

بررسی اثر هشت هفته تمرین هوازی همراه با مصرف آب پرتقال بر غلظت آنزیم های کبدی و قند خون ناشتا سرم در زنان میانسال دارای اضافه وزن

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چکیده

اضافه وزن و چاقی، از مهمترین نگرانی های بهداشت عمومی هستند که با پیامدهای متعدد سلامت منفی ارتباط دارند. فعالیت بدنی یک رفتار شیوه زندگی مهم است که به تنظیم وزن بدن کمک می کند. به منظور کاهش خطر ابتلا به دیابت، بیماری های قلبی عروقی و سرطان، مردان و زنان میانسال در حال حاضر توصیه می شود که وزن بدن سالم، اجتناب از اضافه وزن و چاقی و سطح پروفایل لیپیدی مناسب سرم را حفظ کنند. علاوه بر این طی مطالعات انجام شده تاثیر مصرف آب پرتقال بر بهبود پروفایل لیپیدی و شاخص سندروم متابولیک دیده شده است. لذا هدف از تحقیق حاضر تأثیر ۸ هفته تمرین هوازی همراه با مصرف آب پرتقال بر غلظت آنزیم های کبدی و قند خون ناشتا سرم در زنان میانسال (۳۰-۵۹ سال) دارای اضافه وزن می باشد.

روش کار: این مطالعه که به صورت Clinical Trial Double Blind بر روی ۶۰ نفر از زنان دارای اضافه وزن با توده بدنی بالای ۲۸ بین سنین ۳۰ تا ۵۹ سال مراجعه کننده به مرکز بهداشت کن، به صورت داوطلبانه صورت گرفت. به صورت تصادفی به ۴ گروه ۱۵ نفر به ترتیب (تمرین) (تمرین + مکمل آب پرتقال) (مکمل آب پرتقال) و (کنترل) تقسیم بندی شدند. در ابتدا و انتهای مطالعه خون گیری بعد از ۱۲ ساعت ناشتایی انجام گرفت. دریافت مکمل و تمرین روز بعد از خون گیری شروع شد، گروه های مکمل به میزان ۵۰۰ سی سی آب پرتقال در روز تمرین به مدت ۸ هفته و سه بار در هفته دریافت کردند، گروه کنترل در هیچ برنامه تمرینی شرکت نداشتند. پروتکل تمرین استقامتی روی تردمیل به صورت دویدن و راه رفتن به مدت هشت هفته و سه جلسه در هفته با شدت ۴۵ تا ۹۸ درصد ضربان قلب بیشینه اجرا شد. مدت زمان جلسات تمرین از ۲۸ تا ۳۸ دقیقه ادامه

داشته و قبل و بعد از هر جلسه تمرینی به ترتیب ۱۸ و ۷ دقیقه گرم کردن و سرد کردن انجام شد. تمامی داده ها به منظور آنالیز آماری وارد SPSS نسخه ۲۴ شدند.

یافته ها: یافته های حاصل از این پژوهش نشان داد که هشت هفته تمرین هوازی همراه با آب پرتقال بر سطوح آلانین آمینوترانسفراز (ALT)، آسپاراتات آمینوترانسفراز (AST) و قند خون ناشتا در زنان میانسال دارای اضافه وزن تاثیر معناداری ندارد. اما هشت هفته تمرین هوازی به تنهایی و مصرف آب پرتقال به تنهایی سبب کاهش معناداری در سطح سرمی آلکالین فسفاتاز (ALP) در زنان میانسال دارای اضافه وزن گردید ($p < 0.05$).

نتیجه گیری: نتایج پژوهش حاضر نشان داد که هشت هفته تمرین هوازی با یا بدون مصرف آب پرتقال تاثیر معناداری بر سطوح قند خون ناشتا و آنزیم های کبدی به جز ALP ندارد.

