

## Online nutritional counseling and assessment: A potential tool for the present and the near future

### Asesoramiento y evaluación nutricional en línea: una herramienta potencial para el presente y el futuro cercano

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#### Abstract

**Introduction:** Care and attention to people's health is an objective of professionals in this area. Comprehensive strategies are being sought to reduce the alarming prevalence of obesity in populations around the world, coupled with the restructuring of the health system that came as a consequence of the COVID-19 pandemic, different tools, such as online nutrition counseling, have been incorporated to embrace the needs and provide a service in favor of the population. **Objective:** To evaluate the effect of online nutrition counseling on anthropometric parameters of overweight and obese adults. **Methodology:** Thirty individuals were enrolled in an online nutritional intervention and followed a weight control diet for 8 weeks. Every 15 days, the participants received nutritional counseling through virtual platforms. Anthropometric parameters were evaluated at the beginning, middle and end of the intervention, the physical activity performed by the participants was calculated, and an emotional eating questionnaire was applied. **Results:** Significant changes were observed in baseline versus final anthropometric parameters. 30% of participants reported an increase in the physical activity performed, and 31% indicated improvements in the influence of emotions on their eating habits. **Conclusion:** Online nutrition counseling is a feasible and reliable strategy to provide and receive nutritional care remotely.

**Keywords:** Online counseling; nutrition; multimedia; overweight; obesity.

#### Resumen

**Introducción:** El cuidado y atención a la salud de las personas es un objetivo de los profesionales de esta área. Se buscan estrategias integrales para reducir la alarmante prevalencia de obesidad en poblaciones de todo el mundo, aunado a la reestructuración del sistema de salud que vino como consecuencia de la pandemia del COVID-19, se han incorporado diferentes herramientas, como el asesoramiento nutricional en línea, para abrazar las necesidades y brindar un servicio en favor de la población. **Objetivo:** Evaluar el efecto de la asesoría nutricional en línea sobre parámetros antropométricos de adultos con sobrepeso y obesidad. **Metodología:** Treinta personas se inscribieron en una intervención nutricional en línea y siguieron una dieta de control de peso durante 8 semanas. Cada 15 días los participantes recibieron asesoría nutricional a través de plataformas virtuales. Se evaluaron parámetros antropométricos al inicio, mitad y final de la intervención, se calculó la actividad física realizada por los participantes y se aplicó un cuestionario de alimentación emocional. **Resultados:** Se observaron cambios significativos en los parámetros antropométricos finales *versus* iniciales. El 30% de los participantes informó un aumento en la actividad física realizada y el 31% indicó mejoras en la influencia de las emociones en sus hábitos alimenticios. **Conclusión:** La consejería nutricional en línea es una estrategia factible y confiable para brindar y recibir atención nutricional a distancia.

**Palabras clave:** Asesoramiento en línea; nutrición; multimedia, sobrepeso; obesidad.

## Introduction

Obesity is a precursor to various diseases with important long-term individual and social consequences that can be summed up as a compromised quality of life (Saffel-Shrier et al., 2019). The obesity epidemic is a critical health challenge worldwide since the number of people with obesity has tripled in the last 40 years (WHO, 2020). In this sense, another current challenge for improving people's quality of life lies in finding the most effective way to change the obesogenic environment that surrounds us, as well as raising awareness and guiding the population to make healthier decisions regarding nutrition and physical activity (Turri Quarenghi et al., 2021).

Over the generations, nutritional counseling and assessment have been primarily face-to-face, in clinics, hospitals, or doctors' offices; however, the COVID-19 pandemic brought global instability in multiple spheres, and the health sector had to reorganize and create strategies according to each country's demands to provide care to the population (Turri Quarenghi et al., 2021). In parallel, it has been strongly recognized that interaction through virtual media is a resource that has allowed us to continue advancing and meeting the population's needs. In this context, online communication platforms have become essential to many people's daily routines (Schønning et al., 2020). Social media refers to any digital platform, website, or application that allows people to create and share content and connect with others (Zoom, TikTok, Facebook, Instagram, YouTube, Twitter, gaming sites, and other similar interactive websites). Due to this technological-social phenomenon, nutritional and sports advice, among others, began to have more acceptance and demand (McInerney & Pritchard, 2021), becoming a valuable tool that can be used to provide a service in the health sector, either in the area of nutrition, preventive medicine, or psychology, among others.

