

EFFECTS OF A LIFESTYLE PROGRAM ON RISKS FOR CARDIOVASCULAR DISEASE IN WOMEN

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SUMMARY

Objective: The aim of this study was to evaluate the effects of a weight reduction lifestyle program on risk factors for cardiovascular disease in women.

Materials and Methods: The present study was a pilot clinical trial designed to test the effects of a weight reduction lifestyle program on risk factors for cardiovascular disease in women. Obese and overweight women were recruited from April 2006 to November 2006. The data collected included age, body weight, body mass index (BMI), abdominal circumference, hip circumference, serum lipid profile, as well as levels of high-sensitivity C-reactive protein and homocysteine. The subjects underwent a 3-month lifestyle program, including diet education, balanced diet with caloric restriction of 1,200 kcal/day, aerobic exercise (1 hour) twice weekly and jogging for at least 10,000 steps daily. Physical examination and blood tests were performed at the beginning and at the end of the study.

Results: A total of 29 subjects were included in the present study. Significant reductions were observed in body weight, BMI, abdominal circumference, hip circumference, systolic blood pressure, diastolic blood pressure, fasting insulin, total cholesterol, low-density lipoprotein cholesterol, triglycerides and high-sensitivity C-reactive protein. No significant differences were observed in the levels of fasting sugar, high-density lipoprotein cholesterol or homocysteine.

Conclusion: An appropriate weight reduction lifestyle program may effectively reduce body weight and decrease most of the risk factors for cardiovascular disease. [*Taiwan J Obstet Gynecol* 2009;48(1):49-52]

Key Words: cardiovascular diseases, exercise, risk factors, Taiwan, weight loss

Introduction

Cardiovascular disease has a complex etiology, and there is no single cause. The risk of dying from complications arising from cardiovascular disease is higher in industrialized nations than in developing countries [1]. This is related in large part to the lifestyle of affluence. Rapid economic development has accompanied lifestyle changes during recent years in Taiwan, and

cardiovascular disease has become the second leading cause of death in women [2]. Traditionally, cardiovascular disease management strategies have focused on treating patients with the disease. However, it is now known that the disease process begins early in life. Thus, primary prevention is important for presymptomatic people.

Several biochemical markers have been identified as risk factors for cardiovascular disease, including elevated levels of serum low-density lipoprotein cholesterol (LDL-C), total cholesterol, triglycerides (TG), homocysteine (Hcy), high-sensitivity C-reactive protein (hsCRP) and insulin, as well as reduced levels of high-density lipoprotein cholesterol (HDL-C). Obesity is associated with an adverse effect on each of these risk factors and increases the risk of cardiovascular disease.



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Thus, weight loss generally results in beneficial effects on many risk factors. However, there is limited data about the beneficial effects of weight loss in Taiwanese women.

The primary purpose of this study was to examine the effects of a weight reduction lifestyle program on risk factors for cardiovascular disease in women.

Materials and Methods

The present study was a pilot clinical trial designed to test the effects of a weight reduction lifestyle program on the risk factors for cardiovascular disease in women.

Participants and protocol

Obese and overweight women were recruited from April 2006 to November 2006 at the women's weight control clinic in the Taiwan Adventist Hospital. The study was approved by the institutional research board. The subjects underwent medical evaluations designed to identify contraindications to diet, exercise, or both, including history of myocardial infarction, cerebrovascular, kidney or liver disease, as well as cancer, diabetes mellitus, pregnancy and the use of medications known to affect weight or energy expenditure.

The subjects underwent a 3-month lifestyle program, which consisted of diet education, compliance to a balanced diet with a caloric restriction of 1,200 kcal/day, 1 hour of aerobic exercise twice weekly, and jogging for at least 10,000 steps daily.

Physical examinations and blood tests were performed at the beginning and at the end of the study. The data collected included age, body weight (BW), body height (BH), abdominal circumference (AC), hip circumference (HC), body mass index (BMI; BW in kilograms divided by the square of height in meters), systolic blood pressure (SBP), diastolic blood pressure (DBP), serum levels of hsCRP, fasting glucose levels, fasting insulin levels, LDL-C, HDL-C, TG and Hcy.

