

Lipid profile alterations following aerobic and resistance training programmes among HIV- seropositive female patients

Elvis I. Agbonlahor¹ ✉ • Oluwaseun Susan Kubeyinje²

Received: 28th April, 2020

Accepted: 3rd June, 2020

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DOI: 10.31382/eqol.200602



Abstract

This study was designed to assess the changes in lipid profile of HIV-seropositive patients following 6-week aerobic and resistance exercise training.

The pretest-posttest control-group design (experimental and control groups) was adopted. Sixty female HIV-seropositive patients in stage 1 and 2 of the disease registered in University of Benin Teaching Hospital participated in the study. They were randomly assigned into control and experimental groups. The experimental group exercised for One hour, three times a week for six weeks while the control group continued with their daily routine. The baseline intensity of the exercise was 60% of maximum Heart Rate (HRmax) and 60% 1RM and it was progressed by 10% every 3 weeks. Lipid profile were recorded at baseline and on completion of 6 weeks for both groups. The hypotheses were tested with inferential statistics of Analysis of variance.

The findings of this study revealed that short duration exercise training improved some of the components of the lipid profile (high density lipoprotein and triglycerides).

It was therefore concluded based on the findings

of this study that health professionals should recommend exercise for female HIV-infected individuals due to the health benefits. Also, human kinetics specialists should design exercise programmes suitable for this special population.

Keywords HIV- seropositive • lipid profile • aerobic and resistance Training

Introduction

Exercise is generally regarded as safe because it does not compromise the immune function, and is beneficial in boosting functional capacity, strength, physical fitness, mood, and sense of wellbeing, and in ameliorating wasting and lipodystrophy (Bopp, Phillips, Fulk & Hand, 2003; Hand, Lysterly & Jagers, 2009). Aerobic and resistance exercises have been shown to improve the quality of life and cardiovascular fitness. The prevalence of HIV/AIDS in Nigeria has recently reduced. However, the prevalence is higher in females across all age groups but more in young adults. The diverse immunosuppressive effect of HIV affects all systems of the human body; however, the advent of Highly Active Antiretroviral Therapy (HAART) has significantly reduced the progression of the infection to the stage of AIDS but not without its attendant consequences such as HIV Lipodystrophy Syndrome (HIVLDS). HIVLDS is characterized by abnormal distribution of body fat (Terry, Sprinz, Stein, Medeiros, Oliveira & Ribeiro, 2006). The lipodystrophy alterations following the use of HAART have been documented by several authors to include lipodystrophy, mitochondrial toxicity, and reduction

✉ elvisagbon@yahoo.com

¹ University of Benin, Department of Human Kinetics and Sports Science, Benin City, Nigeria

² University of Benin, Department of Physiotherapy, Teaching Hospital, Benin City, Nigeria

of the activity of oxidative enzymes. These could lead to impairment/deficiency in extraction and use of oxygen in the peripheral musculature, thereby greatly affecting physical fitness.

Despite all these negative sequelae of HIV infection and the use of HAART that impact on the physical functioning of affected individuals, HIV-seropositive patients are usually referred to physiotherapy units only at the end stage of the infection (AIDS) for palliative care. Due to these late referrals, most of the patients do not benefit from the preventive aspects of exercise. Exercise, when prescribed and monitored by exercise specialist is very beneficial in improving Quality of Life (QoL) of patients diagnosed with chronic diseases as well as helping to slow down the progress of such diseases. However, there is very few documented evidences of the effect of aerobics and resistance exercise in a special population such as HIV-seropositive patients.

The HIV infects cells of the immune system, destroying or impairing their functions leading to progressive deterioration of the immune system called "immune deficiency". Presentations associated with chronic HIV infection that eventually lead to disability and mortality include muscle wasting, muscle weakness, fatigue, impaired functional work capacity, depression and decreased quality of life (Bopp, Phillips, Fulk & Hand, 2003), however the mortality rate of HIV - infected persons has greatly reduced since the advent of Highly Active Anti-Retroviral Therapy (HAART), thus making HIV/AIDS a chronic disease. This increase in the life-expectancy of People living with HIV/AIDS (PLWHA) has several negative metabolic, physiologic and morphologic changes that have an impact on their Quality of Life (QoL) as well as the health-related components of physical fitness such as muscular strength, muscular endurance, cardiorespiratory endurance, and body composition. These adverse changes cut across the entire systems of the body and the common physical adverse effects include gastrointestinal tract (nausea, vomiting, and diarrhoea), integumentary system (rash, dry skin), metabolic processes (glucose, lipid alterations, and bone disease) and morphology-lipodystrophy (lipohypertrophy and lipoatrophy) (Ciccolo, Jowers & Bartholomew, 2004). Likewise, lipodystrophy is associated with physical and metabolic changes whereby the body is unable to produce and maintain healthy fat tissue with resultant alteration in body composition. This alteration in body composition results in accumulation and reduction of fat in some parts of the body. These morphological changes also

augment alteration in lipid profile. Abnormality of serum lipid is common and showed female preponderance among treatment-naive HIV patients (Denue, Alkali, Abjah, Kida, Ajayi & Fate, 2013). It is on this premise, that the use of non-pharmacological therapies such as exercise has become important in order to maintain the functional and physical fitness status of PLWHA without the antecedent adverse effects of pharmacological therapy.

