Effect of Aerobic Exercise on Reducing Obesity in Girls after Puberty

Hala M. Hanfy and Amir A. Gabr
* Department of Physical Therapy for Obstetrics and Gynaecology, Faculty of Physical Therapy, Cairo University, Egypt.
** Department of Gynaecology and Obstetrics, Faculty of Medicine, Cairo University, Egypt.

ABSTRACT

The present study was conducted to investigate the effect of aerobic exercise on reducing obesity in girls after puberty. Sixty obese girls have obesity class II with BMI 30-35 kg/m^2 participated in this study. They were chosen from Kasr Elenie hospital, Faculty of Medicine, Cairo University. Their ages ranged from 13 to 19 years old. They were divided randomly into two groups equal in number. The first group (group A) included 30 girls treated with low caloric diet (1200) calories only for 6 weeks. The second group (group B) included 30 girls treated with low caloric diet (1200) calories and aerobic exercise for 6 weeks every other day for 45 minutes, at70% of maximum heart rate in the form of walking by using treadmill. Body weight, BMI, waist circumference and waist to hip ratio were evaluated before and after the program for both groups. Duration of the study was 6 months from September 2011 to March 2012. The obtained results showed a statistically highly significant decrease (P<0.01) in body weight, BMI, waist circumference and waist to hip ratio for both groups. When comparing the results of both groups, group (B) which treated with diet and aerobic exercises showed a decrease in body weight, BMI, waist circumference and waist to hip ratio. As there was a statistically significant difference in the post treatment values between both groups as the mean difference was ,for body weight (2.7), BMI (1.21), waist circumference (5.53) and waist to hip ratio (0.03). Accordingly, it could be concluded that the aerobic exercise is very effective in reducing obesity in females after puberty.

Key words: *Aerobic exercise, obesity, puberty, BMI, waist circumference, waist to hip ratio.*

INTRODUCTION

Adolescence is the period during which a disturbed body image was most likely to begin.

Several recent studies suggest that the timing of the onset of puberty in girls has become earlier over the past 30 years, and there is strong evidence that the increasing rates of obesity in children over the same time period is a major factor. These studies are nearly all cross-sectional, so many questions remain unanswered. However, at least several studies show that girls who have relatively higher body mass index are more likely to have earlier menses, as well as a relationship between body mass index and other measures of pubertal onset. The evidence published to date suggests that obesity may be causally related to earlier puberty in girls rather than that earlier puberty causes an increase in body fat. In contrast, few studies have found a link between body fat and earlier puberty in boys[19].

Obesity has been defined as "an increase in body weight resulting from an excessive increase in body fat". The problem with obesity is not weight or mass but excess adipose tissue. Adipose tissue is a "major energy store in the body and its size can only increase if food (energy) intake is greater than the body's energy demands"[3].

The current best single gauge for body fat is a measurement (called body mass index (BMI). In general a BMI of 25 to 29.9 indicated being overweight and obesity is a BMI of 30 and above. Higher BMIs are associated with significant health problems[9].

Waist to hips ratio (WHR), abdominal-to-gluteal circumference ratio or Android-Gynoid ratio (AGR) is calculated by dividing waist girth by hip girth. WHR at which there is an increased relative risk is defined as follows: (men> 0.9 and women> 0.8). The waist to-hip ratio measurement can be used to help determine obesity. The distribution of fat is evaluated by dividing waist size by hip size. A person with a 30-inch waist and 40-inch hips would have a ratio of .75; one with a 41-inch waist and 39-inch hips would have a ratio of 1.05. The higher the ratio, the higher the risk of heart disease and other obesity-related disorders[8].

Some studies have found that the prevalence of obesity in children is directly related to the hours of television viewed. Other studies, however, have failed to establish a direct correlation. Critics of television have suggested that television watching induces laziness, passivity; hyperactivity and/or many other undesirable conditions. There are two main reasons why television watching may contribute to obesity. Firstly, it results in less activity as television watching replaces more active pursuits and secondly, television viewing decreases the metabolic rate[3].

The amount of obese children and youth increasing dramatically in the western countries, but obesity has also spread world-wide and recent research has shown that Arab countries has the second higher rate of child and adult obesity after United State of America. In most European countries obesity is increasing among children and youth[28].

