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ORIGINAL PAPER

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Effect of Nutrition Education on Weight Reduction of Obese Girls in Jordan

Abstract: The objective of this work is to study the effect of two different means of nutrition education on body weight of obese and overweight girls. Forty two Jordanian females aged between 16-22 years were divided into two equal groups: one received nutrition education through a leaflet alone (G1) and the other (G2) received individual counseling in addition to the leaflet. The study lasted for 24 weeks. The first stage lasted for 12 weeks during which weight was taken every two weeks, and the second stage, a follow-up stage, lasted for another 12 weeks during which no contact was made with the subjects. At the end of the first stage of the study, the mean weight loss for G1 was 1.5 kg, and for G2 was 4.3 kg. Changes in BMI were parallel to changes in body weight. At the end of the follow-up stage, the two groups did not differ significantly in their mean weights. It is concluded from this study that nutrition education based on well planned simplified leaflet could be effective in long term weight control.

Keywords: Obesity, overweight, body mass index, nutrition education.

أثر التثقيف التغذوي على خفض وزن الجسم عند فتيات أردنيات يعانين من زيادة الوزن أو السمنة

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المستخلص: يهدف البحث إلى دراسة أسلوبين من التثقيف التغذوي على وزن الجسم لفتيات ذوات أوزان عالية. قسمت عينة الدراسة المكونة من 42 فتاة أردنية بعمر 16–22 سنة إلى مجموعتين متساويتين في العدد ، كان أسلوب التثقيف لإحداها عن طريق نشرة مبسطة، وللأخرى من خلال التثقيف الفردي بالإضافة إلى النشرة . استمرت الدراسة لمدة 24 أسبوعاً وكانت مقسمة إلى مرحلتين، تم خلال المرحلة الأولى ومدتها 12 أسبوعاً قياس الوزن مرة كل أسبوعين ، بينما لم يجر أي إتصال بالفتيات خلال المرحلة الثانية وهي مرحلة المتابعة والتي مدتها 12 أسبوعاً أيضاً.

كان معدل نقص الوزن في نهاية المرحلة الأولى من هذة الدراسة 15 كجم و 4.3 كجم للمجموعتين الأولى والثانية على التوالي، وكان ثمة تشابة بين التغير في منسب كتلة الجسم ووزن الجسم . أما في نهاية المرحلة الثانية فلم يكن الإختلاف في معدل النقص في الوزن بين المجموعتين معنوياً.

يمكن الإستنتاج من نتائج هذة الدراسة أنه من الممكن أن يكون التثقيف التغذوي المرتكز على نشرة إرشادية غذائية مبسطة أكثر فاعلية في تخفيف الوزن على المدى الطويل من التثقيف الفردي.

كلمات مدخلية: بدانة، زيادة وزن، تثقيف تغذوي، تخفيض وزن.

Introduction

Obesity is the oldest, most common metabolic disorder in man. It was documented in Egyptian mummies and in Greek sculpture (Bierman, 1981). Nowadays, obesity and overweight have been reported to be common in affluent countries including many Middle Eastern ones (Alwan, 1993). In Jordan, a recent study revealed that 37.1% of a randomly selected sample is grade I overweight (body mass index or BMI) 25-29.99 kg/m^2, 28.3% grade II overweight (BMI 30-39.99) and 2.5% grade III overweight (BMI≥40) (Ministry of Health, Hashemite Kingdom of Jordan, 1997). BMI is body weight in kg divided by the squared height in cm.

