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RESEARCH ARTICLE

EFFECT OF DIFFERENT INTENSITIES OF AEROBIC EXERCISE ON SELECTED CARDIAC RISK FACTORS AMONG DIABETIC PATIENTS

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ABSTRACT

The aim of this study is to find out the effect of different intensities of aerobic exercises on selected physiological variables among diabetic patients. Randomly selected 60 (N=60) diabetic patients whose blood glucose levels were more than 140 mmHg and who were undergoing treatment for diabetics in Government General Hospital, Nagercoil were treated as subjects for this study. They were randomly assigned into four groups consisting of 15 in each group. Group I was considered as low intensity aerobic exercises group (LIAE), group II was considered as medium intensity aerobic exercises group (MIAE), group III was considered as high intensity aerobic exercises group (HIAE) and the fourth group served as control group. Pre and post test scores on cardiac risk factors, breath holding time and cardio respiratory endurance were collected and statistically analysed. The results of the study proved that cardiac risk factors selected were beneficially altered by different intensities of aerobic exercises compared to control group and there was no significant difference among treatment groups. It was concluded that aerobic exercises of different intensities can be prescribed for diabetic patients for managing diabetics and the resultant cardiac risks.

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INTRODUCTION

The fact sheet of the 2016 Global World Health Organization (WHO) Report of Diabetes estimated worldwide adult diabetes prevalence in 422 millions of individuals in 2014, rising from 4.7% in 1980 to 8.5% in 2014, with the greatest increment in middle and low-income countries . This number will probably overcome the previous WHO projection of 439 million adults with diabetes for 2030. Currently, 1.5 million deaths are directly attributed to diabetes each year. Although great advances in cardiovascular therapy and prevention have promoted outstanding reductions in diabetes-related coronary mortality in developed countries, cardiovascular morbidity and mortality still remain high in the majority of patients with diabetes. Gregg *et al.* (2014) , considering the increasing number of cardiovascular event survivors and the global epidemic of T2DM, it is expected the number of patients with T2DM at a higher cardiovascular risk to rise, posing a giant challenge for health care systems worldwide recommended for a cost-effective policies for reducing cardiovascular risk in this population are therefore urgently needed.

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Haffner *et al.* (1998) , found diabetes has long been considered a "cardiovascular risk equivalent". This statement was formerly based on a study in which T2DM patients without coronary heart disease (CHD) events showed a similar coronary mortality as non-diabetic patients who had a previous coronary event. Diabetes also increases coronary death rates conferring the patient a worst prognosis after having the first CHD event (National Cholesterol Education Program Expert Panel, 2002) . These arguments led the 2001 NCEP-ATP III (NCEP, 2001) to recommend patients with diabetes to be treated as a separated high-risk category, with no need for stratification. Aerobic exercise refers to exercise that involves or improves oxygen consumption by the body. Aerobic means "with oxygen", and refers to the use of oxygen in the body's metabolic or energy-generating process.(Concise Oxford English Dictionary) Many types of exercise are aerobic, and by definition are performed at moderate levels of intensity for extended periods of time. To obtain the best results, an aerobic exercise session involves a warming up period, followed by at least 20 minutes of moderate to intense exercise involving large muscle groups, and a cooling down period at the end. Canabal Torres (1994) made a study on "Exercise, Physical Activity and Diabetes Mellitus" and reported that vigorous regular exercise is a recommended inclusion in the management of diabetes of persons with diabetes of the both