واژگان کلیدی: تمرین هوازی، آب پرتقال، آنزیم های کبدی، قند خون ناشتا، زنان میانسال

The effect of eight weeks of aerobic exercise with orange juice consumption on liver enzymes and fasting blood glucose in overweight middle-aged women

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Abstract

Introduction: Overweight and obesity are among the most important public health concerns associated with multiple negative health outcomes. Physical activity is an important lifestyle behavior that helps to regulate body weight. ALSO, Physical activity reduce the risk of diabetes, cardiovascular disease and cancer, middle-aged men and women are now recommended to maintain a healthy body weight, avoid overweight and obesity, and maintain a good serum lipid profile. In addition, studies have shown the effect of orange juice consumption on improving lipid profile and metabolic syndrome index. The aim of the present study was to investigate the effect of 8 weeks of aerobic training combined with orange juice consumption on the concentration of liver enzymes and fasting blood sugar in overweight middle-aged women (30-59 years).

Methods: This study was performed as a voluntary clinical trial on 60 overweight women (BMI \geq 28) age between 30 and 59 years from the Kan Health Center. Randomly divided into 4 groups (n = 15) (exercise) (exercise + orange juice) (orange juice) and (control) respectively. At the beginning and the end of the study, blood samples were taken after 12

hours fasting. Supplementation and Exercise The day after blood sampling, the supplemented groups received 500 ml of orange juice daily for 8 weeks and three with weekly, the control group did not participate in any training program. The endurance training protocol was performed on treadmill running and walking for eight weeks and three sessions per week with intensity of 45 to 98% of maximum heart rate. Training sessions lasted from 28 to 38 minutes and were warmed and cooled for 18 and 7 minutes, respectively, before and after each training session. All data were entered into SPSS version 24 for statistical analysis.

Results: The results of this study showed that eight weeks of aerobic training with orange juice had no significant effect on the levels of alanine aminotransferase (ALT), aspartate aminotransferase (AST) and fasting blood sugar in overweight middle-aged women. But eight weeks of aerobic training alone and consumption of orange juice alone significantly decreased serum alkaline phosphatase (ALP) levels in overweight middle-aged women ($p < 0.05$).

Conclusion: The results of this study showed that eight weeks of aerobic training with or without orange juice intake had no significant effect on fasting blood glucose and liver enzymes except ALP.

Keywords: aerobic exercise, orange juice, liver enzymes, fasting blood sugar, middle-aged women

Introduction

Overweight and obesity are among the most important public health concerns associated with multiple negative health outcomes. Physical activity is an important lifestyle behavior that helps to regulate body weight. (Jackie et al., 2018). Obesity and overweight have been recognized as the fifth leading cause of death in the world. At least 2.8 million adults die from overweight and obesity worldwide each year. To reduce the risk of diabetes, cardiovascular disease and cancer, middle-aged men and women are now recommended to lose weight. Maintain a healthy body, avoid overweight and obesity, and maintain good cholesterol levels. Strategies for achieving these goals include a balanced diet and a

regular physical activity plan. Fruits and vegetables are an important part of a balanced and nutritious diet because they not only provide a wide assortment of vitamins, minerals and phytochemicals, but they also have fewer calories than other foods (Aptekman et al., 2010).

Weight loss and obesity in adults are associated with overweight and obesity. In contrast, regular sub-maximal aerobic exercise such as walking, slow running, cycling or exercising in the morning, as a supplement. Non-pharmacological agents are known to reduce the incidence of these diseases. Various studies have shown the positive role of different patterns of physical activity in lowering blood lipids such as triglyceride (TG), total cholesterol; TC, and low-density lipoprotein (Low). -density lipoprotein cholesterol; LDL-C), increased high-density lipoprotein (HDL-C) and decreased resistance Has shown insulin (Insulin Resistance; IR). The role of light and moderate physical activity in reducing cardiovascular disease, as well as prevention of type 2 diabetes and metabolic syndrome has been reported. Also, endurance training can greatly reduce metabolic risk factors in cardiovascular disease.