Most dietary treatments of obesity involve a reduction in energy intake and, in theory, most are simple to adhere to. However, in practice most obese patients find compliance to low-energy diets extremely difficult, particularly in long-term[26].

Nutrionists recommend that the daily intake of carbohydrate versus fat should not differ with age, gender or activity level. Of the total calorie intake in a western diet, 55% to 60% is typically carbohydrate, 25% to 30% is fat, and the remaining 10 to 15% is protein. The requirements for total calorie intake vary among individuals and depend on a number of factors including a person ability to use store energy (efficiency) and the daily activity level[22].

The literature supports that exercise for the goal of weight loss should be of low to moderate intensity for a long duration (at least 45 min). At low to moderate intensities, fat is the preferred fuel for muscles, especially if the exercise duration is greater than 45 min. this is because there are greater stores of body fat than carbohydrate while at high intensities, the accumulation of lactic acid in the muscle inhibit fat utilization[1].

Some believe that exercise stimulates appetite to such an extent that food intake is unconsciously increased to at least equal that expended during exercise, But in fact exercise appear to be a mild appetite suppressant at least for the first few hour following intense exercise training, further more studies have shown that the total number of calories consumed per day does not change when a person begins a training program but with intense levels of exercises, appetite decreases due to increased catecholamine (epinephrine and nor epinephrine) secretion besides the increased, Body temperature which explain a desire of food in cold weather and vice versa[27].

A single bout of exercise either before or after a meal increases the thermic effect of a meal (TEM) but some studies showed a decrease or even no effect on TEM, because TEM measuring must be timed carefully with the last exercise about, When measurements are made within 24 hours of the last about the TEM is typically lowered than it is 3 days after wards[13].

The use of diets and exercise in the treatment of obesity is being challenged today by the public and a growing number of health care professionals, as well as obesity researchers. The challengers argue that diets are at best ineffective, and many times harmful. The supporters contend that the commonly cited 95% failure rate for dieting is based on weak data that are more than 35 years old. They further contend that the body of weight loss literature is based on a subpopulation of obese people who seek clinical help from hospital- or university-based programs, and that these people do not represent the entire obese population. The issue becomes even more confusing when the scientific community itself cannot determine at what threshold of obesity health risks increase or whether the disease to be treated is really obesity, or dieting itself[24]. Furthermore, in order to come to a consensus on whether or no; diet and exercise are effective in the treat-ment of obesity, researchers must come to an agreement as to which outcome variables or criteria represent effective treatment[23].

Purpose of the study

The present study was conducted to investigate the effect of aerobic exercise on reducing obesity in girls after puberty.

SUBJECTS, MATERIAL AND METHODS

Sixty obese girls had obesity class II with BMI 30-35 kg/m^2 participated in this study They were chosen from kasr Elenie hospital, faculty of medicine,Cairo University. Their ages ranged from 13 to 19 years old.

Inclusion criteria:

1. All girls after puberty.
2. Their age ranged from 13 to 19 years old.
3. All girls have BMI from 30 to 35 Kg /m^2.

Exclusion criteria:

All girls were subjected to full detailed history and full clinical examination for exclusion of the following:

1. Cardiac disease.
2. Chest disease.
3. Musculoskeletaldeformities.

They were divided randomly into tow groups equal in number. The first group (group A) included 30 girls were treated with low caloric diet (1200) calories only for 6 weeks. The second group (group B) included 30 girls were treated with low caloric diet (1200) calories and aerobic exercise for 6 weeks, every other day, for 45 minutes, at 70% of maximum heart rate in the form of walking by using treadmill.

Body weight, BMI, waist circumference and waist to hip ratio were evaluated before and after performing aerobic exercise program. Duration of the study was 6 months from September 2011 to March 2012.

Aerobic exercise program (for group B only), moderate aerobic exercise was done at (70% of Maximum Heart Rate) in the form of walking by using treadmill for 45 minutes, every other day, for 6 weeks. It was consisted of:-

Warming up phase: It consisted of 10 minutes.

Active phase: It consisted of 25 minutes running by using electrical treadmill (70% of maximum heart rate).