types regardless of age. Exercise in the management of non-insulin-dependent diabetes mellitus was constructed by Wallberg-Henrikson (1998) and found exercise training also improves many other physiological and metabolic abnormalities that are associated with NIDDM such as lowering body fat, reducing blood pressure and normalizing dyslipoproteinaemia. A study on insulin sensitivity was constructed by Ryan (2000) resistance a reduction in the rate of glucose disposal elicited by a given insulin concentration, and presented in individuals who were obese and those with diabetes mellitus and may develop with aging methods which were utilized to measure insulin sensitivity included the hyperinsulinaemic-euglycaemic and hyperglycacric clamped and the intravenous glucose tolerance tests. Researches showed that aerobic exercises in the form of walking has been shown to reduce cholesterol levels, have a protective effect from coronary heart disease, reduce body weight, reduce blood pressure and improve circulation in medical patients. Walking about 30 minutes after eating has been beneficial in keeping post prandial blood sugars in control for many patients. They feel that they can accomplish a 20 to 30 minutes walks 2 or 3 times per day and over a couple of months, they feel better. Many have reduced their medication levels during their tenure in their walking programme (Girish and Sridhar, 2007). Among the causes outlined for increasing diabetes, the problem of physical inactivity can be addressed effectively by suggesting different sets of physical activities. Among the different physical activities suggested, aerobic exercises are considered to be more effective for patients with diabetes. (Gaziano *et al*. 2007) Aerobic is a system of exercises designed to promote the supply and use of oxygen in the body. Some of these exercises include running, dancing, rowing, skating and walking. Aerobic exercise increases cardio respiratory fitness, which is the heart's ability to pump blood and deliver oxygen throughout the body. Some benefits of cardio respiratory fitness are increased endurance and energy, weight control decreased blood pressure, decreased heart rate, decreased cholesterol levels, and an increased ability to manage stress.

Therefore, it might be useful to develop rationale strategies for detecting and treating more intensively patients at higher risk while it may be reasonable and cost-effective to use moderate therapies in those at lower cardiovascular risk. Hence, the investigator was interested to find out the effect of varied intensities of aerobic exercises on selected cardiac risk factors breath holding time and cardiorespiratory endurance among diabetic patients.

METHODOLOGY

Randomly selected 60 (N=60) diabetic patients whose blood glucose levels were more than 140 mmHg and who were undergoing treatment for diabetics in Government General Hospital, Nagercoil were treated as subjects for this study. They were randomly assigned into four groups consisting of 15 in each group. Group I was considered as low intensity aerobic exercises group (LIAE), group II was considered as medium intensity aerobic exercises group (MIAE), group III was considered as high intensity aerobic exercises group (HIAE) and the fourth group served as control group. Prior to the experimental treatments all the subjects were measured of their cardiac risk factors breath holding time and cardiorespiratory endurance which formed the initial scores of the subjects. The subjects were treated in respective experimental treatment for 12 weeks and immediately on completion of the experimental treatments, all the subjects were tested on the criterion measures which formed the final scores of the study. The difference between initial and final scores was considered as the effect of different intensities of aerobic exercises. To ascertain the statistical significance of the differences in means, statistical tool ANCOVA was employed. In all cases 0.05 level was fixed to test the hypothesis of the study.

RESULTS

The descriptive statistics on breath holding time and cardio respiratory endurance proved that there existed mean differences due varied intensities of aerobic training and to test

Tab 1: Descriptive Statistics on Breath Holding time and Cardiorespiratory Endurance due to Low intensity aerobic training (LIAE), Medium intensity aerobic training (MIAE), High intensity aerobic training (HIAE) and Control Groups (CG)

Groups	Test	Mean	Standard Deviation	RANGE	
				Min	Max
BREATH HOLDING TIME					
Low intensity aerobic training	Initial	41.67	8.01	28.00	58.00
	Final	50.40	7.44	39.00	65.00
	Adjusted Mean	50.34			
Medium intensity aerobic training	Initial	41.13	8.03	29.00	57.00
	Final	49.60	8.17	36.00	65.00
	Adjusted Mean	50.02			
High intensity aerobic training	Initial	41.40	7.04	28.00	58.00
	Final	50.07	6.23	39.00	65.00
	Adjusted Mean	50.25			
Control Group	Initial	42.20	2.51	38.00	48.00
	Final	41.00	1.56	39.00	44.00
	Adjusted Mean	40.46			
CARDIORESPIRATORY ENDURANCE					
Low intensity aerobic training	Initial	49.81	3.60	44.06	55.78
	Final	51.78	3.39	45.13	57.33
	Adjusted Mean	51.43			
Medium intensity aerobic training	Initial	48.98	3.18	42.67	53.33
	Final	51.91	2.86	47.78	56.15
	Adjusted Mean	52.19			
High intensity aerobic training	Initial	48.39	2.53	42.67	51.56
	Final	51.48	2.37	47.78	55.11
	Adjusted Mean	52.21			
Control Group	Initial	50.21	2.74	45.86	55.78
	Final	50.09	2.21	46.13	55.11
	Adjusted Mean	49.43			

Tab 2. ANCOVA Results on Breath Holding time and Cardio Respiratory Endurance comparing LIAE, MIAE, HIAE and CG

	Source of Variance	Sum of Squares	df	Mean Squares	Obtained F
BREATH HOLDING TIME					
Pre Test Mean	Between	9.33	3	3.11	
	Within	2581.07	56	46.09	0.07
Post Test Mean	Between	920.60	3	306.87	
	Within	2288.13	56	40.86	7.51*
Adjusted Post Test Mean	Between	1066.17	3	355.39	
	Within	184.06	55	3.35	106.20*
CARDIO RESPIRATORY ENDURANCE					
Pre Test Mean	Between	30.29	3	10.10	1.09
	Within	518.01	56	9.25	
Post Test Mean	Between	31.61	3	10.54	1.40
	Within	422.15	56	7.54	
Adjusted Post Test Mean	Between	74.12	3	24.71	11.21*
	Within	121.22	55	2.20	

Required $F_{(0.05), (df\ 3,75)}$ =2.77; * Significant at 0.05 level of confidence

Tab 3. Multiple paired means comparisons among LIAE, MIAE, HIAE and CG on Breath Holding time and Cardio Respiratory Endurance

Low intensity aerobic training Group	Medium intensity aerobic training Group	High intensity aerobic training Group	Control Group	MEAN DIFF	C.I
BREATH HOLDING TIME					
50.34	50.02			0.32	1.93
50.34		50.25		0.09	1.93
50.34			40.46	9.88*	1.93
	50.02	50.25		0.23	1.93
	50.02		40.46	9.56*	1.93
		50.25	40.46	9.79*	1.93
CARDIO RESPIRATORY ENDURANCE					
51.43	52.19			0.76	1.56
51.43		52.21		0.78	1.56
51.43			49.43	2.00*	1.56
	52.19	52.21		0.02	1.56
	52.19		49.43	2.76*	1.56
		52.21	49.43	2.78*	1.56

***** Significant at 0.05 level

statistical significance, ANCOVA were computed and the results presented in Table 2. The results proved that obtained F values of 3.68 and 6.34 on adjusted means were greater than the required F value to be significant at 0.05 levels. Hence, post hoc analysis was made and results presented in Table 3.

DISCUSSION

The problem of physical inactivity, which is considered as a factor to increase diabetics among diabetic patients can be addressed effectively by suggesting different sets of physical activities. (Gaziano *et al.* 2007) And among the different physical activities suggested, aerobic exercises are considered to be more effective. This paper made an attempt how far different intensities of aerobic exercises, namely, low, medium and high can influence selected cardiac risk factors, breath holding time and cardio respiratory endurance of diabetic patients. The descriptive statistics on breath holding time and ANCOVA results showed the obtained F value 106.20 was greater than the required value of 2.77 and proved that the experimental treatments significantly improved breath holding time of the diabetic patients as they could improve the breath holding time due to different intensities of aerobic training. The post hoc analysis of obtained ordered adjusted means proved that due to twelve weeks low, medium and high intensity aerobic training were significantly better than control group's breath holding time. The results further proved that there was no significant difference among treatment groups on breath holding time among diabetic patients. The descriptive statistics on cardio respiratory endurance and ANCOVA results showed the obtained F value 11.21 was greater than the required value of 2.77 and proved that the experimental treatments significantly improved cardio respiratory endurance of the diabetic patients as they could improve cardio respiratory endurance due to different intensities of aerobic training. The post hoc analysis of obtained ordered adjusted means proved that due to twelve weeks low, medium and high intensity aerobic training was significantly better than control group in improving cardio respiratory endurance. The results further proved that there was no significant difference among the treatment groups in altering cardio respiratory endurance among diabetic patients. The findings of this study are in agreement with the findings of Gaziano *et al.* 2007 and Girish and Sridhar, (2007) who found aerobic activities are best among different physical activities for diabetic patients.

Conclusion

It was concluded that different intensities of aerobic exercises can beneficially alter cardiac risk factors breath holding time and cardio respiratory endurance of diabetic patients

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