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The objective of this study was to evaluate the effect and functional impact of online nutritional counseling on anthropometric parameters of overweight and obese Mexican adults during the COVID-19 pandemic.

## Methods

### Design

The online nutritional intervention consisted of an 8-week, controlled pilot trial.

### Population

For recruitment, promotional flyers were designed and shared virtually through social networks (Facebook, Instagram, WhatsApp). The dissemination stage of the project lasted one month, during which interested participants were referred to answer the digital eligibility form. The inclusion criteria were: both sexes, overweight or obese: BMI  $25 \geq 40$  (kg/m<sup>2</sup>), 18-50 years old, having an electronic device and internet access. The exclusion criteria were diagnosed diabetes, endocrine disorders, cardiovascular disease or cancer, pregnant or lactating women, gastrointestinal disorders, and prescription of medications to control blood lipids or weight loss. All subjects who met the inclusion criteria signed an online informed consent before enrolling in the intervention.

### Dietary intake and nutritional counseling

The caloric requirement for each participant was calculated with the Harris-Benedict equation, with a 500 kcal/d restriction. The study population followed a caloric restriction diet for eight weeks according to the dietary pattern recommended by international health organizations (Arnett et al., 2019; WHO, 2021) with the following distribution of macronutrients: carbohydrates 50%, proteins 25%, fats 25%: saturated fats 7%, monounsaturated: 10% and polyunsaturated 10%). Calorie intake was not less than 1,000 or 1,200 kcal/d in participants.

The nutrition team developed multimedia content such as videos, infographics, TikToks, and PowerPoint presentations with the following topics: "How to access the consultation through virtual platforms," "Nutrition counseling programming," "Build your plate: Use of food portions" (WHO, 2021), "Healthy fats" (Arnett et al., 2019), and "how to follow my eating plan away from home," among others, to guide nutrition to the study population, who received online nutritional counseling every 15 days. In these sessions, new menus were delivered and explained. Weekly menus were divided into five meal times: breakfast, morning snack, lunch, evening snack, and dinner, accessible and seasonal foods were used. Besides, participants consulted with nutritionists about how to improve daily eating habits and physical activity, according to each participant's physical condition.

### *Anthropometry*

Anthropometric parameters were evaluated: weight (kg), height (cm), waist, and hip circumference (cm). Since the intervention was carried out remotely, the participants received prior training from the nutrition team to carry out the anthropometric measurements correctly according to the guidelines of the STEPS Manual (WHO, 2018) and to keep their records. Tutorial videos with the steps and considerations to follow to precise the measurements (use the same instruments, take measures simultaneously and under the same conditions) were prepared by trained nutritionists and analyzed with the participants. Anthropometric data were collected three times by specialized dietitians: at the beginning of the intervention (baseline), week 4 (intermediate), and week 8 (final).

### *Evaluation of physical activity*

The International Physical Activity Questionnaire (IPAQ) short version (Mantilla Toloza & Gómez-Conesa, 2007) was applied at the beginning and at the end of the intervention to evaluate, through METs-min-week, the physical activity (PA) performed by the participants. The calculation of the PA index uses the following formula: Intensity (METs) \* frequency \* duration of activity = level of physical activity. The results classify the level of PA performed in 3 categories: low, medium, or high.

### *Emotional eaters*

At the beginning and the end of the intervention, the Garaulet Emotional Eaters Questionnaire (Garaulet et al., 2012) was applied, which includes ten questions regarding food intake and emotions and classifies individuals into four categories: “non-emotional eater”, “mildly emotional eater”, “emotional eater”, and “highly emotional eater”. Based on the results obtained, recommendations were provided to each participant on the identification of emotions and how to work on them to avoid eating associated with an emotional state.

### *Statistical analysis*

The normality of the variables was analyzed with the Shapiro-Wilks test. Repeated measures ANOVA with post-hoc analysis (Tukey's test) was applied to evaluate the difference between evaluation times. A significance level of  $p < 0.05$  was considered. Absolute frequency tables were generated to assess the Physical Activity (IPAQ) and Emotional Eaters Questionnaire. The statistical package IBM SPSS 26 (Statistical Package for the Social Sciences, Chicago, IL.) was used.

