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**Title: EFFECTIVENESS OF TELENUTRITION IN A WOMEN'S WEIGHT LOSS PROGRAM**

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**Conflict of interest**

The authors declare no conflict of interest.

# EFFECTIVENESS OF TELENUTRITION IN A WOMEN'S WEIGHT LOSS PROGRAM

## ABSTRACT

*Objective:* To evaluate the effectiveness of telenutrition versus traditional nutritional consultation for obese patients.

*Methods:* A comparative clinical study was conducted among 233 (including 20 dropouts and 60 failures) obese or overweight women who consulted a nutrition clinic in Barranquilla (Colombia) for nutritional assessment by telenutrition or traditional attention that includes a weekly follow-up consultation over 16 weeks, food consumption patterns, Body Mass Index (BMI, kg/m<sup>2</sup>) register, waist and hip circumference register. Treatment response and difference between telenutrition and traditional consultation were made according to BMI, waist, hip and initial-waist/height ratio. Data's nonparametric statistical comparison was made.

*Results:* In 68 (29.2%) women who chose traditional attention, 9 (37.5%) dropped out, 24 (40%) failed and 35 (23.5%) were successful, showing 1.4%(1.0 SD) BMI loss, 5.8% (3.4 SD) in waist circumference, 4.5% (2.8 SD) in hip circumference and 0.04% (0.02 SD) in *i*waist/height ratio. In 165 (70.8%) women who chose telenutrition, 15 (62.5%) dropped out, 36 (60%) failed and 114 (76.5%) were successful, showing 1.1% (1.0 SD) BMI loss, 5.0% (3.2 SD) in waist circumference, 3.5% (3.1 SD) in hip circumference and 0.03% (0.02 SD) in *i*waist/height ratio. A significance level of  $p < 0.05$  is considered.

*Conclusion:* Telenutrition has a failure or dropout risk factor about half values of traditional consultation with slightly statistically significant differences. This study concludes that telenutrition can support or sometimes replace the traditional consultation when developing weight loss programs in obese women.

**Keywords:** telenutrition, e-health, obesity, overweight

## INTRODUCTION

The solutions in home care, is becoming a response to the need to control health care costs of the population. Advances in information and communication technology (ICT) have directly influenced the development of Telemedicine and Telecare solutions<sup>1</sup>.

Besides the change in the form of providing medical care, telemedicine is becoming an industry that can generate multiple billions of dollars, so there is a need to create successful programs that provide clinical services remain profitable<sup>2</sup>.

The application of telehealth principles by registered dietitians or doctors to deliver medical nutrition therapy is termed telenutrition<sup>3</sup>.

Obesity is a multifactorial disorder related to genetic background, environmental factors, behavioural, underlying diseases and socioeconomic status<sup>4</sup>. It is known that the prevalence of obesity has experienced an alarming worldwide increase<sup>5</sup>; therefore, we can say that we are in the midst of a global obesity epidemic<sup>6</sup>. The physiology of obesity is based on an imbalance between caloric intake and energy expenditure<sup>7</sup>. Obesity has become a very frequent source of medical, nursing or nutrition advice<sup>8</sup>.

The status of overweight and obesity has connotations relating to the patient's own body image. The appearance or perception of body image is defined as body shape that is made by the mind plus the fact that consists of subjective representations of physical appearance<sup>9</sup>. The concept of body image varies throughout life, depending on the social influences and life situations that affect the behavior<sup>10</sup>. Dissatisfaction with physical appearance related to body weight is higher in women than men varying across ethnic groups related to the cultural integration degree<sup>11</sup>. Some authors find no relationship between dissatisfaction with body appearance and body mass index (BMI) in obese and overweight women<sup>12</sup>.

Obesity has more adverse effects in women than men, in relation to cardiovascular risk; in turn, some health professionals are reluctant to initiate treatment of comorbidities of

obesity and metabolic syndrome in women, because they perceive less risk, than that seen in men<sup>13</sup>.

