**Estudio del papel de la educación nutricional en el proceso de pérdida de peso**

**Study of the role of nutrition education in the process of weight loss**

Jafri, A.1; Jabari, M.2; Hibbi, N.1; Delpeuch, F.3; Derouiche, A.1

1 Université Hassan II Mohammedia Casablanca, Faculté des Sciences Ben M’sik, Laboratory of Research on Lipoproteins and Atherosclerosis (URAC 34), Casablanca, Morocco.
2 Division d’hygiène, Sidi Othmane, Casablanca, Morocco.
3 Institut de Recherche pour le Développement, Monpellier, France.

**RESUMEN**

**Objetivo:** Este estudio intenta evaluar la eficacia de la educación nutricional en la lucha contra el sobrepeso y la obesidad.

**Métodos:** El estudio se reclutó a mujeres adultas sanas de Casablanca, Marruecos con sobrepeso u obesidad. 96 mujeres participaron en el estudio, pero sólo 52 participaron hasta el final. Participantes fueron distribuidos aleatoriamente en 3 grupos: grupo control (GC), grupo 1 (G1 participó en un seminario de educación sobre la nutrición), y grupo 2 (G2 participó en dos sesiones de educación nutricional al mes). Las mediciones antropométricas y de composición corporal se tomaron al inicio y después de 12 semanas del comienzo del estudio.

**Resultados:** Ambos grupos participantes mostraron una disminución significativa en el peso después de las 12 semanas, (G2: 3.2 kg ± 0.65 (p <0.01); G1: 1.4 kg ± 1.33 (p <0,01)). Cambios significativos también se han notado en los parámetros de la composición corporal (grasa corporal y músculos esqueléticos) en ambos grupos. El grupo de control no mostró cambios significativos.

**Conclusiones:** Los resultados sugieren que la educación nutricional puede ser una forma costo-efectiva para combatir y prevenir la obesidad en Marruecos, especialmente en las comunidades con poco conocimiento sobre la dieta buena y las consecuencias de la obesidad.

**PALABRAS CLAVE**

Educación nutricional, obesidad, sobrepeso, mujeres, Marruecos.

**ABSTRACT**

**Objective:** Our study aims to assess the effectiveness of nutrition education in fighting overweight and obesity.

**Methods:** The study enrolled healthy adult women from Casablanca, Morocco with overweight or obesity. 96 women participated to the study, but only 52 participated to the end. Participants were randomized into 3 groups: control group (CG), group 1 (G1 participated to a seminar of nutrition education), and group 2 (G2 participated to 2 follow-up sessions per month). Anthropometric measurements and body composition were taken at the baseline and after 12 weeks of the beginning of the study.

**Results:** Both participating groups showed a significant decrease in weight after the 12 weeks, (G2: 3.2 kg ± 0.65 (p<0.01); G1: 1.4 kg ± 1.33 (p<0.01)).

**Corresponding author:**
Pr. Abdelfettah Derouiche
afderouiche@yahoo.fr

*Nutr. clín. diet. hosp. 2012; 32(3):57-63*
Significant changes also have been noticed in the body composition parameters (body fat and skeletal muscles) in both groups. The control group didn’t show any significant changes.

**Conclusions:** Our findings suggest that nutrition education might be a cost-effective way to fight and prevent obesity in Morocco especially in communities with little knowledge about good diet and the consequences of obesity.

**KEYWORDS**

Nutrition education, obesity, overweight, women, Morocco.

**INTRODUCTION**

In Morocco, obesity among women is much higher than among men, many factors contribute to this trend: sociodemographic, education, sedentary and diet habits, but also, a cultural factor that makes feminine obesity accepted and sometimes even promoted.

A lot of effort is spent to fight obesity, from promoting a healthier lifestyle to proposing alternatives as radical as laws and policies as tools to monitor chronic diseases including obesity. Still, the usual approach to reduce obesity is by adopting restrictive diets in order to decrease the amount of consumed calories and to establish the balance between what people consume and what they spend. However, facts show that it is practically hard to adhere to this kind of diets and that stopping the said diet is often followed by a regain of weight, especially in a population used to a sedentary lifestyle and a lack of physical activity.

In this order, we proposed to evaluate the impact of nutrition education in the process of losing weight and fighting obesity. It seems that nutrition education might play a key role in fighting some malnutrition issues and change the dietary behavior.

**METHODS**

Randomized study of 12 weeks was organized with the participation of 96 adult women from Casablanca, Morocco with overweight or obesity (36 women didn’t complete the study). Participants were housewives, employees and school teachers. Selection criteria were included BMI > 25, age > 18 and healthy subjects, pregnant and breastfeeding women were excluded as well as those with chronic diseases (the data of 8 women were excluded from analysis for non conforming to the criteria).