### *Ethical aspects*

This study adhered to the international standards of the Declaration of Helsinki and the General Health Law of Mexico in research for health, in articles 13 to 17. The ITESO, Jesuit University of Guadalajara ethics committee approved the study and registered it under the 0001DRC number. Authors confirm all patient identifiers have been removed or disguised so the patient described are not identifiable and cannot be identified through the details of the manuscript.

## **Results**

Sixty subjects were interested in participating in the intervention and answered the digital eligibility form; however, only 30 met the inclusion criteria. The mean age of the participants was  $35.0 \pm 8.3$  years old; 47% were women ( $n=14$ ) and 53% men ( $n=16$ ). The mean body weight of population was  $90.7 \pm 14.2$  kg, and BMI of  $30.5 \pm 3.2$  kg/m<sup>2</sup>, which classified the population in class 1 obesity, with average parameters of the waist:  $99.9 \pm 14.2$ cm and hip circumference of  $111.4 \pm 6.8$  cm. 77% of the participant population resided in Guadalajara city or surrounding municipalities of Jalisco but 33% resided in other states of the Mexican Republic, such as Michoacan, Sinaloa, and Nayarit.

Throughout the intervention, 57% ( $n=17$ ) abandoned the project, and 43% ( $n=13$ ) completed the study.

Baseline measurements of BMI, waist circumference, and hip circumference of the study population were above the reference values established as healthy (WHO, 2018). This result indicates that the participants had a possible risk of developing cardiometabolic diseases.

Table 1 shows the anthropometric changes during the intervention. At the end of 8 weeks, the evaluated anthropometric parameters showed significant favorable changes ( $p < 0.001$ ).

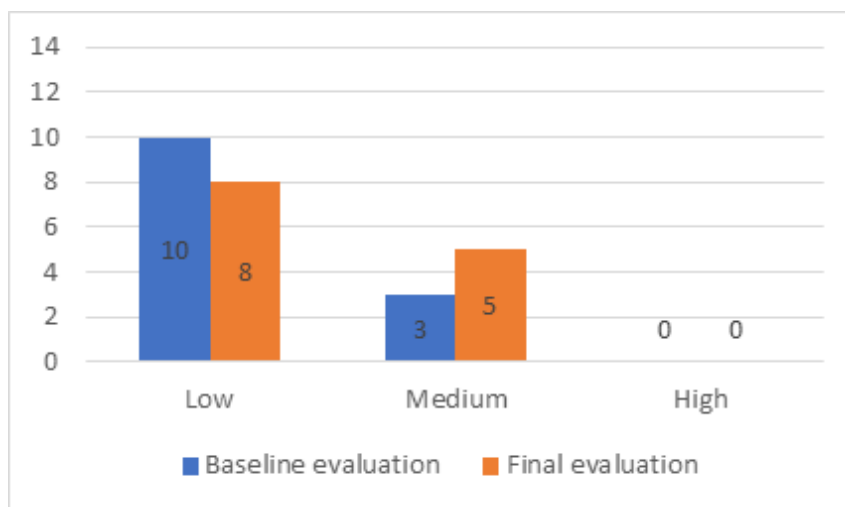
The final BMI mean ( $28.5 \pm 4.2$ ) classified the population as overweight. Participants reduced (basal vs final) waist circumference by  $-6.1 \pm 3.8$  cm and hip circumference by  $-6.3 \pm 2.9$  cm. The improvement in weight loss, decrease in BMI, waist and hip circumference.

**Table 1.** Changes in anthropometric parameters during the online intervention.

| Parameter                | Online nutritional monitoring (n= 13) |                  |                  |                |        |
|--------------------------|---------------------------------------|------------------|------------------|----------------|--------|
|                          | Baseline                              | Intermediate     | Final            | $\Delta$       | p      |
| Weight (kg)              | 90.7 $\pm$ 14.2a                      | 87.7 $\pm$ 14.7b | 84.9 $\pm$ 15.0c | -5.7 $\pm$ 4.5 | <0.001 |
| BMI (kg/m <sup>2</sup> ) | 30.5 $\pm$ 3.2a                       | 29.4 $\pm$ 3.4b  | 28.5 $\pm$ 4.2c  | -2.0 $\pm$ 1.5 | <0.001 |
| Waist C. (cm)            | 99.9 $\pm$ 14.2a                      | 96.8 $\pm$ 15.6b | 93.8 $\pm$ 16.0c | -6.1 $\pm$ 3.8 | <0.001 |
| Hip C. (cm)              | 111.4 $\pm$ 6.8a                      | 108.3 $\pm$ 7.5b | 105.1 $\pm$ 7.9c | -6.3 $\pm$ 2.9 | <0.001 |

