DOI: https://doi.org/10.67203/jhpesls.2024.lk3apx5q

Journal of Health, Physical Education, Sports and Leisure Studies, Vol. 8, No. 2, Jan., 2024

ASSESSMENT OF THE EFFECT OF STEP AEROBICS ON TRIGLYCERIDE LEVEL OF OVERWEIGHT FEMALE ADOLESCENTS IN GINDIRI, PLATEAU STATE, NIGERIA

BY

Chollom Dung WASH[1];
C. E. Dikki[2]; J.A. Gwani[2] & E.A. Gunen[2]
[1]Department of Physical and Health Education, College of Education Gindiri, Plateau State,
[2]Department of Human Kinetics and Health Education, ABU Zaria
chollonwash@gmail.com

Abstract

This study assessed the effect of step aerobics on triglyceride level of overweight female adolescents in Gindiri, Plateau state, Nigeria. One group repeated measure experimental research design was used. Sixteen (16) overweight female adolescents who were between the ages of 14 and16 years volunteered to participate in the study. The participants were subjected to 8-week step aerobics performed three times a week on alternate days. The training intensity was maintained at between 45% and 50% of heart rate reserve (HRR) and 50% to 55% HRR at the first 4 weeks and 5th – 8th week respectively. The Borg's rate of perceived exertion (RPE) scale was used to monitor the rate of exertion throughout the training period. The enzymatic colorimetric method was used to measure the concentration of triglyceride in fasting serum of the participants. Triglyceride concentration was measured at baseline, immediately after the 4th week and 8th week respectively. Descriptive statistics were used to analyze the demographic data of the participant. Repeated-measures Analysis of Variance (ANOVA) was used to test the hypothesis at 0.05 level of significance using Statistical Package of Social Sciences (SPSS) version 23. The result of the study revealed significant decrease in triglyceride level of the participants due to 8-week step aerobics (*p* - 0.000). It was concluded that moderate intensity step aerobics performed at 45% -55% HRR three times a week on alternate days for a period of 8 weeks had significant effect on triglyceride level of overweight female adolescents in Gindiri, Plateau State, Nigeria. It was recommended that overweight female adolescents should be involved in regular step aerobics to achieve desirable weight overtime and enjoy greater protection from cardiovascular diseases.

Key words: Female, Adolescents, Heart rate reserve, Moderate intensity, Overweight, Step aerobics. Triglyceride level.

Introduction

Research evidence showed that puberty is a period of physiological change in adolescents characterised by a decrease in insulin sensitivity and that insulin insensitivity is the major

mechanism in the development of metabolic syndrome (MS) (Kelsey & Zeitler, 2016, Vukovic, Milenkovic, Mitrovic, Todorovic, Plavic, Vokovic & Zdravkovic, 2015). MSis a universal term used to indicate that an individual has three out of the following five risk factors: visceral adiposity, high blood pressure, high glucose level, high triglyceride level and low high-density lipoprotein cholesterol (HDL-C) level (Magge, Goodman, & Armstrong 2017).

Triglyceride (TG) also known as "lipids" anessential fat transported in the bloodstream with cholesterol, each molecule of TG contains three fatty acids. TG is among the main source of energy in our diet and constitute a critical component of the lipoprotein energy distribution system (Berglund, Sacks & Brunzell, 2013). The body forms it from the food we consume. People who have elevated serum of TG are more likely to become overweight and may develop cardiovascular problems due to elevated cholesterol levels. Elevated serum of TG and TGrich lipoproteins (TGRL) are associated with cardiovascular disease (CVD) independent of low-density lipoprotein-cholesterol(LDL-C) (Prenner, Mulvey, Ferguson, Rickels, Bhatt, & Reilly, 2014). According to Memon, Shaikh, Memon. and Majeed (2017), high TG and low HDL-C are considered as dyslipidaemia and are independently associated with hypertension or other cardio metabolic risk factors. This dyslipidaemia state is described as atherogenic dyslipidaemia which has been found to be associated with coronary heart disease (CHD) among overweight and obese people with Type II Diabetes Mellitus (TIIDM). This has been confirmed in large prospective researches like the UK Prospective Diabetes Study (American Diabetes Association, 2012). Having fasting TG level above 1.7 mmol/l is abnormal and is associated with CVD(Berglund, Sacks& Brunzell,2013).Han, Nicholls, Sakuma, Zhao and Koh (2016), reported that hypertriglyceridemia is having high levels of TG which is the major cause of atherosclerosis and CVD. They further explained that plaques are formed in the intima of the blood vessels because the cholesterol contents of triglyceride are not degraded by cells .