Obesity is both a disease in itself and a precursor to many diseases such as atherosclerotic cardiovascular disease, hypertension, gall bladder diseases, menstrual irregularities, increased obstetric risk, cancer and adult onset diabetes mellitus. It represents a significant risk to health when it appears early in life (Anderson, 1991). Furthermore, childhood obesity may account for a considerable proportion of severe adult obesity. Therefore, weight reduction prior to or during adolescence seems to be essential to prevent lifelong disease and suffering (Dietz, 1983). Females are generally more prone to become obese than males, and adolescents more than children (Dietz, 1983). To overcome excess weight, obese girls often undergo some dangerous practices such as bulimia, sweating and complete fasting (Martin and Mullen 1987). These practices result in serious ill-health

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effects among which are electrolyte disturbances and cardiac problems (Martin and Mullen, 1987). Sound nutrition education has been found to be very efficient in weight reduction (Nieman *et al.* 1990, Wadden *et al.* 1990, Whatley *et al.* 1994)

Accordingly, this study aimed at investigating the effect of two different methods of nutrition education on food intake and body weight of obese and overweight girls.

Subjects and Methods

Forty-two volunteer girls aged between 16-22 years were recruited. They were at or above the 85th age-sex specific centiles for body mass index (BMI) according to Must et al. data (Must *et al.* 1991a, & b) collected from various ethnic groups. The participants were apparently healthy and free from adverse health symptoms or hormonal disturbances which might relate to energy imbalances. They seemed to belong to families of high or middle socioeconomic status based on father's occupation.

The subjects were then randomly divided into two equal groups, each 21 subjects. One group received nutrition education through a simple and clear leaflet, whereas the other group received individual nutrition counseling in addition to the leaflet. The study was conducted in two stages over a period of 24 weeks. The first stage lasted for 12 weeks during which weight was taken every two weeks. It was followed by the second stage, a follow-up stage, which lasted for another 12 weeks. During the follow-up stage no contact was done with the subjects.

Energy requirement for each subject was calculated according to the equations suggested by James and Schofield (James and Schofield, 1990). Energy restriction was then made in two stages. The first stage was an energy intake equal to 75% of total calculated energy requirement. This stage was applied for the first 7 weeks of the study. The second stage of energy restriction was an energy intake equal to 65% of total energy requirement. This stage was applied starting week 8 until the end of the study. Body measurements were repeated at the end of each stage.

Anthropometric measurements

Height was taken without shoes while weight was taken with minimum clothes as described by Gibson (1990). Weight in kilograms and height in meters were recorded for the calculation of body mass index (BMI) according to the following equation (Gibson, 1990):

$$BMI = \text{weight (kg)}/\text{height}^2 \text{ (m)}.$$

Overweight was indicated when body weight was at or above 85th centile, and obesity when it was at or above 95th centile (Must *et al.* 1991 a,b).

Nutrition education schemes

Nutrition education was performed by two different methods, through the leaflet or through the leaflet combined with individual counseling. The leaflet provided information on relevant facts on obesity and its consequences; health effects of improper methods of weight loss; balanced nutrition program based on the American Dietetic Association (ADA) exchange list (1995) and local food habits; suggested daily meal plans based on individual caloric requirements; and general guidelines related to food and eating behavior.

Individual dietary counseling consisted of a total of seven sessions held biweekly for each subject. Telephone calls and home visits were done when necessary. Individual counseling involved also detailed explanation of the leaflet.

Results

Statistical analysis included Student t-test and paired t-test at a significance level of <0.05. Of the 42 subjects, 50% were considered obese as they had BMI >95th centile, and the remaining subjects were considered overweight as they had BMI >85 — < 95th centile of NHANES I data as defined by Himes and Dietz, 1994). The initial anthropometric data for the two groups are shown in Table 1.

Table 1. Initial anthropometric measurements (mean + SEM) of the group receiving nutrition education through the leaflet alone (G1) and the group receiving nutrition education through the leaflet and individual counseling (G2)

Parameter	G1(n=21)	G2(n=21)	Total subjects (n=42)
Age	18.1 ± 0.5	18.3 ± 0.5^{ns}	18.2 ± 0.4
Weight (kg)	75.5 ± 10.6^{a}	77.9 ± 9.4^{ns}	76.7 ± 9 9
Height (cm)	158.3 ± 4.8^{a}	162.4 ± 6.5^{ns}	159.9 ± 5.5
BMI(kg/m^2)	30.1 ± 3.5^{a}	29.5 ± 2.6^{ns}	29.9 ± 3.2

^{ns} Not significant as compared with G1.