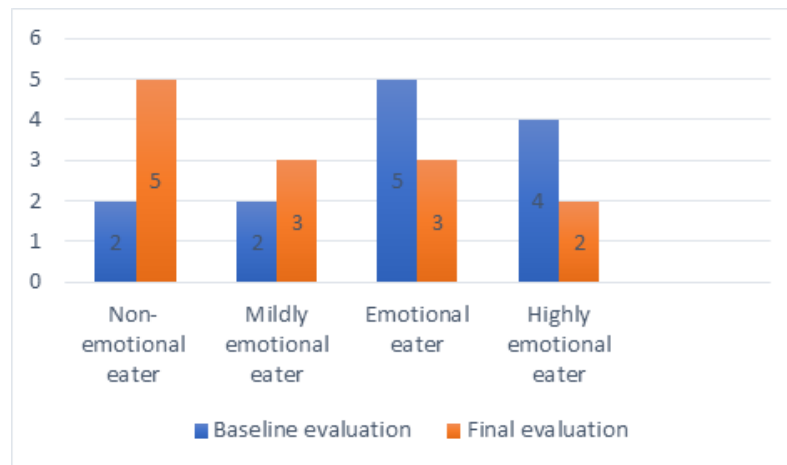
Only data from the participants who completed the intervention are presented as mean  $\pm$  SD;  $\Delta$ = final value – baseline. a,b,c: significant differences between evaluation times ( $p < 0.05$ ).

Regarding the physical activity performed by the participants, at the beginning of the intervention, 77% (n=10) of the population reported performing low physical activity (sitting or performing  $\sim 20$  min of physical activity  $\leq 3$  days/week), and 23% (n=3) self-reported moderate physical activity (3-5 days/week intense physical activity:  $\geq 20$  min, or moderate physical activity:  $\geq 30$  min such as carrying light weights, riding a bicycle at regular speed or practicing a sport that does not involve physical effort or requires more intense breathing than normal). However, at the end of the intervention, 30% of the population reported an improvement in their physical activity habits, 38% (n=5) of the individuals registered performing moderate physical activity, and 62% (n=8) had low physical activity (Figure 1).



**Figure 1.** Report of the intensity of physical activity performed during the intervention: baseline vs. final (Data expressed as absolute frequency. X axis = Intensity of physical activity. Y axis= Number of individuals).

The Emotional Eaters questionnaire by Garaulet et al. (2012) allowed classifying the population with emotional states and their influence on eating behavior. Baseline evaluation classified the study population as follows: 15% (n=2) non-emotional eaters, 15% (n=2) mildly emotional eaters, 39% (n=5) emotional eaters, and 31% (n=4) highly emotional eaters (Figure 2). In this sense, it was observed that 70% of the population strongly influenced emotions when eating. However, the final evaluation reported improvements in this topic: 39% of the population (n=5) were classified as “non-emotional eaters”, that is, they did not suffer from binge eating; 23% (n= 3) “mildly emotional eaters”, 23% (n=3) “emotional eaters” and 15% (n= 2) “highly emotional eater”. These results suggest that during the intervention, the participants could better manage personal decisions when choosing the amount, frequency, and type of food they ingested.



**Figure 2.** Results of the emotional eaters questionnaire (Garaulet et al., 2012) baseline vs final (Data expressed as absolute frequency. X axis = Type of eater in relation to the emotions reported to experience when eating. Y axis= Number of individuals who repeat the behavior)

The final BMI mean ( $28.5 \pm 4.2$ ) classified the population as overweight. Participants reduced (basal vs final) waist circumference by  $-6.1 \pm 3.8$  cm and hip circumference by  $-6.3 \pm 2.9$  cm. The improvement in weight loss, decrease in BMI, waist and hip circumference.

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## Discussion

The Academy of Nutrition and Dietetics and the Society for Nutrition Education and Behavior (Saffel-Shrier et al., 2019) state that healthcare professionals should be actively involved in nutritional counseling to help people make good decisions regarding their diet and lifestyle, along with monitoring and evaluating the process and outcomes, that's way, in the context of the reorganization of the medical service caused by the pandemic, the search for nutritional support strategies has turned the attention to virtual tools, which have the advantage of offering the service remotely, an opportunity that arose during the confinement period. In this sense, it is recognized that digital communication channels (email, phone calls, web chats, podcasts, videos, and social networks, to name a few) work as a bridge between individuals.

