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EFFECTS OF THE EXERCISE AND DIET PROGRAMS ON BODY MASS INDEX AND FASTING BLOOD GLUCOSE LEVEL IN OVERWEIGHT AND OBESE SUBJECTS

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ABSTRACT

Background: Being overweight is a risk factor in developing many chronic diseases, and globally, the frequency of obesity rapidly increases. Our study aims to investigate the effects of an exercise program on Body Mass Index (BMI) and fasting blood glucose (FBG) level in overweight and obese subjects who have a diet program.

Methods: 61 overweight and obese women subjects were included in this study. The subjects were randomly divided into two groups. The Control Group (CG) was included 32 women and received only a diet program. And, Experimental Group (EG) was included 29 women and received both diet and exercise program. A dietitian recorded weight, height, and BMI, and fasting blood glucose levels were recorded by blood test asking from subjects before and after program.

Results: There was statistically significant decrease in BMI in both groups ($p < 0.05$). When the CG and the EG group were compared, there was more decrease in the EG group. Fasting blood glucose level decreased statistically significantly in the exercise and diet groups ($p < 0.05$). When the mean changes between the groups were compared, the difference in the FBG level in the exercise and diet groups was not statistically found even though it was higher than the dietary group.

Conclusion: The 6-week exercise program which was applied in addition to diet programs for overweight and obese people led to improvement in BMI and FBG level, we think that a multidisciplinary team should follow these people.

Keywords: BMI, Diet, Exercise, Fasting Blood Glucose Level, Obesity, Overweight.

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INTRODUCTION

One of the current public health problems is being overweight due to the urban lifestyle. Although being overweight may be a risk factor to develop chronic diseases as diabetes mellitus, hypertension, and some cancers, globally the frequency of obesity is rapidly growing with the closer relationship with sedentary life and poor nutrition habits [1].

Body Mass Index (BMI) is a measurement of being overweight to detect the extent. Classification of obesity, according to the World Health Organization (WHO): BMI between 25 and 29.9 as overweight and BMI 30 or greater than 30 as obesity [2]. In the literature, it has been reported one of the effective strategies to cope with obesity may be having a regular nutrition program. Reduction in energy intake with a structured diet program may affect positively the weight loss and negative energy balance. Low carbohydrate diets and low calorie and fat-restricted diets are the most preferred diet programs to promote weight loss.

Moreover, it is reported that glucose metabolism and insulin action may significantly influence weight loss in overweight and obese people [5,6]. Though studies included short-term regular diet intervention recommended that a diet program with low carbohydrate can be a most efficient method in overweight and obese people to lose weight, there is a limited study comparing the long-term effects of two different nutrition programs [7]. Another effective strategy for obesity may be a regular aerobic exercise which can significantly increase glucose tolerance [3], reduce fasting and postprandial glucose [4], reduce fasting insulin in overweight and obese individuals since energy expenditure may be influenced by physical activity [8].

Public health guidelines recommend physical activity [9], which can be easy to reach, limited time allocated to many sedentary individuals. Recent studies put forward that regular exercise programs combined with dietary modification may be an effective intervention to increase the weight loss for overweight and obese adults [10,11]. Moreover, it is believed that the combination of regular exercise and diet program may increase the adherence of individuals both in nutrition and exercise programs [12]. It has been showed that regular exercise programs were associated with better results in terms of weight control and ischemic heart disease risk factors rather than applying for only diet program [13]. Furthermore, 60 minutes of regular physical exercise in a day with the improvement of diet may also protect from cardiovascular disease for obese people, in addition to the healthier lifestyle leads to weight loss [14].

The programs including both diet and exercise could speed upper serve fat-free mass, body fat loss, and prevent or increase in Resting Metabolic Rate more expeditiously than with only diet program. Ross at all suggested that additional physical activity in the diet is associated with healthy weight loss, total fat, and abdominal fat [15].

Resistance training is a form of exercise that may be considered as a novel and useful exercise type in weight de-

crease interventions. Structured strengthening training programs has been indicated to raise fat-free mass, resulting in enhanced resting energy expenditure [16]. Although there are several studies investigating the effects of resistance training have been completed, the current data could not introduce the resistance training alone or with endurance training and dietary intervention to enhance weight loss [17].

Pilates is a strengthening exercise that targets the core stability of the body, including the deeper abdominal muscles (respiratory and pelvic diaphragms, lumbar multifidus, transversus abdominis) [18]. Pilates also increases flexibility and balance and correct the posture [19]. The purpose of the additional exercise in the diet program was to investigate the Pilates exercises effects on BMI and FBG level on individuals with high BMI values.

METHODS

This study was performed in Besin Atölyesi Nutrition and Diet Clinic, 61 in overweight and obese people in our study during January 2017- May 2017. The subjects were divided into two groups randomly. CG received diet program (n=32), and EG received diet and exercise program (n=29). The age, height, weight, BMI, and FBG levels were recorded before and after the programs.

Control group received a diet program for one month regulated by Dietitian according to each subject. The experimental group received a diet program by Dietitian and exercise program, two days in a week for 60 minutes in a day during one month by a certified Pilates coach. The exercise program included 10 minutes warm-up, 40 minutes exercise, and 10 minutes cool down by working total body. Pilates exercise method works eccentric contraction and also stretching all the muscles and improves the core stabilization.