The measurements of anthropometric indices were carried out at the physical examination center in the Taiwan Adventist Hospital by an internist. Overweight was defined as BMI $> 24 \text{ kg/m}^2$ and $< 27 \text{ kg/m}^2$, and obesity as BMI $> 27 \text{ kg/m}^2$.

Laboratory measurements

Blood samples were obtained after an overnight fasting period of 8 hours. Levels of fasting blood glucose, TG, HDL-C and LDL-C were measured using commercial kits on an automatic analyzer (Synchron CX9; Beckman Coulter Co., Fullerton, CA, USA). Insulin levels were also determined using commercial kits on

an automated analyzer (Access Immunoassay System; Beckman Coulter Co.). HsCRP concentrations were measured using a solid-phase, chemiluminescent immuno-metric assay (Immulite 2000; Diagnostic Product Corp., Los Angeles, CA, USA) with a sensitivity of 0.01 mg/dL.

Statistical analysis

All data are presented as means and standard deviations. Comparisons between the pre-program and post-program data were performed using the paired *t* test. The level of significance was set at $p < 0.05$.

Results

A total of 29 subjects with a mean age of 44.3 ± 10.5 years, weight of $77.8 \pm 11.7 \text{ kg}$, height of $156.5 \pm 5.4 \text{ cm}$, and BMI of 31.8 ± 4.1 completed the 3-month program. The effects of the program on cardiovascular disease risk factors in women are shown in the Table.

Anthropometric and physical characteristics

BW, BMI, AC, HC and hsCRP were significantly reduced following 3 months of diet control and exercise. The intervention also significantly lowered SBP and DBP. There were no significant differences in Hcy.

Blood lipoproteins

Three months of diet control and exercise induced weight loss which resulted in significant reductions in total cholesterol, TG and LDL-C. Lipid profile parameters changed as follows: total cholesterol decreased 11.31%, LDL-C decreased 11.41%, and TG decreased 24.60%. HDL-C was not significantly altered by the interventions.

Glucose homeostasis

Twenty-four percent (7/29) of subjects had baseline fasting insulin concentrations above 10.0 IU/mL (range, 1.2–28.4 IU/mL). Four patients (13.8%) had insulin resistance with homeostasis model assessment (HOMA) ≥ 3.8 . Fasting insulin (8.2 ± 7.0 vs. $6.3 \pm 4.5 \text{ IU/mL}$) was significantly reduced from baseline after weight loss. AC, fasting sugar and HOMA (2.04 ± 1.87 vs. 1.53 ± 1.12) were not significantly reduced after participation in the weight loss program.

Discussion

During the past two decades, women in Taiwan have adopted a Western lifestyle. Consumption of high-fat

Table. Anthropometric indices and risk factors before and after the lifestyle program*

	Pre-program	Post-program	<i>p</i>	Change (%)
Age (yr)	44.3 ± 10.5			
Body height (cm)	156.5 ± 5.4			
Body weight (kg)	77.8 ± 11.7	73.6 ± 10.6	<0.001	-5.35
BMI (kg/m ²)	31.8 ± 4.1	30.1 ± 4.0	<0.001	-5.35
AC (cm)	38.3 ± 4.5	36.3 ± 4.2	<0.001	-5.22
HC (cm)	43.7 ± 3.3	42.0 ± 3.1	<0.001	-3.89
SBP (mmHg)	128.3 ± 17.2	122.2 ± 14.7	0.003	-4.75
DBP (mmHg)	77.8 ± 11.0	74.6 ± 11.8	0.02	-4.11
Fasting sugar (mg/dL)	97.0 ± 9.8	96.3 ± 9.3	0.32	-0.722
Fasting insulin (IU/mL)	8.2 ± 7.0	6.3 ± 4.5	0.046	-23.17
Total cholesterol (mg/dL)	210.4 ± 42.1	186.6 ± 32.7	<0.001	-11.31
HDL-C (mg/dL)	48.0 ± 8.4	46.5 ± 8.6	0.16	-3.13
LDL-C (mg/dL)	134.1 ± 35.6	118.8 ± 28.8	<0.001	-11.4
Triglyceride (mg/dL)	141.5 ± 58.7	106.7 ± 53.0	<0.001	-24.59
Hs-CRP (mg/dL)	0.43 ± 3.02	0.29 ± 0.04	0.003	-32.56
Homocysteine (mg/dL)	14.0 ± 3.8	14.9 ± 2.8	0.09	6.43
HOMA	2.04 ± 1.87	1.53 ± 1.12	0.21	-33.33