Cooling down phase: It consisted of 10 minutes.

The data had been collected and statistically analyzed by using descriptive statistics (mean, standard deviation and percentage), paired and unpaired t test.

RESULTS

A- Physical characteristics of the girls.

The data in table (1) represented the mean age (16.66±1.47, 16.93±1.43) years, mean weight (81.63±3.3, 82.0±4.25) kilograms (Kg), mean height (157.2±4.66, 157.43±4.21) centimeters (cm), and mean BMI (32.8±0.83, 33.07±0.7) (Kg/m^2) of both groups A&B respectively.

There was no significant difference between both groups in their ages, weights, heights, and BMI where their t and P-values were (0.71, 0.48), (0.37, 0.71), (0.2, 0.84), and (1.33, 0.18) respectively.

Table (1): Physical characteristics of the girls.

Items	Group A		Group B		Comparison		S
	Mean	±SD	Mean	±SD	t-value	P-value	
Age (yrs)	16.66	±1.47	16.93	±1.43	0.71	0.48	NS
Weight (Kg)	81.63	±3.3	82.0	±4.25	0.37	0.71	NS
Height (cm)	157.2	±4.66	157.43	±4.21	0.2	0.84	NS
BMI (Kg/m^2)	32.8	±0.83	33.07	±0.7	1.33	0.18	NS

B- Body weight, BMI, waist circumference, hip circumference and waist hip ratio:

Table (2) shows that when comparing the results of both groups, group (B) which treated with aerobic exercises and diet show a greater decrease in body weight, BMI, waist circumference, hip circumference and waist hip ratio. As there was a statistically significant difference in the post treatment values between both groups, as ($P<0.05$). Fig. (1,2,3,4,and5).

Table (2): Independent t-test between groups A and B for weight, BMI, waist circumference, hip circumference and waist hip ratio pre and post treatment.

Independent t-test	Body weight		BMI		Waist Circumference		Hip Circumference		Waist Hip Ratio	
	Pre	Post	Pre	Post	Pre	Post	Pre	Post	Pre	Post
Mean difference	0.36	2.7	0.26	1.21	0.23	5.53	0.53	2.66	0.002	0.03
t-value	0.37	2.63	1.33	2.74	0.17	4.02	0.39	2.17	0.15	2.32
P-value	0.71	0.01	0.18	0.008	0.86	0.0001	0.69	0.03	0.87	0.02
S	NS	S	NS	S	NS	S	NS	S	NS	S

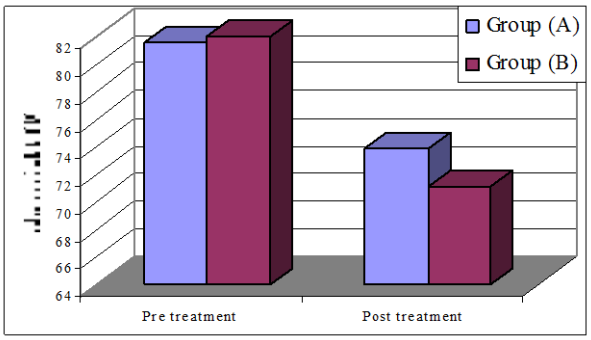

Fig. (1): Mean and ±SD of body weight pre and post treatment of groups (A, B).

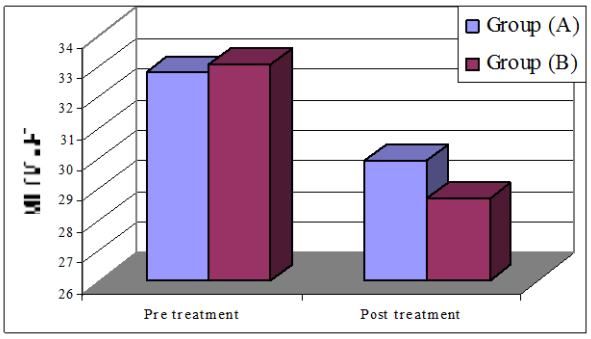

Fig. (2): Mean and ±SD of BMI pre and post treatment of groups (A, B).