It was promising to be able to recruit people from various states of the Mexican Republic (Jalisco, Michoacan, and Nayarit) since it is expected that health services can reach the majority of the population; in this way, the scope of online interventions is highlighted.

On the other hand, some participants reported their dropouts as a consequence of the social and labor adaptation or health problems that the pandemic caused: getting sick, caring for sick relatives, or a job crisis. Thus, the dropout rate was higher than the usually reported in intervention studies lasting 4-12 weeks (0-35%) (Mitchell et al., 2017).

Young adults made up the bulk of the study population; this finding agrees with Schønning et al., (2020), who stated adolescents and young adults are the most active users of social networks and dynamically integrate into virtual groups. It is hard to consider a social network or a digital communication channel as the best way to approach the population and provide nutrition counseling. Most of the work depends on the type of service offered, the message to be communicated, and the profile of the audience. Nevertheless, participants accepted the digital tools used in this online nutritional intervention (videos, infographics, TikToks, PowerPoint presentations, and Zoom consultations). These digital resources were chosen for their easy handling and availability since the participants did not need a personal account to access them, except for Zoom.

Interestingly, young adults and teenagers could be a target population for developing online interventions with more significant impact and success.

On the other hand, the anthropometric parameters of the study population were above healthy reference values (BMI < 25, waist circumference <94 cm for men, and <80 cm for women) (WHO, 2018).

Abnormal anthropometric and body composition markers are associated with cardiovascular diseases (CVD) and other metabolic alterations, so it is essential to keep them within healthy ranges, considering the characteristics of each individual (WHO, 2021). After eight weeks of following a weight-control diet, improvements in anthropometric parameters were observed in this study. The caloric deficit to which the individuals were subjected led to a reduction in body weight, BMI, waist, and hip circumference because when a negative balance is maintained between caloric intake and caloric expenditure, body weight loss occurs (WHO, 2020). However, it should be noted, as mentioned by Al-Nimr et al. (2020) and Calvo Sánchez et al. (2022), that continuous nutritional counseling and the use of didactic materials (i.e. multimedia tools) that reinforce the dietary guidance given during virtual consultations play a crucial role in motivating participants to improve their lifestyle.

The anthropometric change observed suggests an improvement in the quality of life of individuals; these results agree with those reported in other dietary interventions with a duration period between 6-16 weeks in which administered diets' goal is to improve the anthropometric and biochemical parameters in people with overweight and obesity (Warkentin et al., 2014).

In this framework, the WHO (2021) states that adopting a healthy lifestyle, including an improved diet and increased physical activity, are primary prevention strategies to reduce the risk of non-communicable diseases. These changes could prevent up to 80% of CVD. The results obtained in this study are similar to those reported by Romero-Blanco et al. (2020), who showed an increase in the physical activity performed by young people (20.5 ± 4.0 years old) associated with more free time during confinement due to the COVID-19 pandemic, but also an increase in the time spent sitting/day. This situation results from taking classes, working virtually, and interacting through digital media. In addition, Esqueda-Mendoza et al. (2021) evaluated the repercussions of the COVID-19 pandemic on the health habits of Spanish and Mexicans. Their findings suggest a reduction of physical activity (PA) in the population, especially in men. Interestingly, participants who did not practice PA before confinement began to practice it primarily when motivated by a family member, social group, or digital advertising (Calvo Sánchez et al., 2022; Schønning et al., 2020). Despite the improvement in PA during the intervention, the performance of intense PA was not reported (lifting heavy weights, digging, doing intense aerobic exercises or riding fast on a bicycle, practicing sports that involved acceleration in respiration or heart rate for at least ten consecutive min). Moreover, only 38% (n=5) of the population evaluated met the guidelines that recommend at least 150-300 min of moderate or vigorous aerobic physical activity per /week for all adults, including people with disabilities or chronic conditions (WHO, 2020).

