranavaí and Maringá, Paraná, Brazil, 2020

| Vary | PMTO – G1 (n = 22) | | | PMTO – G2 (n = 25) | | | Comparison between groups (*p*) |
|---|---|---|---|---|---|---|---|
| | Initial values | Values after intervention | Time effect (*p*) | Initial values | Values after intervention | Time effect (*p*) | |
| Age (years) | 39.55±7.60 | 39.55±7.60 | _ | 41.48±5.07 | 41.48±5.07 | _ | _ |
| Body mass (kg) | 101.16±22.46 | 99.03±23.32 | 0.064 | 108.69±19.29 | 103.47±18.15 | **0.000*** | 0.046* |
| Height (m) | 1.60.3±0.67 | 1.60.3±0.67 | __ | 1.63±0.09 | 1.63±0.09 | _ | _ |
| BMI (kg/m2) | 39.19±7.34 | 38.31±7.55 | 0.069 | 40.84±5.83 | 39.14±6.06 | **0.000*** | 0.180 |
| Lean body mass (kg) | 47.65±8.59 *,† | 47.53±8.23 | 0.708 | 53.18±8.79 *,† | 51.99±8.14 | **0.001*** | 0.020* |
| Body fat % | 50.10±4.86 | 48.45±4.65 | 0.008* | 47.28±6.21 | 46.19±7.63 | 0.119 | 0.092 |
| Neck circ. (cm) | 37.08±3.22 | 36.66±3.03 | 0.237 | 39.37±4.64 | 38.55±4.50 | 0.011* | 0.416 |
| Abdominal circ. (cm) | 110.80±15.27 *,† | 101.35±12.29 | **0.000*** | 122.38±14.89*,† | 115.41±16.29 | **0.000*** | **0.000*** |
| Waist circ. (cm) | 114.23±15.67 | 97.79±12.73 | **0.000*** | 110.41±12.79 | 105.06±13.24 | **0.000*** | **0.000*** |
| Waist-hip ratio | 124.35±13.22 | 122.79±14.71 | 0.228 | 125.04±13.06 | 121.50±14.21 | **0.001*** | 0.208 |

**Pre = G1 × G2; †Pre = G1 × G2 – Bonferroni post-hoc; BMI – Body Mass Index; % – percentage; cm – centimeters; circ – circumference.*

**Table 2** - Effect of multiprofessional treatment of obese individuals on body composition parameters after intervention and comparison between groups G1 (n = 22) and G2 (n = 25), Paranavaí and Maringá, Paraná, Brazil, 2020

| Vary | PMTO – G1 (n = 22) | | | PMTO – G2 (n = 25) | | | Comparison between groups (*p*) |
|---|---|---|---|---|---|---|---|
| | Initial values | Values after intervention | Time effect (*p*) | Initial values | Values after intervention | Time effect (*p*) | |
| SBP mmHg | 123.61±10.39 | 120.08±14.99 | 0.165 | 123.08±88 | 119.32±7.45 | 0.019* | 0.733 |
| DBP mmHg | 87.09±8.41*.† | 85.95±7.93 §.‖ | 0.470 | 78.12±6.50*.† | 75.56±5.86c-d | 0.136 | 0.543 |
| $SPO_2$ | 96.64±1.87*.† | 97.45±0.74 | 0.053 | 95.24±2.11*.† | 96.44±1.56 | 0.002* | 0.021* |
| HR bpm | 77.32±9.04 | 81.68±11.86§.‖ | 0.086 | 80.44±10.34 | 70.68±9.45§.‖ | **0.000*** | **0.000*** |
| Blood glucose (mg / dl) | 103.82±35.30 | 92.91±25.12 | 0.014* | 93.04±10.41 | 94.96±12.27 | 0.319 | **0.001*** |
| Insulin | 18.50±8.82 | 12.41±5.29 | **0.001*** | 22.05±9.65 | 17.97±10.08 | 0.024* | 0.350 |
| US-CRP | 6.51±4.14 | 6.63±4.39 | 0.894 | 9.25±10.52 | 9.77±10.83 | 0.787 | 0.928 |
| Total cholesterol | 199.09±32.73 | 217.05±37.18§.‖ | 0.021* | 185.32±26.97 | 182.48±33.86§.‖ | 0.604 | 0.023* |
| HDL | 48.73±9.74 | 67.77±14.67§.‖ | **0.000*** | 46.24±12.33 | 42.60±9.47§.‖ | **0.010*** | **0.000*** |
| LDL | 126±26.58*.† | 120.45±30.78 | 0.414 | 109.86±26.43*.† | 114.77±30.67 | 0.290 | 0.192 |
| Triglycerides | 122.82±37.08 | 124.32±44.70 | 0.898 | 152.48±69.75 | 125.44±52.90 | 0.033* | 0.118 |
| Glycated Hemoglobin | 5.55±0.85 | 5.53±0.78 | 0.826 | 5.47±0.64 | 5.35±0.41 | 0.154 | 0.390 |