Participants were randomized into 3 groups: Control group (CG, n=17), Non-Followed group (G1, n=20) and Followed group (G2, n=23).

Anthropometric and body composition parameters were measured at the beginning and the end of the study.

Anthropometric measurements included height (m), weight (kg), Body Mass Index (BMI, Kg/m²), waist circumference (cm), hip circumference (cm) and body composition (fat mass percentage, muscular mass percentage, visceral fat level, basal metabolism). For weight and body composition we used a body composition monitor BF511 from Omron (HBF-511T-E) which can indicate weight up to 150 kg, and for height we used a portable stadiometer.

Participants from CG didn’t receive any directives during the whole program, the objectives of the study were explained to them and they were given an appointment three months later. Participants from the G1 participated to a single nutrition education interactive seminar featuring various topics about healthy diet and were given an appointment 12 weeks later.

Participants from the G2 participated to a nutrition education programme of 6 sessions during the three months study. Seminars and sessions were given to groups of 10 people for more interactivity with visual support and participants were given documents to take with them.

The study was reviewed and approved by the Head of the Human Nutrition research unit at Ben M'sik faculty of Sciences of the University Hassan II Mohammeda Casablanca.

**STATISTICAL ANALYSIS**

Data was analyzed using the Wilcoxon test to compare the variation of the anthropometric parameters and body composition between the baseline and at the end of the study for each group. Mann-Whitney test was used to compare the significance of the variations at the end of the study between the three groups for each parameter.

The confidence level of the null hypothesis was set at $\alpha = 0.05$. 

*Nutr. clin. diet. hosp. 2012; 32(3):57-63*
RESULTS

From the 96 initially screened, 88 met the criteria and 52 completed the study, the average BMI at the beginning of the study was 30.96(±3.29) 44.2% were overweight with a BMI>25 and the other 55.8% had a BMI>30. 73,1% had a waist circumference; WC>0.88 and 61,5% had a waist-to-hip-ratio; WHR>0.85.

While the CG didn’t show any significant change (Table 2), results showed a significant change in the anthropometric parameters of the G2 and the G1 (Tables 3,4), the G2 showed an average weight decrease of 3.2 kg ± 0.65 (p<0.01) with 80.5% of the group losing more than 1kg (lost weight varied between 1.6 and 6.1 kg) dropping the average BMI from 31.3 to 30.0, the weight of the rest of the group increased but this increase didn’t exceed 0.5kg. The G1 showed an average decrease of 1.4 kg ± 1.33 (p<0.01) with 64.7% of the group losing more than 1 kg and dropping the average BMI from 31.5 to 30.6.

Table 1. Baseline characteristics of the total participants and after randomization into groups.

<table>
<thead>
<tr>
<th></th>
<th>Total (n=52)</th>
<th>SD</th>
<th>CG (n=14)</th>
<th>SD</th>
<th>G1 (n=17)</th>
<th>SD</th>
<th>G2 (n=21)</th>
<th>SD</th>
</tr>
</thead>
<tbody>
<tr>
<td>Weight (kg)</td>
<td>77.08</td>
<td>8.94</td>
<td>75.34</td>
<td>6.65</td>
<td>75.67</td>
<td>8.60</td>
<td>79.39</td>
<td>10.33</td>
</tr>
<tr>
<td>BMI</td>
<td>30.96</td>
<td>3.29</td>
<td>29.71</td>
<td>2.65</td>
<td>31.51</td>
<td>3.09</td>
<td>31.35</td>
<td>3.73</td>
</tr>
<tr>
<td>Body Fat (%)</td>
<td>45.99</td>
<td>3.70</td>
<td>44.59</td>
<td>3.32</td>
<td>46.96</td>
<td>3.71</td>
<td>46.14</td>
<td>3.82</td>
</tr>
<tr>
<td>Skeletal Muscle (%)</td>
<td>23.14</td>
<td>1.67</td>
<td>23.63</td>
<td>1.62</td>
<td>22.68</td>
<td>1.77</td>
<td>23.19</td>
<td>1.61</td>
</tr>
<tr>
<td>Resting Metabolism rate (kcal)</td>
<td>1442.71</td>
<td>107.90</td>
<td>1430.64</td>
<td>79.35</td>
<td>1414.88</td>
<td>106.37</td>
<td>1473.29</td>
<td>121.68</td>
</tr>
<tr>
<td>Visceral fat level</td>
<td>9.02</td>
<td>2.05</td>
<td>8.43</td>
<td>1.70</td>
<td>9.47</td>
<td>2.74</td>
<td>9.05</td>
<td>1.56</td>
</tr>
<tr>
<td>Waist circumference (cm)</td>
<td>88.89</td>
<td>7.92</td>
<td>85.89</td>
<td>8.75</td>
<td>88.67</td>
<td>6.38</td>
<td>91.26</td>
<td>8.00</td>
</tr>
<tr>
<td>Hip circumference (cm)</td>
<td>102.69</td>
<td>4.89</td>
<td>100.50</td>
<td>4.09</td>
<td>102.33</td>
<td>4.67</td>
<td>104.58</td>
<td>5.08</td>
</tr>
<tr>
<td>Waist-Hip ratio</td>
<td>0.87</td>
<td>0.06</td>
<td>0.85</td>
<td>0.08</td>
<td>0.87</td>
<td>0.05</td>
<td>0.87</td>
<td>0.06</td>
</tr>
</tbody>
</table>