Effect of Nutrition Education on Anthropometric Measurements

Short-term changes:

At the end of the 12-week period covering the first stage of the study, the mean weight loss for the subjects receiving the leaflet alone (G1) was 1.5 kg, and for those receiving individual counseling in combination with the leaflet (G 2) was 4.3 kg.

Changes in BMI were parallel to changes in body weight (Table 2). The mean baseline BMI declined significantly ($p<0.05$) in both groups but at different rates (-0.67 kg for G1 and -1.63 kg for G2).

Regarding the proportion of subjects from each group who maintained weight and those who lost weight, only 9% of the subjects in G2 maintained their initial body weight as compared to 33% in G1. The proportion of subjects who lost 4 kg or less, constituted 53%. However, 38% of G2 lost more than 4 kg in 12 weeks compared to only 14% of G1. Figure 1 shows the rate of change in body weight and BMI on weekly basis. BMI decreased continuously over the first stage which lasted 12 weeks, but the rate of change in the first 4 weeks was greater than that in the last 8 weeks.

Table 2. Changes in weight and BMI in the group receiving nutrition education through the leaflet alone (G1) and the group receiving nutrition education through the leaflet and individual counseling (G2).

Week number	Mean change ± SEM			
	Change in weight(kg)		Change in BMI (kg/m²)	
	G1	G2	G1	G2
2	0.1 ± 0.30	- 0.9 ± 0.5^{ns}	0.05 ± 0.12	- 0.34 ± 0.18^{ns}
4	- 0.5 ± 0.33	- 2.3 ± 0.46*	- 0.19 ± 0.13	- 0.86 ± 0.16*
6	- 0.7 ± 0.41	- 3.0 ± 0.61*	- 0.29 ± 0.17	- 1.10 ± 0.22*
8	- 0.7 ± 0.48	- 3.3 ± 0.74*	- 0.29 ± 0.19	- 1.24 ± 0.27*
10	- 1.2 ± 0.57	- 4.1 ± 0.78*	- 0.47 ± 0.23	- 1.53 ± 0.28*
12	- 1.5 ± 0.59	- 4.3 ± 0.83*	- 0.67 ± 0.25	- 1.63 ± 0.30*

^{ns} Not significant as compared with G1.

* Significant difference between the two groups at $p<0.05$

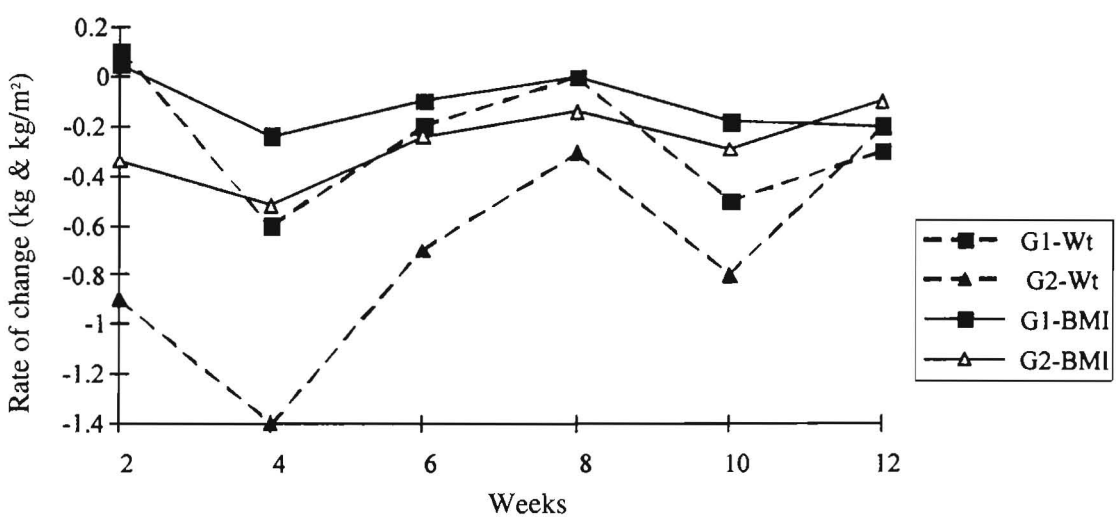

Figure 1. Rate of change in weight (Wt.) and body mass index (BMI) in the group receiving nutrition education through the leaflet alone (G1) and the group receiving nutrition education through the leaflet and individual counseling (G2).

