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Case Study

A STUDY ON THE EFFECT OF STEP AEROBIC EXERCISE ON BLOOD PRESSURE, HEART RATE, TRIGLYCERIDES, HIGH DENSITY LIPOPROTEIN AND LOW DENSITY LIPOPROTEIN ON A PATIENT WITH ACUTE MYOCARDIAL INFARCTION: A CASE STUDY

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ABSTRACT

Background: Myocardial Infarction is the leading cause of global mortality. The prevalence rate is 30 million in India. Researchers have found that step aerobic exercise is more effective than other exercises in reducing body fat & blood pressure. This study was designed to examine the effects of moderate intensity step aerobics on heart rate, blood pressure, triglycerides, High density lipoprotein & Low density lipoprotein on a patient with acute Myocardial Infarction.

Materials and Methods: A 55 years old male diagnosed with acute anterior wall Myocardial Infarction was selected for the study based on risk stratification schema two months post discharge from hospital. The exercise session consisted of a 3 phase exercise program 1) a warm-up (10 min of dance aerobics); 2) aerobic exercise training (20 min of step aerobics); 3) a cool-down (10 min of breathing and flexibility exercises) total 40 minutes duration and included three sessions per week. Exercise intensity was controlled by monitoring targeted heart rate. Measurements of Heart rate, Blood pressure were recorded before, at 5 min & 40 min post intervention. Triglycerides, HDL & LDL levels were measured at baseline and at 8th week post intervention.

Results: It shows variations in systolic blood pressure and heart rate at baseline and after 8 weeks. No difference in diastolic blood pressure. Significant difference between high density lipoprotein, low density lipoprotein and triglycerides level was observed at the end of 8 weeks.

Conclusion: Our findings showed that step aerobics significantly improved heart rate, systolic Blood Pressure and experienced an increase in HDL. This type of currently 'popularised' low-cost step aerobic exercise has an important role in the prevention and reducing the morbidity of cardiovascular diseases.

KEY WORDS: Myocardial infarction, Step aerobics, Triglycerides.

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INTRODUCTION

Coronary heart disease (CHD) is epidemic in India and one of the major causes of disease-burden and deaths. Mortality data from the Reg-istrar General of India shows that cardio-vascular diseases are a major cause of death in India. The incidence of Myocardial Infarction increases with age; however, the actual incidence

is dependent on predisposing risk factors for atherosclerosis [1]. The prevalence rate is 30 million in India [2].

The combined results from randomized clinical trials indicate that exercise-based cardiac rehabilitation in patients who have had a heart attack, results in a 20 to 25% lower death rate[3,4]. A recent American Heart Association consensus statement on preventing heart attack and death in patients with coronary disease suggested a minimum of 30 to 60 minutes of moderate-intensity activity 3 or 4 times weekly supplemented by an increase in daily lifestyle activities. 5 to 6 hours a week was suggested for maximum benefits. Increasing physical activity in daily living can be helpful in this regard [4].

Exercise testing is essential for all patients with documented Cardiovascular disease, whatever the level of exercise intensity. Vigorous exercise ($\geq$ 60% VO_{2max} or $\geq$ 6 METs) should only be performed in dedicated cardiac rehabilitation centers [5]. Step aerobics is a truly beneficial and effective exercise format for all fitness levels. Step aerobics was innovated by Gin Miller around 1989. Step aerobics is a form of aerobic power distinguished from other types of aerobic exercise by its use of an elevated platform (the step). The height can be tailored to individual needs by inserting risers under the step.

Meta-analyses have concluded that aerobic training is effective in reducing clinical blood pressure in the general population as well as in hypertensive patients [6]. Aerobic exercise is more effective than other exercises in reducing body fat percentage [7]. Aerobic exercise reduces acyl-CoA synthesis and markedly acyl-CoA synthesis mRNA levels, lipoprotein lipase, and GLUT4 in adipose tissue. Acyl-CoA synthesis is a key enzyme for fat accumulation in adipose tissue. Lipoprotein lipase and GLUT4, two important factors for metabolic energy, respectively, are fat and glucose in adipose tissue. Lipoprotein lipase and GLUT4, thus aerobic activity can be controlled with diet, positive effects on reducing whole body fat [8].