Table 2. Anthropometric parameters and body composition of the Control Group before and after the study. (n=14).

<table>
<thead>
<tr>
<th></th>
<th>Baseline</th>
<th>SD</th>
<th>12 weeks</th>
<th>SD</th>
<th>P</th>
</tr>
</thead>
<tbody>
<tr>
<td>Weight (kg)</td>
<td>75.34</td>
<td>6.64</td>
<td>75.06</td>
<td>7.59</td>
<td>0.55</td>
</tr>
<tr>
<td>BMI</td>
<td>29.70</td>
<td>2.65</td>
<td>29.57</td>
<td>2.93</td>
<td>0.55</td>
</tr>
<tr>
<td>Body Fat (%)</td>
<td>44.59</td>
<td>3.32</td>
<td>43.71</td>
<td>3.77</td>
<td>0.23</td>
</tr>
<tr>
<td>Skeletal Muscle (%)</td>
<td>23.62</td>
<td>1.61</td>
<td>24.15</td>
<td>1.83</td>
<td>0.13</td>
</tr>
<tr>
<td>Resting Metabolism rate (kcal)</td>
<td>1430.64</td>
<td>79.34</td>
<td>1451.23</td>
<td>129.54</td>
<td>0.40</td>
</tr>
<tr>
<td>Waist circumference (cm)</td>
<td>85.89</td>
<td>8.75</td>
<td>86.23</td>
<td>7.61</td>
<td>0.78</td>
</tr>
<tr>
<td>Hip circumference (cm)</td>
<td>100.5</td>
<td>4.09</td>
<td>103.83</td>
<td>9.23</td>
<td>0.53</td>
</tr>
<tr>
<td>Waist-Hip ratio</td>
<td>0.85</td>
<td>0.08</td>
<td>0.85</td>
<td>0.07</td>
<td>0.70</td>
</tr>
</tbody>
</table>

Wilcoxon test has been used to compare between the values of the baseline and the end of the study. SD: Standard deviation.
Although both G2 and G1 showed a significant weight decrease, the comparison between the weight variation of the G2 members and the G1 members showed a significant difference ($p<0.01$), while the comparison between the G1 variation and the CG variation didn’t show any significant difference (Table 5).

Body composition parameters also showed a change in the percentage of body fat and skeletal muscle mass, both G2 and G1 showed a significant increase in the skeletal muscle mass percentage ($p<0.05$) and a significant decrease in Body Fat percentage (Tables 3,4), with a more significant decrease among the members of the G2 ($p<0.01$). The comparison of these variations between the 3 groups showed that a significant decrease among the participants from the G2 when compared to the two other groups (Table 5).

Waist and hip circumferences and Waist-to-hip ratio didn’t show any significant variations between the baseline and the end of the study or between the three groups (Tables 3-5).
Table 5. Comparison of the anthropometric parameters variations at the end of the study between the three groups (n=52)

<table>
<thead>
<tr>
<th></th>
<th>CG</th>
<th>G1</th>
<th>G2</th>
<th>G2 vs G1</th>
<th>G2 vs CG</th>
<th>G1 vs CG</th>
</tr>
</thead>
<tbody>
<tr>
<td>Weight variation (kg)</td>
<td>-0.28</td>
<td>-1.40</td>
<td>-3.24</td>
<td>0.009</td>
<td>0.001</td>
<td>0.15</td>
</tr>
<tr>
<td>BMI variation (kg/m²)</td>
<td>-0.13</td>
<td>-0.59</td>
<td>-1.31</td>
<td>0.02</td>
<td>0.001</td>
<td>0.15</td>
</tr>
<tr>
<td>BF variation (kg)</td>
<td>-0.82</td>
<td>-1.30</td>
<td>-2.36</td>
<td>0.04</td>
<td>0.02</td>
<td>0.18</td>
</tr>
<tr>
<td>SM variation (kg)</td>
<td>0.36</td>
<td>-0.06</td>
<td>-0.37</td>
<td>0.09</td>
<td>0.06</td>
<td>0.57</td>
</tr>
<tr>
<td>WC variation (cm)</td>
<td>0.34</td>
<td>0.93</td>
<td>0.57</td>
<td>0.44</td>
<td>0.94</td>
<td>0.87</td>
</tr>
<tr>
<td>HC variation (cm)</td>
<td>3.33</td>
<td>-0.33</td>
<td>0.64</td>
<td>0.43</td>
<td>0.65</td>
<td>0.38</td>
</tr>
<tr>
<td>WHR variation</td>
<td>0.00</td>
<td>0.01</td>
<td>0.00</td>
<td>0.97</td>
<td>0.34</td>
<td>0.45</td>
</tr>
</tbody>
</table>