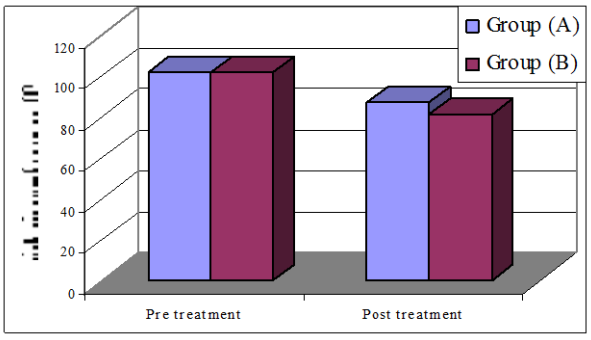

Fig. (3): Mean and ±SD of waist circumference pre and post treatment of groups (A, B).

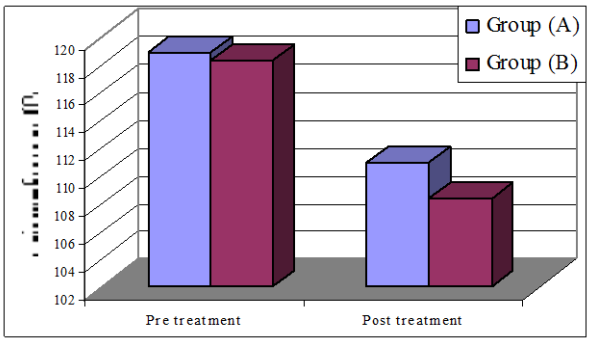

Fig. (4): Mean and ±SD of hip circumference pre and post treatment of groups (A, B).

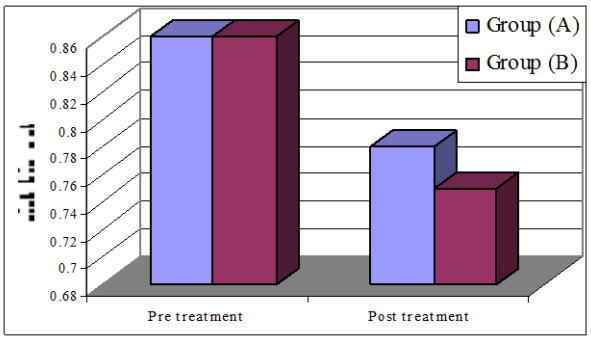

Fig. (5): Mean and ±SD of waist hip ratio pre and post treatment of groups (A, B).

DISCUSSION

Obesity can be titled as the "New World Syndrome" that affecting not only the developed but also developing countries. It is associated with health problems According to the recent studies, it is estimated that obesity currently affects 25% of children in the United States[17]. It is also responsible for some metabolic syndromes, type 2 diabetes, hypertension, other cardiovascular disease and osteoarthritis[25].

Obesity is second to smoking in frequency of causes of death in the United States. Obesity is the sixth dangerous problem responsible for population mortality.

Obesity is a complex, multifactorial disease that develops from the interaction between genotype and environment; it

involves the integration of social, behavioral cultural, physiological, metabolic and genetic factors[29].

Obesity in adolescent has multifactorial etiology bout it is ultimately the result of energy imbalance lie when energy intake is greater than the energy expenditure[15].

Physical activity decreases throughout adolescence[4]. Prospective studies shows that physical activity protects against excessive weight gain[13]. The use of sedentary technology for recreation apparently contributes to the epidemic. The main food, related to higher childhood BMI are fast foods, sodas and snack[2].

The treatment of obesity has improved dramatically during the past 20 years. For the severely obese, a number of successful surgical techniques have been developed[26]. For the majority of the obese who do not fall in the severe classification, behavioral techniques and aerobic exercise can help in weight loss.

It is evident that exercise can significantly reduce the incidence of obesity, although available studies have not established any specific mechanisms for these beneficial effects. Currently, the American obesity Association recommends at least 150 min of moderate activity per week to decrease the body weight. We performed a 6-weeks course of aerobic exercises and examined whether physical activity influences rates of weight loss[13].

The result of the study agree with Cuninon and Lourenco (2005)[5] who found that diet and exercise produced a 20% weight loss than diet alone[21]. Also found that weight loss through diet only was not equated to energy expenditure through exercise.