The duration of aerobic exercise training sessions should include a minimum of 30 continuous or accumulated minutes (e.g., three-10 minute exercise bouts) at an intensity approximating 70 to 85 percent of an individual's measured maximal heart rate. Nevertheless, the prescribed heart rate for exercise training should be 10 or more beats per minute below the intensity that evokes abnormal signs or symptoms [4].

The risk of cardiovascular complications appears to increase transiently during strenuous physical activity compared with the risk at other times. This seems particularly true among persons with heart disease who are habitually sedentary. Contemporary estimates of major cardiovascular complications in exercise-based cardiac rehabilitation programs range from 1/100,000 to 1/300,000 patient exercise hours [3,4].

Only few studies have analyzed the effect of step aerobics on Blood Pressure, Heart Rate and triglycerides on patients with acute MI, which makes this a scarce and poorly studied area, considering the diverse possible exercise protocols and different individual characteristics and responses. This study was designed to examine the effects of moderate intensity step aerobics on heart rate, blood pressure and triglycerides, HDL & LDL on a patient with acute Myocardial Infarction.

MATERIALS AND METHODS

A 55 years old male diagnosed with acute anterior wall myocardial infarction and STEMI who underwent percutaneous transluminal coronary angioplasty (PTCA) for LAD was selected for the study. The participant was called 2 months post discharge from hospital that was on strict dietary modification and exercise advised by the cardiologist. The participant was selected on the basis of risk stratification schema to optimize patient management and minimize potential risk. The participant was explained about the study and a written informed consent was taken from the patient. Ethical clearance was obtained from the institutional ethical committee prior to the commencement of the study.

Participant's baseline Heart Rate (HR), Blood Pressure (BP) was measured after a period of 10 minutes seated rest, before each experimental

session with a clinically validated automatic BP monitor (Omron M6 Comfort, Japan). Lipid panel blood sample was collected by a staff nurse before the start of the study and sent for analysis.

The exercise session comprised three phases: 1) a warm-up (10 min dance aerobics); 2) aerobic exercise (20 min step aerobics with two different choreographies performed separately and together) 3) a cool down (10 min of breathing and flexibility exercises) totaling 40 minutes duration and included three sessions per week. Step platforms were 15 cm high and movement cadence was defined by music with 128-132 beats per minute. For first month routine 1 was followed which included basic step workouts of 4 counts, turn step and step over of 8 counts. For the 2nd month alternating basic step, V step, high knee step, leg side step, knee repeater & step touch of 8 counts were followed.

Exercise intensity was controlled by monitoring THR (70-75% maximal HR). The patient was connected to a finger Pulse oximeter (Omron MD300C20). Measurements of Heart rate, Blood pressure were recorded pretest, at 5 min, 40 min & 8 weeks post intervention. HDL, LDL & Triglyceride levels were measured at baseline and at 8th week post intervention. Participant was instructed to drink water as desired at baseline, during experimental sessions and recovery period, in order to avoid the potential effect of dehydration on BP responses.

Table 1: Baseline characteristics.

Variables	Values
Age(yrs)	55
Height(m)	1.63
Weight (kg)	79.3
BMI	29.84

RESULTS

Variation of heart rate, systolic blood pressure (SBP) and diastolic blood pressure (DBP) between baseline and recovery (0, 5th & 40th min) was noted for the patient at each session who's mean and standard deviation was calculated after 8 weeks.

SBP before intervention mean of all the sessions was 124± 9 variations at the 5th (12mmHg) and 40th min of recovery (9 mmHg).

Table 2: Mean SBP, DBP & HR measured at baseline at 5 min & at 40 min of all sessions.

	Baseline	5 min	At 40 min
SBP	124±9	136±3	143±5
DBP	74±3	78±3	76±3
HR	74±6	130±5	170±8

DBP showed no much variation difference at different timing of measurement. HR showed reduction from 56 to 50 beats per minute.

Table 3: Serum lipids.