Storing excess energy in the body with little energy expenditure for a long-time result in overweight (Teo, Nurul-Fadhilah, Aziz, Hills & Foo, 2014). The primary way to maintain a negative energy balance is through maintaining a healthy diet and increasing physical activity. Plasticity and lifelong habits are formed during adolescence (Hochberg, 2011). Most parents today give their wards extra money to supplement their feeding while in school. These students use this money to buy energy dense food, high in saturated fat and sweetened beverages which are cheap and are common in the immediate environment rather than traditional diets which are wholesome and healthy. Taking energy dense food for a long period of time with little or no exposure to regular physical activity to burn the excess energy often result to positive energy balance ,the surplus is stored as fat in the muscles as TG, which may cause an increase in body weight. Due to the increase in weight of female adolescents observed over the years in Girls High School Gindiri, Plateau State, Nigeria, the school management has provided sporting facilities and equipment to promote active life style among the students to reduce the incidences of overweight. Despite these measures, some of the students are still overweight because they are not involved in any type of physical activity regularly to increase their metabolic rate.

Step aerobics is an aerobic workout that involves stepping up and down on a platform or bench according to the cadence of a music. People of all fitness levels can engage in it because the height of the step bench can be modified to suit one's fitness level *(Nikić&Milenkovic, 2013)*.Step aerobics could be beneficial particularly to those who desire to improve their body composition and $V0_{2max.}$ Therefore, this study investigated the effect of step aerobics on triglyceride level of overweight female adolescents in Gindiri Plateau State, Nigeria

Methodology

In this study, one group repeated measure experimental research design was used. With this design the participants were assessed at three(3) different intervals at baseline, first and second levels of exercise intensity. In the first exercise level, the participants performed step aerobics exercise on a bench height of 10.16cm at an intensity of 45% - 50% HRR for 4 weeks. While in the second exercise level, the participants performed step aerobics exercise on a bench height of 12.7cm at an intensity of 50% -55% HRR for another 4 weeks making a total of 8 weeks.

The population of the study consisted of twenty-four (24) overweight female adolescent students of Girls High School Gindiri, Plateau Sate, Nigeria with BMI range of 25 kg/m^2 to 29.9 kg/m^2 and were 14 to 16 years old. Purposive sampling technique was used to sample nineteen (19) overweight female adolescents from the overweight student's population. The 19 overweight female adolescents volunteered to participate in the study and 3 out of the 19 participants could not continue with the training after the 4^{th} week. Only sixteen (16) participants complete the routine exercise period. Informed consent form was willingly signed by every participant. The principal of the school who is a custodian of the students signed as a witness on behalf of their parents. Ethical approval with approval No. ABUCUHSR/2023/013 was obtained from the ethical committee of Ahmadu Bello University, Zaria to conduct the study.

The participants did an overnight fast of 8 to 10 hours and 5ml of blood was taken from the cubital vein at baseline, immediately after the 4^{th} and 8^{th} week respectively. The sample stayed for at least 30-45 minutes to clot and was spun at 4000 revolutions per minute for 5 minutes. Pasteur's pipettes were used to separate the serum into plain (Z5) labelled containers and were transported in ice-packed flask within one hour to the chemical pathology laboratory at Jos University Teaching Hospital for triglyceride assay. A clinical chemical analyzer COBAS C111Rotkreuz, Switzerland was used for the assay of TG of the participants. The analyzer uses enzymatic colorimetric method to measure the concentration of TG in fasting serum.

Results

The descriptive statistics of mean, standard deviation and standard error of triglyceride level of the participants is presented in Table 1.