The positive effect of orange juice could be related to minor components - especially flavonoids, which have been suggested to exert LDL oxidation through platelet aggregation and Vit C and β -carotene, which mainly act as antioxidants. Despite the beneficial effects of resistance exercise on the health of individuals, direct and indirect evidence suggests that high workload resistance activities are likely to increase the production of free radicals beyond the capacity of anti-ischemic injury and stress and mechanical stress. Oxidation of cells results in oxidative stress in muscles and other active tissues of the body. Therefore, identifying and presenting appropriate strategies that can prevent the production of oxidative stress indicators and its negative consequences, including muscle injury during intense physical activity, can have important applications. One of these strategies is nutritional interventions and

dietary antioxidant supplementation that has a protective effect against oxidative stress induced by exercise (Khosravi et al., 2018). Flavonoids in orange juice are one of the most common causes of 100% orange juice consumption in the United States and contribute to the observed decrease in serum total cholesterol concentrations measured in epidemiological studies. Orange juice intake along with a proper diet and physical activity may affect blood lipid profile, liver enzymes, blood glucose and insulin levels, as well as effects on body composition in overweight and obese individuals (Alam et al., 2014).

Previous epidemiological studies have also shown that excessive consumption of fruits and vegetables is associated with a reduced risk of cardiovascular disease. Its positive effect could be related to minor components, in particular flavonoids, which have been suggested to inhibit LDL oxidation and the accumulation of platelets and vitamins C, E and β -carotene, which mainly act as antioxidants. It has been reported that high levels of folic acid and natural folate in citrus fruits and green leafy vegetables also decrease total plasma homocysteine and methionine metabolism as a risk factor for cardiovascular disease. Citrus juices, especially orange juice and grapefruit juice, are rich sources of flavonoids, folate and vitamin C, but their role in cardiovascular health has not been fully investigated (Kruska, 2000).

Antioxidant, low calorie and high fiber content of fruits and vegetables is one of the main advantages of this fruit. In this study, we selected orange juice extract in addition to a controlled diet. However, changes in dietary energy consumed with orange juice reduce body mass index in overweight and obese individuals with high lipid profile and high blood sugar (Doridge et al., 2006). Therefore, since an active lifestyle reduces the risk factors for cardiovascular and metabolic diseases, and given the increased risk of these diseases in middle age, The purpose of this study was to

investigate the effect of eight weeks of aerobic training with orange juice on liver enzymes and fasting blood sugar levels in overweight middle-aged women.

Methods

The study, conducted as a Clinical Trial Double Blind study on 60 overweight women over 28 years of age between 30 and 59 years who attended a health center training session at the Shahid Haj Sha'ban Ali Sports Complex in the Kenyan region, It was done voluntarily and after obtaining written consent. Subjects completed a general health endorsement questionnaire in response to a call at the Ken Health Center and 60 were selected after being approved by a physician. Subjects were randomly divided into 4 groups (n = 15) (Exercise + orange juice supplement) (orange juice supplement) and (control) randomly divided into 4 groups. At the beginning of the study, subjects were asked to avoid supplements and other medications that may interfere with the program (eg, antioxidant supplements, especially vitamin C supplements).

Supplementation and Exercise The day after blood sampling, the supplemented groups received 500 ml of orange juice daily for 8 weeks and three with weekly, the control group did not participate in any training program.

Blood sampling was performed in both pre-test and post-test stages by an expert in laboratory science. Subjects were asked to attend the laboratory after 12 hours of nocturnal fasting. Subjects were asked to refrain from heavy exercise two days before the pre-test blood sampling and to have adequate rest the night before blood sampling. Subjects rested for 30 minutes after being in the laboratory, then 5 cc of blood was collected from the braided vein. Blood samples were taken between 9 am and 10 am.

All measurements were performed at the same temperature, humidity, ventilation, and ambient light. After blood sampling,

blood samples were centrifuged at 3000 rpm for 10 min and the plasma was separated from the red blood cells at 70 ° C. The samples were kept until testing. The ALT, AST, and ALP values of FBS were measured using the Antigene Co assay kit and enzymatic assay with the BT3500 auto analyzer.

