Original Research Article

Effect of short term exercise on abdominal obesity and blood pressure

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Abstract

Introduction: obesity is associated with a variety of chronic diseases, including but not limited to coronary artery disease, hypertension, diabetes, and certain forms of cancer. The present study was designed to examine the effects of short-term exercise on markers of obesity. **Material and methods**: This was a randomized trial in 52 overweight and obese [body mass index (in kg/m2): 25–40; waist circumference >88 cm], women assigned to 16 week interventions of short term Exercise (3 d/wk) involved treadmill walking at an intensity of 45–50% (moderate-intensity) or 70–75% (vigorous-intensity) of heart rate reserve. The primary outcome was abdominal visceral fat volume determined by the measurement of waist and hip circumferences ratio. **Results:** Average height of the females under study is 159.96 cm and average weight of females before exercise is 68.92 kg, it shows that the females in our study are overweight. After exercise training program, weight, arm circumference, chest circumference, WHR and BMI decreased significantly (Z= 4.27,7.30 , 4.99, 8.51 and 3.27 respectively). Similarly systolic blood pressure and diastolic blood pressure (Z=5.74 and 1.75 respectively) was decreased significantly after exercise training. **Conclusion:** Short term exercise intervention can induce favourable changes in the body composition, but the magnitude of these changes is of limited biological significance.

Keywords: Exercise, Body mass index, Waist hip ratio

Introduction

Obesity is defined as the presence of excess adipose tissue. A person whose body weight is in excess of standard weight (calculated from BMI & Hip Waist Ratio) is termed as overweight [1].

The obesity epidemic in children and adolescents is well recognized and poses a major threat to the health and longevity of American children. Just as obesity in adults is associated with chronic diseases such as cardiovascular disease, type 2 diabetes, metabolic syndrome, and certain forms of cancer [2,3] some have suggested that the women of today may be the first generation not to outlive their parents due to the premature development of these obesity-related diseases [4]. In the context of epidemiological studies, body mass index (BMI, weight/height2) in adults is currently considered as a diagnostic test (separator variable) which is able to identify overweight (25 kg/m2) and obese (30 kg/m2) individuals and may predispose to increased CMD risk, morbidity and mortality [5,6] demonstrating interruption of sedentary time with brief moderate-intensity walking resulted in an improvement of short-term metabolic function in non-overweight people without increasing subsequent energy intake [7].

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Despite the difficulty in directly comparing studies because of the variety of environmental factors and defined end-points, systematic reviews consistently highlight that better and safer access to physical activity resources are directly related to increased leisure time physical activity in women, which subsequently decreases the risk of developing obesity [8-12].

So this study was undertaken to see the effect of short term exercise in abdominal obesity and blood pressure in women.

Material and Methods

The present randomised control study was carried out in the Department of physiology of tertiary care teaching hospital of the central India. Fifty two overweight and obese women were studied for short term exercise trial and its effect on reduction of obesity parameters.

Inclusion criteria: Women of age 25 to 45 years attending health center and living sedentary life style were included. To be eligible, participants were required to report no participation in regular structured exercise and that they did not do >30 min of moderate-intensity exercise, accumulated in 10 min bouts, on most days of the week.

Exclusion criteria: women were taking prior medications, Individuals who smoked, suffered from a condition known to interact with the study measures or took regular medication that may have interfered with the results were excluded from the study.