Table 1 Descriptive Statistics of Mean, Standard Deviation and Standard Error of TG Level of the Participants

Variable	Duration	N	Mean	SD	SE
Triglycerides Level	Baseline	16	0.97	0.40	0.10
	4th Week	16	0.73	0.24	0.06
	8th Week	16	0.59	0.24	0.59

Table 1 shows the means, standard deviations and standard error of triglyceride level of overweight female adolescents at baseline, immediately after the 4th and 8th week of step aerobics training. The results showed that the participants had mean triglyceride level of 0.97± 0.40, 0.7 3±0 .24 and 0.59 ± 0.24 at baseline, 4th and 8th week of training respectively. The triglyceride level was observed to have reduced from baseline to the 4th and 8th week of step aerobics respectively. This implies that the 8weeks moderate intensity step aerobics training reduced triglyceride level of overweight female participants.

To test if this reduction is significant the data is subjected to repeated measure analysis of variance and is presented in Table 2.

Table 2 Repeated-Measures Analysis of Variance on TG of Overweight Female Adolescents

Source		Type III Sum of Squares	df	Mean Square	F	Sig.	Remark
Training	Sphericity Assumed	1.213	2	.607	25.883	.000	Sig
	Greenhouse-Geisser	1.213	1.379	.880	25.883	.000	Sig
	Huynh-Feldt	1.213	1.473	.824	25.883	.000	Sig
	Lower-bound	1.213	1.000	1.213	25.883	.000	Sig
Error (Training)	Sphericity Assumed	.703	30	.023			
	Greenhouse-Geisser	.703	20.690	.034			
	Huynh-Feldt	.703	22.101	.032			
	Lower-bound	.703	15.000	.047			

Table 2 shows the results of the repeated-measures analysis of variance on triglyceride level of overweight female adolescents in Gindiri, Plateau State, Nigeria. The analysis revealed that the training had statistically significant reduction on triglyceride level of the participants (p = 0.000) at an alpha level of 0.05. Therefore, the null hypothesis which states that there is no significant effect of step aerobics on triglyceride level of overweight female adolescents in Gindiri, Plateau State, Nigeria was rejected. This implies that

moderate intensity step aerobics performed regularly can decrease triglyceride level of overweight female adolescents.

Discussion

The purpose of this study was to assess the effect of step aerobics on triglyceride level of overweight female adolescents in Gindiri, Plateau State, Nigeria. Sixteen (16) female adolescents with mean age of 14.81 years, mean weight 69.94.kg and mean height 1.56m participated in the study. The finding of this study on the effect of step aerobics on TG level of overweight female adolescents in Girls High School, Gindiri showed significant reduction of 0.38mmol/l of TG after eight weeks of moderate step aerobics of overweight female adolescents ($p = 0.000 < 0.05$). This finding greed with the results of Selcuk *et al.,* (2017), who reported significant decrease in TG level of young women who participated in six -week step aerobics. The training was performed at an intensity of 50%-60% HRR for 30 minutes each session for three days alternately in a week. The result of this study also supports the findings of Ceylan, Irez and Saygin (2014) who reported significant decrease in TG level of overweight female students who participated either in aerobics dance or step aerobics two times a week for 12 weeks. After the 12thweek of training there was decrease in TG level in both aerobics dance and step aerobics group. However, significant reduction was found in the step aerobics group only.

The result of this study also supports the study of Kolukisa, Baskan and Baskan (2019), who reported significant decrease in TG level of sedentary women who were involved in 12 weeks aerobics training. The training sessions were performed for 60 minutes three times a week at an exercise intensity of 130-140 beats per minute. The 12 weeks step aerobics significantly reduced the TG level of the participants. In this study the participants were overweight female adolescents who participated in eight weeks step aerobics three times a week at moderate intensity of45% - 55% HRR. The participants target heart rate was between 133-140 beats per minute which significantly decreased their TG level. This result is in line with the findings of Imamoglu, Akyol and Satici (2017), who reported significant reduction in TC and TG levels of sedentary healthy young women who participated either in step aerobics or step aerobics plus weight lifting training. The two groups participated in 12-week training and each training session lasted 60minutes performed 3 times a week on alternate days. The training intensity was maintained between 45% and 55% HRR while the heart rate was maintained between 130 and 140 beats per minute. In their study one of the groups performed step aerobics plus weight lifting while in this study the participants performed step aerobics only. In their study the participants were healthy sedentary young women while in this study the participants were overweight female adolescents. In their study the training lasted for 12 weeks but in this study the training was performed for 8 weeks. In both studies the training sessions lasted 60minutes performed 3 times on alternate days of the week with the same intensity of 45% - 55% HRR which reduced TG level of the participants significantly.