Exercise program:

Aerobic exercise protocol was also performed for 8 weeks and 3 sessions per week. A treadmill exercise was performed to determine the appropriate exercise intensity, for example: (70% maximal heart rate prediction (HRmax), [age - 0.7% [220). During the initial treadmill exercise, participants were allowed to choose a fast and slow walk by themselves that was maintained during the test. The endurance training program will run on treadmill for eight weeks and three sessions per week. The intensity of exercise in the first two weeks will be 65%, the second two weeks 70, the third two weeks 75 and the last two weeks 80% of maximum heart rate, which will be controlled by the Polar Pacemaker. The duration of training session sessions will also increase from 20 minutes in the first week to 40 minutes in the final week and will warm up and cool down 10 and 7 minutes, respectively, before and after each training session (Fisher et al., 2011). During each session, the participants' heart rate was monitored using a heart rate monitor and recorded every 10 minutes to maintain the intensity of their target exercise. All exercises were supervised by the research assistant. The control group participants did not perform any physical activity during the study period (Ke et al., 2017).

North Thomson Orange Juice Extract: Juice preparation The fruits were thoroughly washed with water. Fruit juices were extracted by cutting the fruit in half and carefully compressing them to extract the juice. The collected juice was filtered through 4-layer chitosan and pure juice was collected in clean containers. Estimated amount of ascorbic acid Ascorbic acid content in juices was estimated by

volumetric method. 5 ml standard ascorbic acid (100 μg / ml) was removed in a 10 ml mixture containing 4% oxalic acid in 2,6-dichlorophyll and endophenol titanium. The appearance and durability of the pink was obtained as an end point. The amount of dye used (V_1 mL) is equivalent to ascorbic acid. 5 ml of sample (prepared by consuming 5 g of water in 100 ml of 4% oxalic acid) was measured in a conical flask containing 10 ml of 4% oxalic acid in color (V_2 ml). The amount of ascorbic acid was calculated using the following formula: Ascorbic acid (mg / 100 g) = (0.5 mg / V_1 mL) \times (V_2 / 15 mL) \times (100 mL / Wt. Of sample) \times 100

Estimation of total phenolic content Phenol content in juices was estimated by Folin-Siocalto method. 0.5 ml of each juice was mixed with 2.5 ml of distilled water. To this end, 0.5 ml of the F-C reagent (1: 1) was added and incubated for 3 min. For each tube, 2 ml of 20% sodium carbonate was added and the tubes were kept in boiling water bath for 1 minute. The tubes were cooled and the reaction mixture absorbance was read at 650 nm. The standard curve was designed using different concentrations of gallic acid (standard, 0-1000 μg / ml). Total phenolic content was calculated as μg of gallic acid equivalent (GAE) / mL of juice. Research data analysis After in vitro analysis, quantitative data analysis was performed using central scattering indices such as mean and standard deviation. First, the Shapirovilk test was used to ensure that the data distribution was normal, and since the results showed that the data distribution was normal, parametric tests were used. Covariance analysis (Ancova) was used to compare inter-group differences (between control, orange juice, exercise and exercise + orange juice). Bonferroni post hoc test was used if there were significant differences between groups. In addition, a significance level ($p < 0.05$) was considered for testing the hypotheses and deciding whether to accept or reject the hypotheses, and if p was less than five hundred, the changes were

considered significant. . All statistical methods were performed using SPSS 24 software.

Results

Table 1 presents the results of liver enzymes and fasting blood glucose in the control, exercise, orange juice and exercise + orange juice groups in two pre-test and post-test stages, with mean میانگین standard deviation.