There are several studies showing that an overweight and obesity treatment to be performed for a few months, more women than men attend, but leave 42% for various reasons, including a lack of motivation with the results of weight loss and the economic cost<sup>14</sup> and it is demonstrated that social classes, level of education, marital status, alcohol and tobacco consumption are not regarded as influential factors in the successful outcome of treatment in overweight and obese patients<sup>10</sup>.

Is necessary to give to all nutrition consultations a global approach, that adds to the necessary changes in eating habits, exercise and other respects in accordance with the acquired body image, health, etc. producing an adherence to the acquired new habits. Socioeconomic and demographic changes are occurring very rapidly in some areas of the world, accompanied by changes in lifestyle, dietary patterns and the epidemiological profile of prevalent diseases<sup>15</sup>.

Telehealth network can serve as a model for integrating health services<sup>16</sup> including telenutrition<sup>2</sup>. Commercial industries have outpaced traditional healthcare consultation in terms of traditional approaches to weight control for electronic online delivery. Little is known about the effectiveness of telenutrition. This gap represents a barrier to developing successful, patient-based e-health applications for effectiveness behaviour change. The main objective of this paper is to determine the effectiveness of telenutrition versus a traditional healthcare consultation in a weight loss program.

## **MATERIAL AND METHODS**

### **Subjects**

A clinical intervention and e-health study was conducted among 233 (according to the WHO classification<sup>17</sup>) overweight and obese women who consulted a nutrition clinic in Barranquilla (Colombia) for the purpose of nutritional assessment by telenutrition and traditional in-person consultation. They were subject to a personalized weekly follow-up consultation over the course of 16 weeks in which food consumption patterns, and measures were registered. The inclusion criteria were female gender, voluntary

assistance, the use of internet communications, excluding those with chronic diseases such as kidney failure, cancers, etc. that requires also medical follow up. This study also considers patients who tried to lose weight in the previous month or earlier. In turn, alcohol or tobacco consumption does not affect actual results. The study was conducted according to Helsinki's rules obtaining all patients informed consent.

## Methods

Weight loss results in patients could be seen in 16 weeks<sup>5</sup>. The study included an initial in-person consultation with complete medical record (date accessed, date of birth, personal identification data including e-mail and messenger service, socioeconomic status, educational level, personal medical history, toxic precedents, etc.) and a weekly WHO recommended nutritional assessment<sup>18</sup> nutritional assessment (age, height and weight, waist and hip perimeter). With an eating habits questionnaire<sup>19</sup> response we made the weekly WHO-based<sup>20</sup> low calorie diets. Patients who followed telenutrition were instructed and taught on first in-person consultation in how to measure and read waist, hip, and weight scale. Nutritional assessment and diet were sent by email and patients controls by online internet messenger. In week number sixteen they were also evaluated in physical consultation to control de results. All patients were controlled and supervised by telenutrition (email, messenger and computer chat) and in-person weekly nutritional assessment.

With the obtained data we calculate the initial and final BMI according to WHO criteria<sup>17</sup> as well as weight, waist, hip, initial and final waist/height ratio loss percentages. The data were treated using IBM SPSS Statistics version 22.0 software, checking the normality and comparative nonparametric statistics on data that not showed a normal distribution. A significance level of  $p < 0.05$  is considered using U Maan-Whitney. This study was approved by SEMI-Servicios Médicos Integrados of Barranquilla, Colombia.

## RESULTS

A total of 233 women were interviewed, of whom 68 (29.2%) chose traditional consultation and 165 (70.8%) chose telenutrition. 24 (15 (62.5%) telenutrition versus 9

(37.5%) traditional) patients dropped out the study with no known reasons, representing 89.7% (209) follow-up tracking; we assumed that patient discontinued the treatment because they were unmotivated.

Our focus groups included 233 individuals with 165 (70.8%) in the telenutrition group and 68 (29.2%) in the traditional healthcare consultation group (Figure 1).

36 (60.0%) patients who followed telenutrition versus 24 (40.0%) patients who followed the traditional consultation did not drop weight, considering them to be failures and 114 (76.5%) patients who followed telenutrition versus 35 (23.5%) patients who followed traditional consultation have lost weight (Figure 1). Significant differences were found in relation to comparative results (Table 2).

Table 1 gives descriptive information. As indicated previously, the objective of the study is to evaluate the effectiveness of telenutrition versus traditional nutritional consultation for obese patients measuring their weight, waist and hip loss results.

Responses from our focus group participants suggest that most patients chose telenutrition for their overweight treatment. Telenutrition gives home based supports to some participants using ICT, results are quiet similar.

In order to avoid interference between the studied variables, the multinomial regression analysis was performed in failure versus success regarding telenutrition and traditional healthcare consultation.

Table 2 shows BMI, hip, waist, and iwaist/height loss percentage in the 149 patients who have had success with traditional treatment showing 1.4%(1.0 SD) BMI loss, 5.8% (3.4 SD) in waist circumference, 4.5% (2.8 SD) in hip circumference and 0.04% (0.02 SD) in *i*waist/height ratio; and in women who chose telenutrition showing 1.1% (1.0 SD) BMI loss, 5.0% (3.2 SD) in waist circumference, 3.5% (3.1 SD) in hip circumference and 0.03% (0.02 SD) in *i*waist/height ratio. There is a slightly BMI% and Hip% difference in the traditional consultation versus telenutrition ( $p=0.046$ ,

p=0.040). No statistical differences were found in waist% and iwaist/height%. A significance level of  $p < 0.05$  is considered.

## DISCUSSION

Prevalence of obesity is especially concerning because of its association with increased risk for chronic health conditions risk which can be mitigated with weight loss<sup>21</sup>. Weight-loss programs include education and support for improving dietary self-monitoring and behaviour change skills in patients increasing social support<sup>22</sup>.

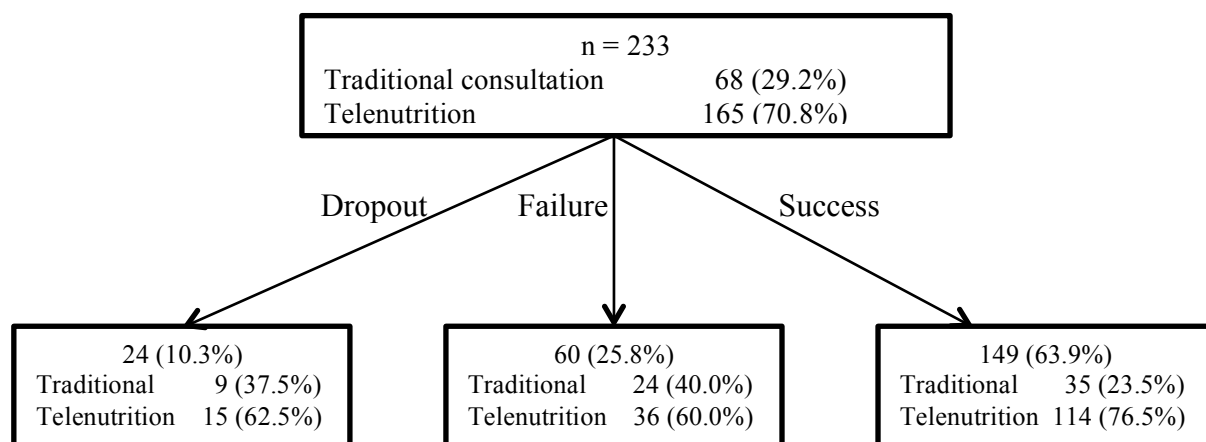
Alternative overweight and obesity treatments are very popular and despite being widely used, have not been shown to be safe and effective<sup>23</sup>. Success weight loss rates are highly variable in the literature<sup>24</sup> and depend on many factors<sup>25</sup>.

The present study has used a comparative non-invasive clinical approach and has searched if telenutrition can be more effective than the traditional healthcare consultation as determinants in the success of a treatment for obesity in a Caribbean population. Patients who completed treatment and therefore have lost weight in the week number 16 are 63.9% of the total that began the treatment, despite the great difficulties that arise in the treatment of overweight and obesity. The dropout rate is small (10.3%) maybe because the initial attendance is voluntary and for aesthetic reasons without a clinical condition or maybe due to a lack of motivation.

## CONCLUSION

Patients who chose telenutrition has a failure or dropout risk factor about half values of traditional consultation with slightly statistically significant differences. Based on these results, ICT-based using telenutrition can support or sometimes replace the traditional consultation when developing weight loss programs in obese women.





Chi<sup>2</sup> Test:  $p < 0.05$

Figure 1. Overweight and obesity treatment success through traditional consultation and telenutrition. The dropout or failure risk of telenutrition versus traditional consultation is  $OR = 0.45$  (CI95% 0.27 - 0.85;  $p < 0.05$ )

Table 1. Initial BMI values, waist, hip and waist/height index between patients who have achieved success in traditional consultation and those who chose telenutrition.

	Traditional consultation	Telenutrition	P (U Mann-Whitney)
Initial BMI (SD)	27.3(4.0)	27.1(4.2)	ns
Final BMI (SD)	25.9(3.7)	26.0(3.9)	ns
Paired T test iBMI vs fBMI(p)	0.000	0.000	
Initial waist (cm) (SD)	86.2(10.4)	87.7 (10.3)	ns
Final waist (cm) (SD)	80.4(9.3)	79.7(9.4)	ns
Paired T test iWaist vs fWaist (p)	0.000	0.000	
Initial hip (cm) (SD)	104.5 (11.4)	105.0(8.6)	ns
Final hip(cm)	99.9(10.5)	101.4(8.3)	ns
Paired T test iHip vs fHip (p)	0.000	0.000	
iW/Initial Height index (SD)	0.55(0.06)	0.53(0.06)	ns
iW/Final Height index (SD)	0.51(0.06)	0.50(0.06)	ns
Paired T test iW/iH vs iW/fH(p)	0.000	0.000	

Table 2. BMI, waist, hip and initial waist/height percentage loss in patients who have achieved success in traditional consultation and telenutrition.

	Traditional consultation	Telenutrition	P (U Mann-Whitney)
BMI Dif %(SD)	1.4(1.0)	1.1(1.0)	0.046
Waist Dif %(SD)	5.8(3.4)	5.0(3.2)	ns
Hip Dif %(SD)	4.5(2.8)	3.5(3.1)	0.040
iWaist/Height Dif %(SD)	0.04(0.02)	0.03(0.02)	ns

## REFERENCES

1. **While, A., Dewsbury, G.** 2011. Nursing and information and communication technology (ICT): a discussion of trends and future directions. *International journal of nursing studies* 48(10): 1302-1310.
2. **Kuzmar, I., Rizo, M., Cortés, E.** 2014. How to create a telemedicine service: telemedicine heptagon. *Actual. Med.* 99(791): 44-45
3. **Chung, L. M. Y., Chung, J. W. Y.** 2010. Tele-dietetics with food images as dietary intake record in nutrition assessment. *Telemedicine and e-Health* 16(6): 691-698.
4. **Shea, J., Diamandis, E. P., Sharma, A. M., Després, J. P., Ezzat, S., Greenway, F.** 2012. The obesity epidemic. *Clinical chemistry* 58(6): 968-73.
5. **Kuzmar I, Rizo M, Cortés-Castell E.** 2014. Adherence to an overweight and obesity treatment: how to motivate a patient?. *PeerJ* 1-10. <http://dx.doi.org/10.7717/peerj.495>
6. **Flegal, K. M., Carroll, M. D., Kit, B. K., Ogden, C. L.** 2012. Prevalence of obesity and trends in the distribution of body mass index among US adults, 1999-2010. *JAMA* 307(5): 491-497.
7. **Kuzmar, I., Cortés, E., Rizo, M.** 2014. Asistencia y respuesta al tratamiento por sobrepeso y obesidad en una población de Barranquilla (Colombia). *Nutr. Clín. Diet. Hosp.* 34(3):18-26. Accepted for Publication
8. **Macleod, M., Gregor, A., Barnett, C., Magee, E., Thompson, J., Anderson, A.** 2013. Provision of weight management advice for obese women during pregnancy: a survey of current practice and midwives' views on future approaches. *Maternal & child nutrition* 9(4): 467-472.
9. **Alwan, H., Viswanathan, B., Paccaud, F., Bovet, P.** 2011. Is accurate perception of body image associated with appropriate weight-control behavior among adolescents of the Seychelles. *Journal of obesity* (2011)
10. **Kuzmar I., Rizo M., Cortés E.** 2014. Social classes, level of education, marital status, alcohol and tobacco consumption as predictors in a successful treatment of obesity. *J Nutr Disorders* 4:1-3. <http://dx.doi.org/10.4172/2161-0509.1000135>