Serum lipids	Pretest	Posttest
HDL (mg/dl)	34	50
LDL (mg/dl)	88	81
TG (mg/dl)	110	96

DISCUSSION

This study was conducted as a pilot study and showed conclusive results in the reduction of Systolic blood pressure, Heart Rate and serum lipids. The energy cost of step exercise can vary dramatically. Important factors include the selected step height, exercise rate & imposed step maneuver. Biomechanical research has shown that the ground reaction forces (GRF) experienced during step aerobics are lower than running and directly related to the step height and type of maneuver [9].

However, while high blood pressure, cholesterol, obesity and diabetes may be favorably affected by regular physical activity, exercise alone should not be expected to alter global risk status. The most effective regimens for coronary risk reduction also include nutritional education, counseling for smoking cessation, stress reduction and medication usage, if appropriate.

Although the many benefits of exercise are undeniable, there is no convincing evidence that exercise alone increases the diameter of the coronary arteries or the number of tiny interconnecting blood vessels (called collaterals) that feed the heart muscle. Moreover, conventional exercise training seems to have little or no effect on improving the pumping effectiveness or "ejection fraction" of a damaged heart or reducing heart rhythm irregularities. With such a convincing case for moderate exercise, it is unfortunate that more

cardiac patients don't enjoy its benefits. A mere 11% to 20% of patients with heart disease participate in supervised rehabilitation programs, which suggests a vast underutilization, particularly among older adults, women, and minorities. Moreover, cardiac exercise programs have typically reported dropout rates of 50% after 3 to 6 months. Contemporary studies now suggest that aggressive coronary risk factor modification, including diet, drugs, and exercise (especially in combination) may slow, halt and even reverse the progression of atherosclerotic coronary heart disease [4].

CONCLUSION

From the results of this study we can conclude that a step aerobic exercise program was effective in inducing post-exercise hypotension, lowering heart rate and serum lipids in a patient with acute Myocardial Infarction. This type of a low-cost exercise intervention seems to have sufficient intensity to trigger benefits in cardiovascular health and its regular practice may play an important role in the prevention of hypertension and hyperlipidemia.

Conflicts of interest: None

REFERENCES

[1]. Gupta R. Recent trends in coronary heart disease epidemiology in India. Indian Heart J. 2008; 60(2 Suppl B):B4-18.

[2]. Mark d. Huffman and Dorairaj Prabhakaran. Heart failure: Epidemiology and prevention in India. Natl Med J India. 2010; 23(5): 283–288.

[3]. Taylor RS, Brown A, Ebrahim S, Jolliffe J, Noorani H, Rees K, Skidmore B, Stone JA, Thompson DR, Oldridge N. Exercise-based rehabilitation for patients with coronary heart disease: systematic review and meta-analysis of randomized trials. American Journal of Medicine. 2004;116: 682– 697.

[4]. Barry A. Franklin, Gary J. Balady, Kathy Berra, Neil F. Gordon, and Michael L. Pollock. American College of Sports Medicine Recent comment.

[5]. Alexandra S. Ghadieh, Basem Saab. Canadian Family Physician. 2015; 61.

[6]. Cardoso Jr CG et al. Acute and chronic effects of aerobic and resistance exercise on ambulatory blood pressure. Clinics. 2010; 65(3): 317-25.

[7]. De Souza e Silva MJ et al. Effects of two kinds of aerobic training on body fat content and serum lipid profile in cadets. Biomed Human Kinet. 2009; 1: 72–5.

[8]. Okura T, Nakata Y, Lee DJ, Ohkawara K, Tanaka K. Effects of aerobic exercise and obesity phenotype on abdominal fat reduction in response to weight loss. Int J Obes. 2005; 29: 1259–66.

[9]. Michele Scharff Olson et al. The Physiological Effects of Bench/Step Exercise. Sports Med. 1996; 21(3):164-75.

[10]. Romeus M. et. al. Can a Single Session of a Community-Based Group Exercise Program Combining Step Aerobics and Bodyweight Resistance Exercise Acutely Reduce Blood Pressure? Journal of Human Kinetics volume 43/2014, 49-56 DOI: 10.2478/hukin-2014-0089.

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