Methods: women aged 25 - 45 years who visited the outpatient clinics in a regional teaching hospital for evaluation of their obesity were screened. The risk factors were as follows: hypertension (defined as resting sitting blood pressure > 140/90 mmHg, or > 130/ 80 mmHg for diabetic participants), dyslipidemia (fasting blood lipid levels within 3 months prior to entering the study showed that total cholesterol > 200 mg/dl, LDL cholesterol > 129 mg/dl, HDL cholesterol < 50 mg/dl, or triglyceride > 150 mg/dl), type 2 diabetes (fasting blood glucose > 126 mg/dl) or obesity (body mass index (BMI) > 24 kg/m2 or waist to hip ratio > 0.82). Informed consent was obtained from each participant. Thereafter, the participants were assigned into exercise according to the availability to attend the treadmill exercise. They underwent treadmill training, 30 minutes each time and three times a week, for continuous 16 weeks. Each participant achieved 60-80% of maximum heart rate during the exercise. At the end of the 16 weeks, all participants were examined to obtain the data of fasting blood lipids and sugar, resting blood pressure, and body composition, including waist to-hip ratio and BMI. BMI was defined as weight (kg) divided by height square (m2). In brief, waist was measured at the narrowest part of the torso (above the umbilicus and below the xiphoid process); hip, at the maximal circumference of the hip or buttock region, whichever was larger (above the gluteal fold). Blood pressure was measured in a sitting position by a sphygmomanometer after resting for 5 minutes the average of two sequential measurements was entered into our records.

Exercise: Exercise testing and exercise training was conducted a TAKASUMA 830BL treadmill equipped with HP type 78351-T electrocardiogram to monitor heartbeat. Modified Bruce protocol was adopted for exercise testing. Target heart rate (THR) was calculated using Karvonen's method: Resting HR + 60%~80% (maximal HR-resting HR). Exercise training included warm-up with 1.7 mph, 0% grade for 5 minutes, then adjusting the level according to individual's target HR for 30 minutes on treadmill and cooling down 5 minutes. Participants' ST variation on electrocardiogram, blood pressure, and status quo before every switch on the grade of treadmill were carefully monitored.

Statistical analysis- All analyses were performed with the use of SAS software, version 9.1 and an α of 0.05 was used as the type I error rate. All analyses were conducted under the intent-to-treat model with intervention assignment based on the assigned intervention at time of randomization.

Baseline characteristics are reported as mean (±SD) and analysed by "Z" test. Simple bivariate correlation and regression analyses were performed to examine relations between mean changes in the primary and secondary outcomes with baseline values of these outcomes

Results

Average height of the females under study is 159.96 cm and average weight of females before exercise is 68.92 kg, it shows that the females in our study are overweight. After exercise training program, weight, arm circumference, chest circumference, WHR and BMI decreased significantly (Z= 4.27,7.30 , 4.99, 8.51 and 3.27 respectively). Similarly systolic blood pressure and diastolic blood pressure (Z=5.74 and 1.75 respectively) was decreased significantly after exercise training.

Table: 1: Comparison of variables before and after 16 weeks of exercise training program(Mean ± S.D)

Variable	Before exercise	After exercise	Significance "Z"
Weight(kg)	68.92 ± 9.74	60.75 ± 9.79	Significant
BMI(kg/m2)	26.73±3.99	24.17±3.99	Highly significant
WHR	0.93±0.051	0.84±0.056	Highly significant
Upper arm circumference (cm)	13.71±1.36	12.11±1.16	Highly significant
Chest circumference (cm)	38.01±2.66	35.63±2.84	Highly significant
Systolic BP(mm Hg)	118.76±4.62	113.53±4.67	Highly significant
Diastolic BP (mm Hg)	77.11±3.88	75.84±3.66	Highly significant

*Z > 2 SE, Significant; Z > 3SE, highly significant.

Discussion

Obesity is closely related to socioeconomic environment .In some societies lean and thin individuals are socially branded as undernourished and are encouraged to put on weight. Economic prosperity is usually associated with increased prevalence of obesity due to increased availability and consumption of tasty foods rich in sugar, fat and calories and decreased need for physical activity. Mainly obesity is problem of higher class and middle class women living sedentary life style.

Many intervention studies have investigated the effects of either dietary restriction [13-20] on metabolic and inflammatory outcomes. Improvements in systemic markers of low-grade inflammation often seem to increase with greater weight/fat loss [21]. There is strong scientific support for combining regular physical exercise with an energy restricted diet as the most effective treatment for obesity and in the management of type 2 diabetes [22].