Body composition parameters measurements were recorded using by Tanita MC 780. A blood test was asked from the subjects for fasting blood glucose levels.

RESULTS

In our research, Version 22.0 of Statistical Package for Social Sciences (SPSS) program was used. The acceptance of significance level was $p \leq 0,05$. Descriptive statics, mean \pm , standard deviation ($X \pm SD$) or percentages (%), were gathered. Paired Sample t-test and Independent t-test were used to compute the compartment the values between before and after exercises.

The average height was $1,64 \pm 0,07$ m (EG: $1,64 \pm 0,06$ m, CG: $1,64 \pm 0,09$ m). The average weight was $79,33 \pm 14,59$ kg (EG: $81,58 \pm 15,89$ kg, CG: $77,30 \pm 13,24$ kg). The average of BMI was $29,51 \pm 5,30$ kg/m² - Overweight (EG: $30,33 \pm 6,15$ kg/m² -Obesity, CG: $28,76 \pm 4,37$ kg/m² -Overweight) (Table 1).

Table 1: Distribution of average Age, Height, Weight, and BMI Values of the people.

	Mean ± SD	Mean ± SD	Mean ± SD
	Experimental Group (n=29)	Control Group (n=32)	Total (n=61)
Age (yr)	35,27±9,32	34±9,09	34,61±9,15
Height (m)	1,64±0,06	1,64±0,09	1,64±0,07
Weight (kg)	81,58±15,89	77,30±13,24	79,33±14,59
BMI (kg/m ²)	30,33±6,15	28,76±4,37	29,51±5,30

As shown in Table 2, we found significant differences between pretest and posttest for BMI and fasting blood glucose levels in both groups ($p < 0.05$). Also, there are more differences between the pretest and posttest of the experimental group compared to the control group.

Table 2: Comparison of the statistical significance between groups in the pretest and posttest.

		Experimental Group			Control Group		
		Mean ± SD	t test	p value	Mean ± SD	t test	p value
BMI	Pretest	30.33±6.15	8.76	0.001*	28.76±4.37	6.29	0.001*
	Posttest	28.40±6.05			27.62±4.81		
Fasting Blood Glucose	Pretest	5.44±0.51	3.21	0.001*	5.33±0.53	3.27	0.001*
	Posttest	5.31±0.50			5.21±0.45		

As shown in Table 3, it indicates intergroup differences in BMI and fasting blood glucose levels. Besides we determined significant differences in the effect of exercise training for BMI intergroup differences ($p < 0.05$).

Table 3: Intergroup differences in BMI and Fasting Blood Glucose Levels of people.

	Experimental Group	Control Group	t test	p value
ΔBMI	-1.93±1.19	-1.14±1.03	2.78	0.007*
ΔFasting Blood Glucose	-3.51±5.02	-2.03±3.04	1.21	0.08

DISCUSSION

The study was conducted to observe the effects of exercise in addition to diet program on people, especially overweight and obese people. Diet and exercise could be performed as a modifier for many risk factors of various diseases. Combination of diet and exercise may also improve quality of life and general health status. Such programs come into prominence in overweight and obese persons. Many types of research described the relationship between weight loss and physical activity. In the study of Rice *et al.* (1999), it was demonstrated that weight loss induced by a combination of diet and aerobic resistance exercise program had effects on lowering fasting, and oral glucose challenge insulin values and these effects are greater than those of the program including diet alone [20]. Parallel to these results, we found

that the combination of an exercise program with the diet program could have positive impacts on fasting blood glucose level. However, the types of exercise are different as we used the pilates exercise program. A study of Hagner-Derengowska *et al.* (2015) showed that exercise training of Nordic Walking model might lead to both statistically and clinically significant differences in glucose and basic blood lipid levels when compared to subjects who did Pilates training and diet [21]. As a difference to the previous study, in our study, we used the pilates without comparison to any other types of exercise programs.

According to Çakmakçı (2012), pilates mat exercise program showed important decreasing in weight, fat percentage, BMI, body composition parameters, and quality of life [22]. Another study conducted by Kloubec (2010) showed a significant decrease in the mean of BMI as a result of the Pilates training program [23]. Slentz *et al.* (2004) found that different intensity of the exercise programs affects the weight loss, body composition changes, and the reduction in the abdominal waist circumference [24]. Despite the variety of the intensity of pilates and other programs, in the current study, we observed the effect of pilates program on BMI and fasting blood glucose level.

On the contrary, Ferreira *et al.* (2009) stated that the impact of a Pilates exercise program might not cause any statistically significant change on total body mass for sedentary women [25]. Pan *et al.* (1997) showed that only diet, only exercise, and diet plus exercise interventions led to similar changes in BMI and fasting blood glucose level in the long term follow up [26]. Snowling *et al.* (2006) indicated that any exercise training program could have similar effects on glucose control compared to dietary, drug, and insulin treatments [4].

As a result of this study, there was a statistically significant decrease in BMI and fasting blood glucose level in exercise and diet groups, which may reflect the importance of this program. Additionally, the combination of diet and exercise programs seems to be more effective. As a limitation of this study, different types of exercise programs did not include, so we suggest more research in this field.

CONCLUSION

Exercise and diet programs may play an essential role in decreasing BMI and fasting blood glucose level. And these two programs are inseparable and may be used as complementary programs.

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