The results agreed with those of John et al. (2003)[11] who suggested that significant weight loss was achieved through the combination of exercise and diet.

The result of this study also agreed with study of Maffiuletti et al. (2007)[15] who found that body mass reduction program diet and physical exercise significantly improved body composition, muscle function and motor performance in girls aged 12-17 years.

The result of this study agreed with study of Fatma, (2009)[6] who found that after the eight weeks of the step aerobic dance exercise program, significant different were found in the subject's, BMI, body composition parameters, waist, hip ratio, waist circumference, fat percentages.

The result of this study agreed with the result of Zhonqqu, (2010)[30] who found that the effect of diet and aerobic exercise is more obvious in the early stage of treatment for body weight and waist to hip ratio.

On the other hand the result of this study disagreed with study of Nassi et al. (2005)[18] who found that 12 weeks aerobic training improved insulin sensitivity in overweight and obese girls without change in body weight, percent body fat.

The result of this study also disagreed with the result of Gert-Jan et al. (2010)[7] who found that aerobic exercise did not affect 24-h energy expenditure and fat oxidation in obese after 12 week of moderate exercise.

Conclusion

On the basis of the data obtained in the present study, we conclude that aerobic exercises with the diet control have a great effect in decreasing body weight and waist hip ratio rather than diet control alone.

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الملخص العربي

تأثير التمرينات الهوائية على تقليل السمنة في الفتيات البدينات بعد البلوغ

أجريت الدراسة الحالية لمعرفة تأثير التمرينات الهوائية على تقليل السمنة في الفتيات بعد البلوغ. وقد شارك في هذه الدراسة ستون فتاة تعانين من السمنة من الدرجة الثانية من مستشفى القصر العيني – كلية الطب – جامعة القاهرة . تراوحت أعمارهن بين 13-19 عام وتراوح مؤشر كتلة الجسم ما بين 30-35 كجم/م^2 . تم تقسيمهم إلى مجموعتين متساويتين في العدد. المجموعة الأولى (أ) وتحتوى على ثلاثين فتاة ، تم علاجهن باستخدام نظام غذائي قليل السعرات الحرارية 1200 سعر حراري فقط لمدة ستة أسابيع . المجموعة الثانية (ب) وتحتوى على ثلاثين فتاة ، تم علاجهن باستخدام نظام غذائي قليل السعرات الحرارية 1200 سعر حراري بالإضافة إلى التمرينات الهوائية باستخدام المشاية الكهربائية لمدة ستة أسابيع يوم بعد الآخر لمدة 45 دقيقة بمعدل (70% من أقصى معدل ضربات القلب) . تم تقييم وزن الجسم ، مؤشر كتلة الجسم ، محيط الوسط والنسبة بين محيط الوسط إلى محيط الحوض قبل و بعد البرنامج العلاجي . وأوضحت نتائج الدراسة نقص ذات دلالة إحصائية عالية في المجموعتين في كلاً من وزن الجسم، مؤشر كتلة الجسم، محيط الوسط والنسبة بين محيط الوسط إلي محيط الحوض($P<0.01$) . وعند مقارنة نتائج المجموعتين : أوضحت النتائج أن المجموعة (ب) التي تم علاجهن باستخدام نظام غذائي قليل السعرات الحرارية بالإضافة إلى التمرينات الهوائية نقصت أكثر في كلاً من وزن الجسم ، مؤشر كتلة الجسم ، محيط الوسط والنسبة بين محيط الوسط إلي محيط الحوض . وذلك لوجود فروق ذات دلالة إحصائية بعد العلاج بين المجموعتين حيث أن الفروق الإحصائية كانت كالتالي وزن الجسم (2.7) ، مؤشر كتلة الجسم (1.21) ، محيط الوسط (5.53) والنسبة بين محيط الوسط إلي محيط الحوض (0.03) وهكذا يمكن أن نستخلص أن التمارين الهوائية ذات كفاءة عالية في تقليل السمنة في الفتيات بعد البلوغ .

الكلمات الدالة : التمرينات الهوائية ، السمنة ، البلوغ ، مؤشر كتلة الجسم ، محيط الوسط ، ونسبة محيط الوسط إلى محيط الحوض .