Conclusion

Based on the findings of this study after participating in step aerobics training three times a week on alternate days for 8-weeks at a moderate intensity of 45-55% HRR lasting between 55 and 60 minutes per session, it was concluded that there was reduction in triglyceride level of overweight female adolescents who participated in the programme.

Recommendations

Based on the findings of this study, the following recommendations are made:

1. Since moderate intensity step aerobics was found to decrease triglyceride level of overweight female adolescents after 8-weeks of training. Physical education teachers should create awareness on the efficacy of regular involvement in moderate intensity step aerobics in preventing early onset of cardiovascular diseases in overweight female adolescents in schools.

2. Exercise and sport scientist and fitness providers should recommend moderate intensity step aerobics to their clients who are overweight female adolescents to decrease their triglyceride level.

References

American Diabetes Association. (2012). Standards of medical care in diabetes. *Diabetes Care* 35(1): 1- 63.

Berglund, F., Sacks, F &Brunzell, J. D.(2013). Risk factors for cardiovascular disease: renewed interest in triglycerides, *Clinical Lipidology*, 8(1): 1-4

Ceylan, H. İ., Babayiğitİrez, G., &Saygın, Ö. (2014). Examining of the effects of aerobic dance and step dance exercises on some hematological parameters and blood lipids. *International Journal of Human Sciences*, *11*(2): 980-991.

Han, S.H., Nicholls, S.J., Sakuma, I., Zhao, D & Koh, K.K., (2016).Hypertriglyceridaemia and cardiovascular diseases: *Revisited Korean Circulation Journal,* 46(2): 135-144

Hochberg, Z. (2011). Developmental plasticity in child growth and maturation. *Frontiers in Endocrinology,* 41(2):1-6.

İmamoğlu, O., Akyol, P. &Satici, A. (2017). Effects of aerobic exercise and weight-lifting plus aerobic exercise on blood pressure, blood serum lipids and lipoproteins of sedentary females. *European Journal of Physical Education and Sport Science*, 3(11): 194-205.

Kelsey,M.M & Zeitler,P.S (2016) Insulin Resistance of Puberty *Current DiabetesReport*16(7): 64 - 73

Kolukısa, S., Başkan, A.H.&Başkan, A.H. (2019). Investigation of the effects of cardiovascular and aerobic exercises on body composition and blood parameters in sedentary women.*European Journal of Physical Education and Sport Science*, 5(5):84-94.

Magge S.N, Goodman E&Armstrong SC (2017). The metabolic syndrome in children and adolescents: Shifting the focus to cardiometabolic risk factor clustering. *Pediatrics.* 140(2): e20171603. Doi. 1542/peds.2017-1603.

Memon, A.R., Shaikh, F., Mamon, Z, A & Majeed, A. B. (2017). Assessment of lipid profile and Serum total protein in patients of hypertension. *Annals Pakistan Insttitute of Medical Science,* 13(2):246-248

Nikić.N D &Milenkovic, D. (2013). Efficiency of step aerobics programme in younger women. ActaMedicaMedianae,52 (3): 25-

Prenner, S B, Mulvey,C.K, Ferguson, J.F., Rickels, M. R, Bhatt,A. B., Muredach, P. & Reilly, M.P.(2014) Very low-density lipoprotein cholesterol associates with coronary. artery calcification in type 2 diabetes beyond circulating levels of triglycerides *Atherosclerosis*; 236 (2): 244–250.

Selcuk, M., Tamur, H. B., Oner, S.&Kinaci, E. (2017). The effects of six-week aerobic exercise programme on body composition and blood lipids in women. *European Journal of Education Studies* 3(10):https.//oapub.org/edu/index.php/ejes/article/review/1163. Assessed 06 June 2019

Teo, P.S., Nurul-Fadhilah, A., Aziz, M.E., Hills, A. P. & Foo, L. H. (2014). Lifestyle practices and obesity in Malaysian adolescents. *International Journal of Environmental Research and Public Health*, 11: 5828-583

Vukovic, R, Milenkovic, T., Mitrovic, K., Todorovic. S., Plavic, L., Vocovic, A., & Zdravkov, C. (2015) Preserved insulin sensitivity predicts metabolically healthy obese phenotype in children and adolescents. *European Journal of Paediatrics*, 174 (12): 1649–1655