Table 1: Levels and values of research variables as mean \pm standard deviation at before and after test

| group variables | Control group | Exercise group | orange juice group | exercise + orange juice group | P Value * | |
|-----------------|---------------|------------------|--------------------|-------------------------------|------------------|-------|
| ALT (IU/L) | before | 15/60 \pm 1/09 | 15/10 \pm 7/59 | 15/60 \pm 7/19 | 12/70 \pm 3/23 | 0/639 |
| | after | 15/00 \pm 8/21 | 13/10 \pm 4/95 | 13/20 \pm 4/89 | 12/20 \pm 3/85 | |
| | P Value# | 0/756 | 0/122 | 0/220 | 0/685 | |
| AST (IU/L) | before | 21/30 \pm 9/12 | 18/60 \pm 6/50 | 19/80 \pm 5/26 | 17/40 \pm 4/37 | 0/513 |
| | after | 18/60 \pm 5/69 | 15/60 \pm 4/52 | 17/00 \pm 3/59 | 15/90 \pm 3/66 | |
| | P Value# | 0/138 | 0/121 | 0/123 | 0/086 | |
| ALP (IU/L) | before | 1/87 \pm 4/91 | 1/64 \pm 3/55 | 1/92 \pm 4/98 | 1/54 \pm 3/68 | 0/443 |
| | after | 1/56 \pm 1/86 | 1/48 \pm 3/97 | 1/58 \pm 7/07 | 1/37 \pm 3/05 | |
| | P Value# | 0/119 | 0/036 | 0/045 | 0/077 | |
| FBS (mg/dl) | before | 92/60 \pm 9/46 | 92/20 \pm 6/76 | 91/90 \pm 6/10 | 90/60 \pm 5/12 | 0/630 |
| | after | 94/70 \pm 1/01 | 92/90 \pm 7/99 | 91/80 \pm 4/23 | 89/60 \pm 4/03 | |
| | P Value# | 0/524 | 0/732 | 0/951 | 0/506 | |

#Paired Samples Test

*ANOVA

ALT: Alanine Aminotransferase, AST: Aspartate Aminotransferase, ALP: Alkaline Phosphatase ,FBS: Fasting Blood Sugar.

According to the results of Anova test for liver enzymes and fasting blood glucose levels after eight weeks of aerobic exercise showed that eight weeks of aerobic training with or without orange juice on liver enzymes and fasting blood sugar levels in overweight middle-aged women had a significant effect. (Table 1).

In addition, the decrease in ALP in the exercise group ($p = 0.036$) and orange juice ($p = 0.045$) was significant in comparison with the control and exercise + orange juice groups.

Discussion

Regular exercise is considered an integral part of the weight loss program. Studies on human and animal specimens have shown that regular exercise preferentially reduces visceral fat, which has been identified as a risk factor for cardiovascular disease (Schoonfeld et al., 2014). The pressure seems to be on Physiologically induced exercise is one of the potential regulators of energy expenditure that results in decreased body fat mass by increasing energy expenditure, affecting body fat percentage, and hormonal changes. In order to achieve these positive effects of exercise, an effective exercise program should include the intensity, duration, number of sessions, and type of exercise to put extra strain on the body parts and achieve adaptability. Ash (Pourabadi et al., 2013). Studies have reported the positive role of various exercise (aerobic, hybrid, and resistance) exercises on improving body composition by increasing pure body mass, weight loss, as well as reducing body mass and fat percentage. (2010) have shown that 16 weeks of resistance training in overweight men and women is associated with body weight loss, BMI, and body fat mass. Specific adaptations of exercise activity, depending on the type, may include Increasing body weight and pure body mass as a result of resistance training, fat loss as a result of endurance and aerobic exercise as well as achieving optimal body composition. (2010) also reported a significant decrease in body fat

percentage and body mass index after six weeks of aerobic exercise in overweight inactive women. Despite the improvement in body composition in Chaudery et al.'s (2010) study, their training duration (six weeks) was shorter than the current study (eight weeks), indicating a positive effect of exercise training after several weeks on improving body composition. Various studies have also shown that orange juice has an effect on liver enzymes concentration due to its antioxidants and polyphenols. A recent study by et al showed that consumption of orange juice in people with non-alcoholic fatty liver significantly reduced serum ALT and AST concentrations (Akhalsi, 2016).

Conclusion

The results of this study showed that eight weeks of aerobic training with or without orange juice intake had no significant effect on fasting blood glucose and liver enzymes except ALP.

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