The following hypotheses were formulated to address the study:

1. There would be no significant difference in the triglycerides level of female HIV-seropositive patients prior to and following a 6-week aerobic and resistance training programmes.
2. There would be no significant difference in the LDL level of female HIV-seropositive patients prior to and following a 6-week aerobic and resistance training programmes.
3. There would be no significant difference in the HDL level of female HIV-seropositive patients prior to and following a 6-week aerobic and resistance training programmes.
4. There would be no significant difference in the total cholesterol level of female HIV-seropositive patients prior to and following a 6-week aerobic and resistance training programmes

Method

The design for this study was the pre-test/post-test experimental and control group design. This design is considered most appropriate because the participants were randomly assigned into control and experimental groups, subjected to an initial test (pre-test) measurement of the variables, the treatment group was administered a treatment (aerobic and resistance training) while the control group continued with their daily routine and both groups were post tested

Two hundred and seventy (276) HIV-seropositive female patients were registered and attending the clinic at the University of Benin Teaching Hospital's President's Emergency Plan for AIDS Relief (PEPFAR), Benin-City, Nigeria (Medical records unit, UBTH). One hundred and fifty-eight (158)

patients met the inclusion criteria thus making the population for this study.

A total of sixty (60) participants were selected out of the entire female patients with HIV-seropositive at the University of Benin Teaching Hospital's President's Emergency Plan for AIDS Relief (PEPFAR), Benin-City, Nigeria. A simple random sampling technique was used to select the participants. Balloting without replacement was used to select one-third (1/3) of the population for the study. 10% of the sample size was added to take care of attrition, thus the figure was rounded up to 60.

The inclusion criteria include:

Young and middle-aged female adults (18 – 60 years) who had been screened for HIV with results

Table 1. ACSM (2009) exercise training protocol

Exercises	Set, Repetition, Rest between sets
Bicycle ergometer	1*, - (60%HRmax)
Dumbbells	3*, 10 (60% 1RM), 30 seconds
Ankle weight	3*, 10 (60% 1RM), 30 seconds

An ethical approval to conduct this study was received from the Research Ethics Committee of the University of Benin Teaching Hospital, Nigeria. Prior to the exercise programmes, a detailed explanation of the test, training programmes and; the objectives and intricacies of the study was provided to the participants and then the participants signed a participant's informed consent form before participating in this study. Thereafter, the participants were made to undergo a 6-week (11th June to 20th July, 2019) combined aerobic and resistance exercise training programmes of a frequency of 3 times per week (Monday, Wednesday, and Friday) with each session lasting for a total of 60 minutes. 10 minutes warm up, 20 minutes cycling on the bicycle ergometer at 60% HRmax, 20 minutes resistance exercise with dumbbells and ankle weights at 60% one-repetition maximum (60% 1RM) and 10 minutes cool down. Progression of intensity was done every two weeks.

Physicians (Infectious disease specialist) at the PEPFAR clinic of the hospital screened the participants for eligibility based on the inclusion/exclusion criteria and conducted a physical examination on each participant. Each participant in addition to the screening and physical examination filled a Physical Activity Readiness Questionnaire (PAR-Q)

indicating positive (+ve); and who volunteered to participate in the study were recruited.

The sample included patients diagnosed to be in stages 1 and 2 of the CDC classification using the CD4 count and clinical symptoms.

Only sedentary (no involvement in a regular exercise program defined as two or more structured exercise sessions weekly for more than or equal to six months prior to enrolment) female adults living with HIV/AIDS participated in the study.

The instrument that was used is an adaptation of ACSM (2009) exercise training protocol. The training protocol was as follows:

Medical laboratory scientists of the Department of Medical Laboratory Science of UBTH collected blood samples from the participants. The blood samples were collected with tripotassiumethylene diaminetetracetic acid (K3EDTA) bottles for analysis of full blood count and lipid profile of the participants. These evaluations were performed at baseline and after the 6th week of the exercise training by the same medical laboratory scientists in order to minimize error and ensure reliability. The blood samples were collected from the participants in the morning following an overnight fast of 10-12 hours.