*Data are presented as mean ± standard deviation. BMI = body mass index; AC = abdominal circumference; HC = hip circumference; SBP = systolic blood pressure; DBP = diastolic blood pressure; HDL-C = high-density lipoprotein cholesterol; LDL-C = low-density lipoprotein cholesterol; Hs-CRP = high-sensitivity C-reactive protein; HOMA = homeostasis model assessment.

foods and decreased physical activity can easily cause women to become obese. It is now recognized that obesity is associated with increased risk of cardiovascular disease. Specifically, an increase in abdominal fat has been related to hyperinsulinemia, dyslipidemia and cardiovascular disease.

There have been numerous studies conducted to identify the risk factors for cardiovascular disease. These risk factors can be divided into those that can be modified and those that cannot. Non-modifiable risk factors include age, gender, and certain genetic mutations. The modifiable risk factors include BMI, exercise, high blood pressure, dyslipidemia, and insulin resistance [1].

After reviewing the literature, our findings here of the risk factors for cardiovascular disease in Taiwan are generally consistent with the findings in the West [2]. Sedentary lifestyle, low HDL-C, and high LDL-C and TG contribute to the risk of coronary heart disease. During the past three decades, numerous studies have demonstrated that lifestyle intervention results in the improvement in blood lipid profiles and BMI [3]. However, there have been few studies on women in Taiwan. The present study is the first to report the efficiency of a weight loss lifestyle program in improving women's health in Taiwan. Participants were studied before and after weight loss, which allowed us to assess the magnitude of change in cardiovascular disease risk factors in response to a 3-month lifestyle program.

After the treatment period, we found significantly decreased BW. This is predicted to improve health,

since accumulation of fat in the abdominal region is associated with a variety of metabolic diseases. SBP and DBP decreased significantly after the 3-month treatment period. Again, our current findings are in agreement with most published results [3,4].

Significant reductions in TG, total cholesterol and LDL-C were observed after participation in the lifestyle program. These findings are consistent with other published results [5,6]. As for the so-called "good" lipoprotein HDL-C, it was decreased 3% from baseline. However, we do not believe that a reduction in the HDL-C level is a cause for concern. The reasons are as follows: a meta-analysis stated that HDL-C levels decreased during weight loss, but increased by 0.009 mmol/L for every kilogram reduction in BW once patients reached a stable, reduced BW [7]. Another meta-analysis stated that the average net increase in HDL-C levels using exercise itself was modest but highly significant [8].

In addition to the lipid profiles, baseline hsCRP concentration was shown to be an independent risk factor for cardiovascular disease among apparently healthy middle-aged women [9,10]. The results of our study showed that serum levels of hsCRP decreased after diet control and aerobic exercise.

Another cardiovascular disease risk factor, Hcy, is believed to be increased after weight loss, which may be the result of inadequate intake of folic acid [11,12]. The weight loss program in our study did not significantly affect serum Hcy. This might be because of the balanced diet in our study. Therefore, emphasis on foods

rich in folic acid may be an important component of a weight loss program to prevent an increase in Hcy [13].

In addition to traditional risk factors, epidemiologic studies have suggested an increased risk of cardiovascular disease in individuals with impaired glucose tolerance and insulin resistance [14]. Fasting insulin concentration was reduced in participants in our program; however, fasting glucose and insulin resistance (sensitivity) were not significantly altered. On the contrary, findings from other studies showed improvements in insulin sensitivity [15,16]. A possible explanation for this discrepancy might be the total exercise duration (120 minutes/week vs. ~170 minutes/week) and program period (3 months vs. 4–6 months).

However, several potential limitations affect the interpretation of the results. The most important is the relatively small sample size and lack of a control group. Second, the duration of follow-up was short. We did not have results from different treatment periods to compare the differences between programs of different durations. Without the long-term cardiovascular disease risk factor evaluation, we do not know how long the “good effect” will last. In addition, there have been few baseline hsCRP evaluations in Taiwanese women [17]. We need more subjects and a long-term follow-up to confirm the beneficial effects of this program.

In conclusion, this pilot study indicated that a weight reduction lifestyle program improves most risk factors of cardiovascular disease in women. It provides a practical approach to prevent cardiovascular events in women.

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