Mann-Whitney test has been used to compare the values variations at the end of the study between the three groups. CG: Control group. G2: Followed group. G1: Non-followed group. BF: Body fat percentage. BMI: Body Mass Index. HC: Hip circumference. SM: Skeletal muscle percentage. WC: Waist circumference. WHR: Waist-to-hip ratio.

DISCUSSION

A 12-weeks follow-up of nutrition education sessions in urban women with overweight or obesity resulted in a significant weight loss of 3.2 kg with 80.5% of the group losing more than 1 kg (lost weight varied between 1.6 and 6.1 kg) dropping the average BMI from 31.3 to 30.0, the weight of the rest of the group increased but this increase didn't exceed 0.5kg. Also, a single seminar of nutrition education resulted in a significant weight loss of 2.2 kg over 3 months with 64.7% of the group losing more than 1 kg dropping the average BMI from 31.5 to 30.6. Although the G2 showed a more significant decrease than the G1, the differences between the 2 groups in weight loss were not statistically significant.

Clinical nutrition education has been reported to be effective in controlling weight and changing food habits but in our study we aimed to use nutrition education in a sample of healthy people without suffering from any obesity related disease in order to assess the role that nutrition education can play in the process of preventing obesity in a society with a high prevalence of weight disorders and thus to encourage them to voluntary lose some weight without being forced by their health condition to do so, but rather by understanding that obesity could lead to other health complications. Our objective was to introduce the concept of balanced and healthy diets without promoting any particular diet programme as they are reported to help fast weight loss in the short term, but no evidence has sustained that those effects last, this added to the controversy about their long-term safety.

Results showed a significant decrease in body fat mass and significant increase in skeletal muscles mass after the 12 weeks in both G2 and G1, which could be attributed to physical activity. Indeed, at the baseline, 26.9% of the total participants were practicing sports, but this percentage increased with the nutrition education sessions through insisting of the benefits of physical activity on weight loss process when associated with good diet and the consequences of long physical inactivity not only on gaining weight but also on health-related parameters and the clear relationship between a sedentary lifestyle and metabolic complications.

Although, the association between exercise and fat mass decrease is controversial but it has been noticed even with low-intensity exercise. Despite the significant weight loss, and body composition change, we didn't notice any reduction of abdominal obesity in any of the groups. Neither did we observe any significant change in the waist-to-hip ratio even when comparison to the control group.

A lot of interest has been given to nutrition education as a tool to prevent obesity in children and in adults. Some studies even reported that using computer-tailored nutrition education as a more efficient way, which is interesting but, sadly, not applicable in a society with a high prevalence illiteracy and a
biased opinion about obesity. In this study we tried to use nutrition education as preventive approach. The challenge that was facing us is that in Morocco the look towards obesity isn’t as severe as in some Western countries\textsuperscript{26}, in Morocco, obesity is usually accepted and even a desired criteria\textsuperscript{2}. Thus, our objectives were to use nutrition education as a tool to make these women aware about the risks related to obesity as a first step in the process of fighting it.

**CONCLUSIONS**

The major findings of this study is that nutrition education and promotion of healthy diet and physical activity gave gave positive results and

Expenditures related to overweight and obesity cost too much and will keep on increasing along with the prevalence of obesity\textsuperscript{27}. In Morocco, most of the population has a low or middle income which makes it urgent to adopt strategies to prevent and to fight obesity. Nutrition education is a cost effective process that could represent the solution to obesity problems in developing countries. During the design of this study we noticed more adherence from the participants when working with small groups than when we worked with individuals, which also happened to be cost effective and time effective. Promoting policies to implement nutrition education in community health centers, schools, etc. could help stopping the rising trend of obesity in Morocco and correct the biased view that society has of obesity by trying it on a larger scale and on the different ethnic groups in the country.

**REFERENCES**