**Pre = G1 × G2; †Pre = G1 × G2 § Post = G1 × G2; || Post = G2 × G1 – Bonferroni post-hoc; SBP – systolic blood pressure; DBP – diastolic blood pressure; mmHg – millimeter of mercury; SPO2 – oxygen saturation; HR – heart rate; bpm: beats per minute; mg/dl – milligrams per deciliter; us-CRP – ultra-sensitive C-reactive protein; HDL – high density lipoprotein; LDL – low density lipoprotein.*

Table 1 presents a comparison between the values of the body composition variables of each group before and after the intervention. Table 2 shows the comparison between the values of the hemodynamic and biochemical parameters of each group before and after the intervention.

## DISCUSSION

The use of a remote approach to follow-up of the participants presented positive results, becoming an option of health care for the population provided by the health team in the scenario of Primary Health Care (PHC). For PHC health professionals, obesity is one of the principal causes of chronic diseases. However, effectively controlling weight can be a challenge because the pathophysiology that leads to weight gain in susceptible individuals makes it difficult to lose weight and maintain it, which becomes a barrier for PHC professionals due to the daily demand for this level of attention[19]. Therefore, tools that enable remote monitoring of physical activities are crucial to expand access to professional guidance in PHC, especially at this time of social distancing due to the COVID-19 pandemic[20].

Therefore, it is worth noting that the counseling of obese individuals performed by health professionals remotely, although hardly used, can support and monitor changes in habits, resulting in weight reduction[21]. The research considers that the Union of web-based interventions with the support of Nursing can provide an effective solution for weight management in the context of PHC[22].

When comparing the total variables with statistically significant results between the two groups, the study considers that the intervention performed in G1 was developed at the beginning of the pandemic, which caused dramatic changes in the daily life of society, especially in the group studied due to the need for social distancing. This abrupt need to realize social distancing has resulted in a radical change in the lifestyle of the population, often maintaining only a certain minimum level of physical activity and exercise for health promotion[23], or to try to minimize the negative consequences of certain diseases[24].

Commonly, high rates of weight control failure are associated with low adherence to therapeutic programs[25-26]. A high percentage of people who receive guidance from health professionals regarding lifestyle changes, including dietary restrictions, have low adherence to weight control[26]. Adherence to treatment involves a complexity of several factors, which may be associated with the characteristics of the user, the disease, cultural and life habits, treatment, institutional difficulties, and the health team[26-27].

In this scenario, even in the face of adversities generated by the COVID-19 pandemic, the effect of multiprofessional remote intervention and telenursing was positive. Thus, the concern to maintain a minimum of physical activities and exercises did not help in the control of obesity, as described in a study that analyzed the impact of social distancing ("stay home") on the health of obese individuals. The need to stay home negatively impacted several health behaviors related to obesity: 69.6% of participants reported that their weight loss goals were more complicated to achieve; there were substantial decreases in the duration and intensity of physical activity (47.9%, 55.8%, respectively); 61.2% stated that healthy eating habits were more challenging to maintain since they ate more than normal[28].

The results obtained in this research do not corroborate these findings of Almondoz[28]. Thus, according to Table 1, the variables studied showed a significant statistical difference after the intervention. Therefore, it is essential to consider that, even in the face of the changes imposed by the need for social distancing, the remote monitoring and telenursing performed in this study were able to promote healthy habits and lifestyle among the participants, leading to the improvement of hemodynamic and laboratory parameters.

The management of people with obesity should not be limited to significant weight reduction goals and their maintenance over time; it should also contribute to the enhancement of the incorporation of healthy habits and improvement of clinical conditions[18]. To that end, remote monitoring and telenursing are successful therapeutic tools for health education and encouragement of self-care and, as for obesity, should be considered as an additional option to conventional treatment[29].