Changes in anthropometric measurements at the follow-up period

During the follow-up period, the second stage of the study, which lasted for 12 weeks, information was obtained on 39 subjects. About 36% of those participants maintained the new weight or lost further weight at week 24, whereas 64% gained weight, but did not regain the initial weight. Furthermore, a large proportion of the subjects in G1 (61%) continued to lose weight slowly but steadily; they either maintained the new weight or lost further weight. Mean body weight of the subjects in G2 increased so that they made up the majority (86%) of those who gained weight. The two directional changes in weight in both groups cancelled the difference between them so that it became insignificant at the end of the follow-up stage.

Discussion

A safe weight loss should be slow and steady for maximum loss of fat and minimum loss of lean body mass (i.e. muscle tissue) (Caterson, 1991) particularly during growth periods. Moderate energy intake (MER), equal to 70% of requirement, is preferred over severe energy restriction (SER) equal to 40% of requirement; this is because weight reduction through the former allows for greater retention of fat-free mass than the latter. Therefore, MER was adopted in this study.

The weight loss achieved in this study, 1.5 kg in G1 and 4.3 kg in G2 (Table 1) is within the range that was reported by Nieman *et al.* (1990), the hypocaloric diet providing 1268 Kcal used by those investigators, resulted in a weight loss of 5.6 kg over 5 weeks (Nieman *et al.* 1990). Similar results were obtained in the study by Rocchini *et. al.* (1988) in which a group of 72 obese adolescents lost weight through a program based on caloric restriction. They reported a change in body weight from 72kg ± 12 prior to treatment to 69.6 kg ±11 post treatment.

Subsequent weight gain at the end of the follow-up period in this study was similar to what was reported by Kayman *et al.* (1990)

Bender and Brookes (1987) attributed failure of outpatients to lose weight or maintain the reduced weight to noncompliance of the patients rather than to any metabolic barrier of weight loss. Such failure could be due to negative emotional states and unexpected stressful life events which are accompanied with increased use of food. In this study, the stressful event that could be responsible for the relapse at the follow-up stage was the school final examinations.

The parallel changes of BMI and weight achieved in this study were in agreement with those reported by Wadden *et al.* (1990) who applied a weight control program over 16 weeks to 36 obese black adolescents; weight loss was accompanied with a decline in BMI from 35.2 to 33.9 kg.

The difference in weight loss behavior in the present investigation seems to be due to difference in the method of nutrition education since the two groups were of similar age, initial weight and socioeconomic background. However, other confounding factors such as socioeconomic factors, family makeup, obesity among parents, dieting, etc. may play a role in weight loss. Any future study on this issue should consider these factors.

The pattern of weight change which was rapid over the first 4 weeks could be partially explained by the depletion of glycogen stores, but this does not continue at the same rate (Garrow, 1993). The body opposes and minimizes weight change. During underfeeding, energy expenditure decreases, thus limiting weight loss. This decrease can, to some extent, be explained by the decreased thermic effect of the low caloric diet (Garrow, 1993)

Conclusion

It is concluded from the findings of this study that nutrition education based on well planned simplified leaflet is effective in weight control and the effect was more lasting than that involving individual counseling in addition to the leaflet. Accordingly, the use of a well planned leaflet is recommended for long-term weight control. However, individual counseling which resulted in more rapid weight loss in the first stage of the study would be useful for faster weight loss. Stepwise energy restriction was found to be useful in overcoming the adaptive slowdown in weight loss.

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