Nicklas BJ [23] et al found that Average weight loss for the 95 women who completed the study was 12.1 kg (+/-4.5 kg) and was not significantly different across groups. Maximal oxygen uptake increased more in the CR + vigorous-intensity group than in either of the other groups ($P < 0.05$).

The CR-only group lost relatively more lean mass than did either exercise group ($P < 0.05$). All groups showed similar decreases in abdominal visceral fat (approximately 25%; $P < 0.001$ for all). However, changes in visceral fat were inversely related to increases in O (2) max ($P < 0.01$). Changes in lipids, fasting glucose or insulin, and 2-h glucose and insulin areas during the oral-glucose-tolerance test were similar across treatment groups. Davis CS et al [24] found that Average weight loss was approximately 0.2-0.8 kg per week. IER resulted in comparable weight loss to DER when overall energy restriction remained similar between diets. The majority of studies that reported body composition outcomes have shown equal efficacy for fat mass, fat-free mass and waist circumference, similar to our study.

Similarly Antoni R [25] found that The intermittent energy restriction (IER) approach to weight loss involves short periods of substantial (75-100 %) energy restriction (ER) interspersed with normal eating. This study aimed to characterise the early metabolic response to these varying degrees of ER, which occurs acutely and prior to weight loss. Ten (three female) healthy, overweight/ obese participants (36 (SEM 5) years; 29·0 (sem 1·1) kg/m2) took part in this acute three-way cross-over study. Participants completed three 1-d dietary interventions in a randomised order with a 1-week washout period: isoenergetic intake, partial 75 % ER and total 100 % ER. Fasting and postprandial (6-h) metabolic responses to a liquid test meal were assessed the following morning via serial blood sampling and indirect calorimetry. Food intake was also recorded for two subsequent days of ad libitum intake. Similarly Keogh JB et al [25] found that the effect of intermittent energy restriction (IER) compared to continuous energy restriction (CER) on weight loss after 8 weeks and weight loss maintenance after 12 months. Secondary aims were to determine changes in waist and hip measurements and diet quality. In a randomized parallel study, overweight and obese (body mass index [BMI] ≥ 27 kg m(-2)) women were stratified by age and BMI before randomization. Participants undertook an 8-week intensive period with weight, waist and hip circumference measured every 2 weeks, followed by 44 weeks of independent dieting. A food frequency questionnaire was completed at baseline and 12 months, from which diet quality was determined. Weight loss was not significantly different between the two groups at 8 weeks (-3.2 ± 2.1 kg CER, n = 20, -2.0 ± 1.9 kg IER, n = 25; P = 0.06) or at 12 months (-4.2 ± 5.6 kg CER, n = 17 -2.1 ± 3.8 kg IER, n = 19; P = 0.19). Weight loss between 8 and 52 weeks was -0.7 ± 49 kg CER vs. -1 ± 1.1 kg IER; P = 0.6. Waist and hip circumference decreased significantly with time (P < 0.01), with no difference between groups.

Strong compensatory responses, with reduced resting metabolic rate (RMR), increased exercise efficiency (ExEff) and appetite, are activated when weight loss (WL) is achieved with continuous energy restriction (CER) which try to restore energy balance. Intermittent energy restriction (IER), where short spells of energy restriction are interspaced by periods of habitual energy intake, may offer some protection in minimizing those responses [26].

Conclusion

We thus conclude that even without caloric restriction a negative energy balance induced by increased caloric expenditure through exercise program causes improved fitness and favourable alterations in body composition and body fat.

Exercise enhances fat mobilization and catabolism accelerating body fat loss. Thus exercise of at least 60 minute possibly produces less accumulation of central adipose tissue. Exercise also reduces the risk of cardiovascular disease by reducing blood pressure in women living sedentary life style. However further study is needed in this aspect.

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