This was carried out on a stationary bicycle ergometer for duration of 20 minutes at 60% of target heart rate due to the fact that individuals who are HIV-seropositive easily fatigue. The participants were instructed to sit upright on the bicycle ergometer, with the feet on the pedals. The participants were instructed to ride the bicycle as fast as he/she could for 15 minutes. The session ended with a 5-minute recovery and relaxation phase. In order to counter the effect of adaptation, the intensity of the exercise was increased by 10% after 3 weeks of training.

Free weights in the form of dumbbells and ankle weights was used for upper and lower limbs' strengthening using 60% of 10 Repetition Maximum (RM). RM is the heaviest weight that can be

successfully lifted 10 times before fatiguing. Each exercise was done at the dosage of 3 sets of 10 repetitions with 30 seconds rest between each set. The session ended with a 5-minute recovery and relaxation phase. In order to counter the effect of adaptation, the intensity of the exercise was also increased by 10% after 3 weeks of training. Meanwhile, subjects in the control group were instructed to continue their normal routine and not participate in any formal exercise program for the duration of the 6-week study.

Inferential statistics of analysis of variance (ANOVA) was used to test the hypotheses. Where there were significances, Tukey's LSD Post-hoc analysis was used to identify the source of significant

difference. Statistical significance was set as p-value of <0.05.

Results

Table 2 presents the results for hypotheses 1 to 4 showing ANOVA analysis of the lipid profile of participants. It shows that the F ratio of HDL and triglycerides were significant ($F=5.789, 4.127$; $p<0.05$) while it was not significant for total cholesterol and LDL ($F=2.181, 0.981$; $p>0.05$). Thus, the null hypotheses 1 and 3 were accepted while the null hypotheses 2 and 4 were rejected. LSD post hoc analysis was performed to ascertain where the significant differences occurred (Table 2).

Table 2. Differences between groups and multiple comparisons

Variable	Pre-Experimental ^a (n=25)	Post- Experimental ^b (n=25)	Pre- Control ^c (n=19)	Post- Control ^d (n=19)	F	p
	M±SD	M±SD	M±SD	M±SD		
Total Cholesterol	209.52±52.61	184.04±37.90	175.74±47.25	180.89±58.11	2.181	0.096
HDL	67.68±16.35 ^d	58.84±18.14 ^d	56.42±14.65 ^d	43.68±26.05 ^{a,b,c}	5.789	0.001
LDL	117.80±38.42	115.68±36.80	99.26±30.67	114.00±46.34	0.981	0.406
Triglycerides	115.24±47.27 ^{b,c,d}	92.68±36.02 ^a	80.36±34.68 ^a	82.47±25.21 ^a	4.127	0.009

different from: **a** Pre-Experimental; **b** Post-Experimental; **c** Pre-Control; **d** Post-Control

Same table shows the Tukey's LSD post hoc analysis of the lipid profile of the control and experimental groups prior to and after 6 weeks exercise training. It shows that the mean difference of HDL in the pre-control versus pre-experimental groups and the pre-experimental versus post-experimental groups had significantly different mean difference. Therefore, it was concluded that there was no significant effect of the 6-week exercise training on the HDL of female HIV-seropositive patients.

It also shows that the mean difference of triglycerides was significantly different in the pre-control versus pre-experimental groups and pre-experimental versus post-experimental groups while there was no significant difference in the mean difference of triglycerides of pre-control versus post-control groups and post-control versus post-experimental groups. Therefore, it was concluded that 6-week aerobic and resistance training significantly altered the triglycerides of female HIV-seropositive patients.

Discussion

Changes in lipid profile of female HIV-seropositive patients following six weeks of aerobic and resistance exercise training was assessed in this study. The results of the study showed that exercise training did not affect total cholesterol and LDL significantly. However, there was statistically significant effect on HDL and triglycerides. This agrees with Maduagwu et al (2015) who reported significant improvement in the lipid profile of HIV infected persons following 12 weeks of aerobic training programme. Garcia et al (2014) also reported an increase in HDL cholesterol following combined exercise training. Terry et al (2006) however reported insignificant changes in triglycerides, total cholesterol and HDL after 12 weeks of aerobic training. Tiozzo et al (2013) following their study believed that the insignificant changes in the lipid profile of their participants after 12 weeks of training could be due to the fact that the participants were not dyslipidaemic at baseline. That is unlike this study in which the participants had baseline dyslipidaemia. Therefore, the significant

changes in lipid profile observed in this study could be due to baseline dyslipidaemia which is not unexpected in PLWHA whether they are on HAART or not. Changes in blood lipids is expected to occur naturally during the course of HIV infection resulting in early reduction in both total cholesterol and HDL cholesterol with subsequent reduction in triglycerides (Sellmeyer & Grunfeld, 1996). Thus, assessment of HIV infected person's lipid profile is important because it has also been shown in some studies that intake of HAART results in increase in cholesterol (Denué et al., 2013). In fact, Denué and colleagues found that abnormality of serum lipid is common and showed female preponderance among treatment-naïve HIV patients in Maiduguri. It has been observed that an HDL increase is associated with a significant decrease in mortality from coronary heart disease independent of changes in LDL (Denué et al., 2013).