The changes in the habits and lifestyle of the participants, stimulated by multiprofessional monitoring and nursing follow-up through telenursing, reflected in the statistically significant reduction in the percentage of body fat. Worldwide, this parameter has been a cause for concern since it is an independent risk

factor for cardiovascular diseases, coronary events, and mortality from all causes[30-31].

In addition to the reduction of cardiovascular risk factors through behavioral modification, interventions based on new technologies emerge as promising tools for PHC services due to their high growth capacity, low cost, adaptability, and wide range of applicability[32-33].

A study that conducted remote monitoring of obese individuals using a cellular application showed that after 12 months of intervention, found significant results in reducing body adiposity and waist circumference among women. In the same period, there was an increase in BMI values among male participants[34]. When these results are compared to those obtained in the G1 of this study, the variables suffered positive effects with only 16 weeks of intervention.

Nursing and health staff know the importance of controlling abdominal obesity because the fat deposit that is concentrated in the abdominal region is associated with an exponential increase in the risk of morbidity and mortality since the pattern of distribution of body fat is the most significant risk factor in morbid processes, more than generalized obesity[35].

Another variable directly linked to abdominal circumference, which had significant improvement after the intervention performed through this study, was waist circumference. Regardless of age and sex, a food caloric decrease and/or an increase in energy expenditure through exercise are associated with a substantial reduction in waist circumference[36-39]. It is an essential parameter for the control of obesity since intra-abdominal fat produces proteins and hormones, such as adipokine, angiotensinogen, and cortisol, which cause inflammation and are associated with cardiometabolic diseases, such as dyslipidemia, coronary diseases, and hypertension[40-42].

Obesity is the most frequent metabolic disorder in the world and the principal risk factor for insulin resistance (IR) and Mellitus diabetes (MD)[43]. The proportion of people affected by MD has increased dramatically over the past three decades, becoming one of the leading causes of death in the world[44]. In Brazil, 7.4% of adults report having a diagnosis of MD[45] type 2, the most prevalent form of the disease, characterized by elevated plasma glucose levels due to deficiencies in insulin secretion and insulin secretion[17]. The intervention was able to lower the participants' blood glucose and insulin levels, decreasing the chances of developing metabolic syndrome, IR, and MD.

The literature confirms, on the one hand, that the difficulty of losing weight and maintaining a healthy lifestyle is usual; on the other hand, it highlights that nurses can act on the front line of care for the prevention and control of excess weight by using in the services where they work, especially in PHC, remote monitoring associated with face-to-face meetings with users[18].

A meta-analysis of 23 randomized clinical trials evaluating the effect of remote monitoring on weight loss programs demonstrated that the use of this strategy resulted in 0.68 kg (95% CI: 0.08, 1.29 kg) of additional weight reduction over 3 to 30 months[46]. However, the stratified analysis suggested that interventions using remote monitoring were effective when applied in combination with personal counseling (-1.93 kg; 95% CI: -2.71, -1.15 kg), rather than a substitute for this (-0.19 kg, 95% CI: -0.87, 0.49 kg)[33].

In this study, the intervention performed with the nursing professional using telenursing highlights the importance of stimulating self-care supported in the maintenance of healthy habits in obese individuals, especially during the period of social distancing due to COVID-19 since severe obesity is a clinical condition of worsening of the infectious picture[47].

### Study limitations

The study showed the difficulty of individuals in adhering to interventions remotely, as well as the difficulty in using technological tools to monitor activities as limitations of this study. It suggests that the intervention with remote monitoring and telenursing be performed in a post-pandemic period, associated with face-to-face guidance, in the PHC scenario, with individuals of different ages to assess adherence in the diverse age group.

### Contributions to the fields of Nursing

Given the findings, this study considers that obese individuals must be constantly monitored since they present a chronic disease. In addition, the role of Nursing in the multiprofessional team, both in remote monitoring and specifically in telenursing, enables comprehensive and quality care by PHC; and also provides a decrease in the demand for visits in health services since care is performed remotely.

## CONCLUSIONS

The research found that the effects of multiprofessional remote intervention and telenursing significantly decreased the risk variables for metabolic syndrome in the treatment of obesity.

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