11. **Fallon, E. A., Harris, B. S., Johnson, P.** 2014. Prevalence of body dissatisfaction among a United States adult sample. *Eating behaviors* 15(1): 151-158.
12. **Cortese, S., Falissard, B., Pigaiani, Y., Banzato, C., Bogoni, G., Pellegrino, M., Maffei, C.** 2010. The relationship between body mass index and body size dissatisfaction in young adolescents: spline function analysis. *Journal of the American Dietetic Association* 110(7): 1098-1102.
13. **Mozaffarian, D., Hao, T., Rimm, E. B., Willett, W. C., Hu, F. B.** 2011. Changes in diet and lifestyle and long-term weight gain in women and men. *New England Journal of Medicine* 364(25): 2392-404.
14. **Carrasco F., Moreno M., Irribarra V., Rodríguez L., Martín, M., Alarcón, A., et al.** 2008. Evaluación de un programa piloto de intervención en adultos con sobrepeso u obesidad, en riesgo de diabetes. *Rev Med Chile* : 13-21.
15. **Aballay R., Eynard A., Díaz M., Navarro A., Muñoz, S.** 2013. Overweight and obesity: a review of their relationship to metabolic syndrome, cardiovascular disease, and cancer in South America. *Nutr Rev* 71(3): 168-179.
16. **Dimmick S., Burgiss S., Robbins S., Black D., Jarnagin B., Anders M.** 2003. Outcomes of an integrated yelehealth network demonstration project. *Telemedicine Journal and e-Health* 9(1): 13-23.  
doi:10.1089/153056203763317611.
17. **WHO.** 2013. Obesity and overweight. Fact sheet No.311. Available at <http://www.who.int/mediacentre/factsheets/fs311/en/>
18. **WHO.** 1995. Physical status: the use and interpretation of anthropometry. Technical report series 854: 312-411.
19. **Dana-Farber Cancer Institute.** Eating habits questionnaire. Available at: <http://rtips.cancer.gov/rtips/viewProduct.do?viewMode=product&productId=173387>
20. **WHO.** 2014. Available at <http://www.who.int/topics/diet/es/>.
21. **Diabetes Prevention Program Research Group.** 2002. Reduction in the incidence of type 2 diabetes with lifestyle intervention or metformin. *N Engl J Med* 346: 393-403.
22. **Burke LE., Wang J, Sevvick MA.** 2011. Self-Monitoring in Weight Loss: A Systematic Review of the Literature. *J Am Diet Assoc.* 111(1): 92-102

23. **Allison DB, Fontaine KR, Heshka S, Mentore JL, Heymsfield SB.** 2001  
Alternative treatments for weight loss: a critical review. *Crit Rev Food Sci Nutr*  
41: 1-28.
24. **Hill AJ and Williams J.** 1998. Psychological health in a non-clinical sample of  
obese women. *Int J Obes* 22(6): 578-83.
25. **Paxton SJ, Wertheim EH, Gibbons K, Sz mukler GI, Hillier L., Petrovich,  
JL.** 1991. Body image satisfaction, dieting beliefs, and weight loss behaviours  
in adolescent girls and boys. *J Youth Adolesc* 20(3): 361-379.