Conclusion

Based on the results that elicited from this study, it was concluded that high density lipoprotein and triglycerides of female HIV-seropositive patients were significantly improved following short duration exercise training programme.

Recommendations

It is therefore recommended that health care team should acknowledge the health benefits of exercise to HIV patients in order to improve their quality of life and appropriate recommendation/referrals should be made to exercise specialists such as human kinetics professionals and physiotherapists;

Also, exercise is safe when prescribed by qualified professionals and it improves several components of subjects health, they should include exercise in their routine care.

References

- Bhattacharjee, A. (2012). *Social science research: Principles, methods and practices (2nd Edition)*. Textbooks Collection. Book **Error! Hyperlink reference not valid.** Accessed on 23rd March, 2019.
- Bopp, C.M., Phillips, K.D., Fulk, L.J. & Hand, G.A. (2003). Clinical implications of therapeutic exercise in

- HIV/AIDS. *Journal of Association of Nurses AIDS Care*, 14(1),73-8.
- Ciccolo, J.T., Jowers, E.M. & Bartholomew, J.B. (2004). The Benefits of Exercise Training for Quality of Life in HIV/AIDS in the Post-HAART Era. *Sports Medicine*, 34(8), 487-499.
- Denué, B.A., Alkali, M.B., Abjah, A.U., Kida, I.M., Ajayi, B. & Fate, B.Z. (2013). Changes in lipid profile and other biochemical parameters in HIV-1 infected patients newly commenced on HAART regimen. *Infectious Diseases: Research and Treatment*, 6, 7-14
- Garcia, A., Fraga, G.A., Vieira, R.C., Silva, C.M.S., Trombeta, J.C., Navalta, J.W., Prestes, J. & Voltarelli, F.A. (2014). Effect of combined exercise training on immunological, physical and biochemical parameters in individuals with HIV/AIDS. *Journal of Sports Sciences*, 32(8), 785-792.
- Hand, G.A., Lysterly, G.W. & Jagers, J.R. (2009). Impact of aerobic and resistance exercise on the health of HIV infected persons. *American Journal of Lifestyle Medicine*. 3, 489-499.
- Maduagwu, S.M., Kaidal, A., Gashau, W., Balami, A., Ojiakor, A.C., Denué, B.A. & Kida, I. (2015). Effect of Aerobic Exercise on CD4 Cell Count and Lipid Profile of HIV Infected Persons in North Eastern Nigeria. *Journal of AIDS Clinical Research*. 6,508.
- Sellmeyer, D.E. & Grunfeld, C. (1996). Endocrine and metabolic disturbances in human immunodeficiency virus infection and the acquired immune deficiency syndrome. *Endocrine Review*, 17(5), 518–32.
- Terry, L., Sprinz, E., Stein, R., Medeiros, N.B., Oliveira, J. & Ribeiro, J.P. (2006). Exercise training in HIV-1-infected individuals with dyslipidemia and lipodystrophy. *Medical Science of Sports and Exercise*. 38, 411-417.
- Tiozzo, E., Jayaweera, D., Rodriguez, A., Konefal, J., Melillo, A.B., Dawn, S. et al. (2013). Short-term combined exercise training improves the health of HIV-infected patients. *Journal of AIDS and HIV Research*, 5(3), 80-89.

How to cite this article:

- Agbonlahor, E., & Kubeyinj, O. S. (2020). Lipid profile alterations following aerobic and resistance training programmes among HIV- seropositive female patients. *Exercise and Quality of Life*, 12(1), 15-20.
doi:10.31382/eqol.200602
- APA:
- Agbonlahor, Elvis I. and Oluwaseun Susan Kubeyinj. "Lipid profile alterations following aerobic and resistance training programmes among HIV-seropositive female patients." *Exercise and Quality of Life* 12.1 (2020): 15-20.
- MLA:
- Agbonlahor, Elvis I., and Oluwaseun Susan Kubeyinj. "Lipid profile alterations following aerobic and resistance training programmes among HIV-seropositive female patients." *Exercise and Quality of Life* 12, no. 1 (2020): 15-20.
- Chicago: