THE EFFECT OF A 3-MONTH AEROBIC EXERCISE PROGRAMME ON BODY WEIGHT, PERCENT BODY FAT, AND BODY MASS INDEX OF PERIPHERAL ARTERIAL DISEASE PATIENTS

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ABSTRACT

There is increasing risk of chronic diseases like coronary heart disease, stroke, osteoporoses, diabetes which have become the leading causes of morbidity and mortality. Many adult men and women in Nigeria today are faced with chronic disease such as diabetes and hypertension. Studies are available on the utilization or aerobic training programmes to improve physical-physiological profiles of college patients, but very little has been done on aerobic training as a means of improving health status. The use of aerobics as a whole method of training for college patients is relatively new in Nigeria. This study, therefore, investigated the effect of a 3-month Aerobic exercise programme on Body weight, percent body fat, and body mass index of peripheral Arterial disease patients in Lagos State. Sixty (60) peripheral arterial disease patients were randomly selected and used as subjects for the study. Descriptive statistics of means, standard deviation and range as well as the inferential of ANCOVA were the statistics tools employed for data analysis. Results indicated that aerobic exercise significantly lowered the weight of the experimental group ($F_{1,76}$ =16.853, $p < 0.05$)% bf of the experimental subjects significantly decreased ($F_{1,76}$ = 18.678, $P < 0.05$). also, BMI of the experimental subjects decreased significantly ($F_{1,76}$ = 15, 632, $P < 0.05$). In conclusion, the findings of this study indicated that aerobic exercises are effective in decreasing fat weight and improving body mass index of peripheral Arterial disease patients when the programme is well supervised.

Key Words: Aerobic Exercise rehabilitation peripheral Arterial Disease, Patients, Percent Body Fat, Body Mass Index.

INTRODUCTION

Exercise is the foundation for healthy living and promotion of health. A person that works out regularly has a lot more energy and capacity to endure life's situation in a healthier way. Exercise can also protect an individual against a number of the chronic diseases and more importantly, it maximizes residual function (Mateson, 2009). Exercise are physical or mental activities that one engages into physical become stronger. It is an excellent example of an activity that can have a substantial positive impact on physical and psychological health; especially if the exercise consists of oxygen consumption, such as fast walking, dancing, rowing swimming, biking, jogging and so on

Regular aerobic exercise improves peripheral Arterial disease condition over the long term and on average increases the chances that one will live longer. Peripheral arterial disease (PAD) is a form of vascular disease characterized by narrowing of the major arteries supplying blood to the lower extremities. PAD is a marker of systemic atherosclerosis and as such it is associated with coronary and cerebrovascular disease (Ernst and Matrai, 1987). It has been estimated that approximately 9.6% of cardiovascular events are reported in people with PAD and about 17,400 deaths occur each year (Kannel, 1996). Peripheral artery disease (PAD) is a progressive atherosclerotic disease that affect 2 million Nigerians Ogbera, A. Adedokun, Fasamade, Ohwovoriole and Ajani (2005). Symptoms of PAD are caused by insufficient arterial blood flow to the lower extremities, which often results in ischemia-induced, debilitating leg discomfort associated with walking.

Claudication, which is cramping, aching, or pain in the calves, thighs, or buttocks, is the classic symptom of PAD. Claudication is defined as a reproducible discomfort or fatigue in the muscles of the lower extremity that occurs with exertion and is relieved within 10 minutes of rest Hiatt, Goldstone, Smith, Mcderm Moneta, Oka, Newnam (2008). Most people with PAD do not have classic claudication symptoms but still have significantly greater functional impairment, mobility loss, and decreased quality of life. Improving functioning and quality of life is a major goal in the treatment of individuals with PAD Hiatt (2001) Stewart, Hiatt, Regensteiner (2002).

The evidence supporting the efficacy of exercise therapy for patients with PAD dates back to 1966 when 6 months of unsupervised intermittent walking exercise was demonstrated to improve time walked to onset of pain and peak walking time (PWT) Larsen, Lassen, (1966). Over the 50 years since that first report, numerous randomized clinical trials and meta-analyses have added to the body of evidence supporting the efficacy of exercise to improve functioning and quality of life in patients with PAD. The most recently published American Heart Association/American College of Cardiology (AHA/ACC) guidelines on the management of patients with lower-extremity PAD include 4 recommendations supporting exercise therapy for patients with PAD (6). The AHA/ACC guidelines gave supervised exercise treadmill training a class 1 recommendation supported by a level of evidence trails showing the efficacy of supervised exercise treadmill training to improve claudication onset time (CoT) or distance (CoD), PWT or peak walking distance (PWD) and other clinically meaningful functional outcomes Gerhard-Heman. Gornik, Barrett, Barshes, Corriere, Drachman, Flesh, Fowkes, Hamburg, Kinlay, Loo, Kstein, Misra, Mureebe, Olin, Patel, Regensteiner, Schanzer, Shishehbor, Stewart, Teat-Jacobson, Walsh, (2016) current AHA/ACC practice guidelines are summarized in the table.

2016 Exercise Therapy Guidelines for patients with lower-Extremity Peripheral Arterial Diseases (PAD)

Class of Recommendation	**Level of Evidence**	**Recommendation**
1	A	In patients with claudication, a supervised exercise programme is recommended to improve functional status and QOL and to reduce leg symptoms.
1	B – R	A supervised exercise programme should be discussed as a treatment option for claudication before possible revascularization.
1/a	A	In patients with PAD, a structured community or home-based exercise programme with behavioural change techniques can be beneficial to improve walking ability and functional status.
1/a	A	In patients with claudication, alternative strategies of exercise therapy, including upper body ergometry, cycling and pain-free or low-intensity walking that avoids moderate to maximum claudication while walking, can be beneficial to improve walking ability and functional status.

PAD indicates peripheral artery disease; and QOL, quality of life Adapted from Gerhard-Herman et al

In 2017, the centers for medicare and Medicaid services evaluated the large body of evidence demonstrating the efficacy of exercise to improve symptoms, functioning, and quality of life in patients with PAD. This has resulted in a national coverage determination of supervised exercise therapy (SET) for medicare beneficiaries with symptomatic with symptomatic PAD. Center for Medicare and Medicaid Services. (2017) gave an overview on the effectiveness of exercise therapy in patients with PAD. The authors concluded that evidence from randomized controlled trails demonstrated that exercise therapy is effective in the treatment of PAD. Also, Aboyans, Criqui Abraham, Allis Creager, Diehm, Fowkes, Haitt, Jonson, Lacroix, Marin,

McDemott, Norgren, Pande, Preux, Stoffers, Treat-Jacobson (2013) ascertain that mild intensity Aerobic exercise reduces pain, disability and psychological strain in patients with PAD.

METHODOLOGY

The population of this study was made up of male and female peripheral arterial disease patients between the ages of 18-65 years who registered at Adeniran Ogunsanya College of Education Health Center. A sample of sixty volunteers was used for the study. They were given an informed consent form for aerobic exercise training after they had been briefed. They were then randomly assigned to the experimental and control groups. The electronic stadiometer was used to obtain both the weight and height of the subjects in kilograms and centimeters respectively. The weight of the subjects was measured to the nearest 0.05kg and their height was measured to the nearest 0.01m. The range skinfold caliper, model 3003 was used to measure skinfold thickness. It is calibrated from 0-67mm and has a constant pressure of $10g/mm^2$ throughout the range of skinfold thickness. The three site equations: utilizing triceps, suprailiac and abdominal skinfolds for adult female; and chest, abdomen and thigh for adult males were utilized for this study. Female: %BF (YMCA) = 0.41563 (sum of 3 skinfolds) 0.0012 (sum of 3 skinfolds) squared + 0.03661 (Age) + 4.03653. for the females, the sum of 3 skinfolds correlated with hydrostatically determined body density, 0.83 (Pollock, Schmidt and Jackson, 1980). Males: D_B = 1.1093800 0.0008267 (sum of 3 skinfolds) + 0.0000016 (sum of 3 skinfolds) squared 0.0002574. (Age)

The above Jackson and Pollock (1978) equation have been found to have a correlation coefficient of 0.91. The percent body fat was predicated using the equation by Brozek, Grande, Anderson and Keys (1963).

$$\%BF = \frac{(4.570\ \ 4.142) \times 100}{D_B}.$$

Body mass index (BMI), otherwise known as the Quetets index were determined before data collection and stratified according to metropolitan life instance tables. The following formula was used to calculate the BMI:

$$BMI = \frac{\text{Weight (kg)}}{\text{Height (m)}}$$

It is fairly closely related to amount of body fat (0.50)

Training Programmme

The training which consists of 3-month aerobic exercise was graduated by increasing the speed, frequency and duration of the exercise according to the condition of individual subjects. The exercise protocol was carried out two times a week: Mondays and Wednesdays between 4.00pm and 7.oopm at Adeniran Ogunsanya College of Education Health Centre. The training session for the peripheral Arterial disease patients was made up of the following components:

1) Warm-up (Flexibility Conditioning)
2) Aerobic exercise (walking and cycling)
3) Cool down

The data was subjected to statistical analysis of means, standard deviation and analysis of covariance (ANCOVA)

Table 1: Descriptive Statistics of Experimental Group

PRE-TEST			**(N-30)**	**POST TEST**		**(N = 30)**
	X	**S.D**	**Range**	**X**	**SD**	**Range**
Age (yrs)	41.80	11.42	18.54	41.80	11.73	18-54
Wt (kg)	22.80	12.80	52-121.5	75.82	12.14	56.2-1.13
Ht(m)	1.65	0.05	1.52-1.81	1.63	0.07	1.52-1.84
%BF	28.41	9.21	9.34-40.22	26.02	10.00	8.95-44.13
BMI/m/kg^2	28.21	4.62	19.53-37.21	27.48	4.41	21.13-31.42

Table 2: Descriptive Statistics of Control Group

PRE-TEST			**(N-30)**	**POST TEST**		**(N = 30)**
	X	**S.D**	**Range**	**X**	**SD**	**Range**
Age (yrs)	48.71	10.64	20-65	48.71	10.63	20-65
Wt (kg)	75.43	14.21	47.10	79.32	14.22	49.1-11.2
Ht(m)	1.67	0.08	1.48-181	1.67	0.08	1.43-1.81
%BF	30.62	7.34	6.61-40.58	32.81	7.43	9.32-41.37
BMI/m/kg^2	27.18	4.94	18.75-42.81	27.12	5.02	19.96-45-01

Table 3: Summary of the ANCOVA Results of the PAD Patients

Variable	**SS Covariate**	**SS Treatment**	**SS CDG**	**SS2-way Inters**	**MS Treatment**	**DF Treatment**	**DF Residual**	**F**
Weight (kg)	14011.673	268.424	0.118	3.275	269.324	1	76	16.853 *
Percent body fat (BF)	4325.370	287.722	2.293	36.225	288.624	1	26	18.678 *
Body mass index (BMII)	1483.762	34.024	0.275	2.053	34.075	1	76	15.632 *

Significant at 0.05 alpha level

Results and Discussion

The pre-and post-test means and standard deviations of body weight (wt), percent body fat (%BF) and body mass index (MBI) of the patients are presented in tables 1 and 2. Table 3 shows the F-ratios of wt, %BF and BMI. For wt, the f-ratio due to the post-test different (due to treatment) between experimental and control groups was (F1,76) = 16.853 p <0.05. This shows that there was a significant difference in body weight. For %BF, the ratio due to the post-test difference between the experimental and control groups was ($F_{1,76}$) = 18.678, P < 0.05. This also shows that there was a significant difference in %BF. Moreover, in the BMI, the F-ratio due to treatment between experimental and control groups was ($F_{1,76}$) = 15.632. This reveals that there was a significant difference in BMI.

Aston and Wilstore (2007) observed that body weight may decrease over long period of time, that is, three months or longer, it is not usual for body weight to change very little during the initial few months of

exercise. This lack of substantial change in the early phase of an exercise programme is primarily the result of alterations in body composition, that is losses in body fat accompanied by similar gains in fat-free weight.

Ajao (2005) observed a modest reduction in body weight of Adeniran Ogunsanya College of Education female academic and non-academic staff after eight weeks of aerobic exercise. After the fourth week of training, the mean weight of the subjects dropped from 74.05kg to 72.2kg. The percentage reduction in the weight of the subject was 1.5570. By the eight week of the training, the mean weight of the subjects fell to 69.25kg. The percentage reduction in the eight week was 4.19%. The result of weight in this study shows that PAD patients without medical complications, if carefully trained, can equally lose weight just like the apparently healthy populations, though; careful attention should be given to the exercise intensity recommended for PAD patients. The decrease in the %BF of the experimental group subjects under studied may be attributed to the duration and frequency of the training programme. The patients trained 2-3 times per week for duration of 15-30 minutes. Kovar, Allegrante, Mackenzie, Peterson, Gutin, Chavisron (2009) submitted that exercise improves strength, enhances cardiovascular endurance, decreases stiffness, increase range of motion, decreases and prevents disability. There is more information in various literatures on weight loss than on any other aspect of human energy. Pickering (2001) noted that although blood pressure tends to increase with age, this process is not inevitable and one of its modifiable risk factors is body weight. Moefa and Hamilsky (2009) carried out a study on the meta-analysis of the past 25years of weight loss research using diet. Exercise or diet plus exercise intervention. Exercise studies were of a shorter duration, used young subjects who weighted less had lower BMI and percentage body fat values. It has been shown that a person's medical care costs are directly proportional to his or her BMI (Quanberry, Caan and Jacobson, 1998; cited in pickering, 2001). According to Peterson lewenthal, Graves and Caroll (1992), many of the aerobic fitness guidelines of the American College of Sports Medicine showed a modest but significant decrease of body mass. The average loss was less than the average of 1.5kg found in 32 studies on young and middle-age subject. As a result of paucity of literature to compare the findings of this study on PAD patients, one could readily postulate that the significant decrease in body mass index (BMI) of the patients could therefore attributed to the improvement in body weight and percent body fat.

Conclusion and Recommendations

From the result obtained while investigating the effects of a 3-month aerobic exercise on the physical parameters of PAD patients, the following conclusions were drawn:

Aerobic exercise, at minimum frequency of 2-3 sessions per week and 15-20 minutes duration of each session, will significantly lower body weight, percentage body fat and body mass index. Moreover, it is possible that moderate aerobic exercise could be a useful adjunct to therapeutic measures used in the rehabilitation of these patients. However, caution is necessary in this context any exercise programme must be supervised. Finally, it is recommended that PAD patients should be engaged in well-supervised exercise that will reduce inflammation and pain, prevent contractures and deformities, maintain or improve range of motion, muscle strength and cardiovascular fitness.

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