On the other hand, it is well known that emotions and mood have a powerful effect on food choices and eating habits (Dicker-oren et al., 2022). According to Garaulet et al. (2012) interpretation, it is considered that for emotional and highly emotional eaters, feelings and mood in some moments of daily life determine how much and how they eat. Particular emphasis is placed on highly emotional eaters, as individuals are at risk since food can control many

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of their actions; their feelings and emotions could revolve around eating, and they could suffer from some disordered eating behavior that can lead to anorexia and bulimia.

World reports exposed that during the COVID-19 pandemic, most of the population reported negative changes in their diet, an increase in alterations in sleep patterns, stress, and anxiety (Esqueda-Mendoza et al., 2021; Schäfer et al., 2022), which suggests a potential relationship between the emotions generated by the pandemic and its repercussions on eating patterns.

Nevertheless, this study observed an improvement concerning emotional states and their influence on eating behavior. This positive change can be attributed to two main aspects: the fact that the participants were motivated to achieve a short-term goal and the process of monitoring and online nutritional counseling that the population carried out (Al-Nimr et al., 2020). Al-Nimr et al. (2020); and Calvo Sánchez et al. (2022); stated that structured and continuous nutritional counseling significantly improves eating habits, and emotional health, reducing episodes of stress, anxiety or even depression, in addition to leading to weight loss and body reconstitution in a controlled manner. Adult nutrition counseling in primary care settings effectively improves diet quality and the individual's response to lifestyle changes.

In this context, it is essential to recognize that lifestyle changes leading to reduced health risks can occur without weight loss. Therefore, to optimize health, the clinical approach should encourage lifestyle formation that includes diet and physical activity to improve weight control and promote beneficial health effects, regardless of body weight status.

Continuous nutritional counseling as part of a weight loss intervention significantly improves the overall diet quality in overweight and obese adults. Significant weight loss and reductions in abnormal anthropometric parameters (considered cardiometabolic risk factors) can occur with scheduled and regular physical activity. The feasibility results obtained in this pilot online intervention can serve as a basis for more extensive and longer clinical trials and design clinical or research programs for diverse populations' health. Vidaña-Pérez et al. (2022) expose the importance of individual dietary interventions that help directly treat people at risk of obesity and CVD, but also population interventions that will act on the population as a whole, reducing and preventing overweight. However, it is recognized that this is a demanding task since to control the current obesity epidemic, it is necessary to consider additional interventions with an emphasis on formulating policies that regulate the obesogenic environment surrounding us.

It is known that Internet access is recognized as a fundamental right or a human right by the laws of several countries. However, it is essential to realize that there are areas with diverse geographical, sociocultural, or political conditions in which access and coverage of the internet are limited. In this sense, it is essential to consider that online nutritional counseling represents an option to meet the demand of a sector of the world population without neglecting the impact of personal consultation and the various public health programs that each country can implement according to the needs of its people.

A weakness of this study was the size of the recruited sample, the diffusion time was insufficient, and the promotion of the project through personal social networks did not have the desired impact. Therefore, diffusion and publicity periods over one month are proposed, as well as carrying out a well-structured advertising campaign on social networks or creating web microsites (Varadarajan et al., 2021).

Also, two main problems were detected: 1) the recent incursion of some participants in using electronic devices and digital platforms, and 2) the complex adaptation to virtual homeschooling and work schedules of all family members, which altered the daily routine of an entire society.

## Conclusion

Online nutritional counseling was a viable and feasible tool during confinement and has become a practical resource with great potential for offering and receiving remote dietary counseling and other health sector services.

The use of dietary plans appropriate to the needs of individuals that promote weight loss and the reduction of cardiometabolic risk parameters, and the use of multimedia educational material as part of the support and motivation to modify habits and improve lifestyle, is essential to develop a successful clinical intervention.

Implications for Research and Practice. Digital media have been a way to provide nutrition care during the pandemic; however, this practice has not been extended to the entire population since access to the internet and electronic devices (cell phone or computer), as well as training for using them, is limited to specific sectors of the

Mexican population, although they are the majority, it is necessary to look for complementary strategies to include and satisfy the health needs of the general population.

On the other hand, it would also be interesting to highlight in future research the impact and influence of the most used social networks in the world, such as TikTok, Facebook, Instagram, and X (Twitter), on the success of online nutritional counseling.

#### Authors' contributions

Each author equally contributed to this paper and approved the final version sent to the journal.

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#### Data availability statement

Data presented in this study can be consulted by contacting the corresponding author.

#### Conflict of interest

The authors of this article declare that they have no conflict of interest.

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