SUST
Journal of Natural and Medical Sciences
Journal homepage:
http://Scientific-journal.sustech.edu/

Assessment of Serum Cholesterol Profile among Healthy Individuals Sudanese under Regular Exercise

AbdElkarim A. Abdrabo[1], Awil M. Elmi[2], Abdillahi A.Mohamed[2], Aisha A.Sheikh Hassan[2], GadAllah Modawe[3*]AlneelainUniversity, Faculty of Medical LaboratorySciences, ClinicalChemistry Department, Khartoum, Sudan International[1] .University of Africa, Faculty of Medical Laboratory Sciences, Department of Clinical Chemistry, Khartoum, Sudan[2].Omdurman Islamic University, Faculty of Medicine and Health Sciences, Biochemistry Department, Omdurman, Sudan[3]. Corresponding author: gadobio77@hotmail.com.

Abstract

Background: Physical activity as an Independent factor Causes change sinserumlipidsprofileinadultsandmayprotecttheblood tubes from the heart from the creation and construction, of plaque rich in triglycerideand cholesterol.

Objective: The study aimed to evaluate serum cholesterol profile among healthy Sudanese individuals under regular exercises at Khartoum state.

Materials and Methods: Analytical case-control study was done in Khartoum state, during the period from March to July 2020.A hundred subjects enrolled in the study, 50 healthy males have regular physical exercise as case group and other 50 healthy male volunteers haven'tphysical exercise as a control grouptheir age ranged between 18 to 45 years with mean 40 years.The cholesterol profiles were estimated by enzymatic methods using spectrophotometers. The data were analyzed using the SPSS version (25).

Results: The age ranged between 18 and 26 years for the case and control group. The common length time of exercise was less than one year. The serum total cholesterol and LDL-C were significantly lowered in the case than a control group, while the serum HDL-C was significantly higher in the case than the control group.

Conclusion: Regular Exercises had lower serum cholesterol and higher serum HDL-C is important to prevent harm from being overweight and disease of the heart and blood vessels.

Keywords: regular exercises, serum cholesterol, Obesity, Sudanese.

Introduction

Regular exercise causes desirable improvements in plasma lipid levels, according to observational and experimental studies (Halverstadt*et al*., 2007), In addition to causing beneficial effects on total cholesterol and its low-density and very-low-density fractions (LDL and VLDL, respectively), a rise in HDL and a decrease in TG showed to cause beneficial effects on total cholesterol and its low-density and very-low-density fractions (Kraus *et al*., 2002, de Munter*et al*.,2011). The impact of physical activity on HDL and cholesterol levels does not appear to be affected by changes in weight or diet (Romero *et al*., 2013). Physical activity is thought to increase lipase lipoprotein and lecithin cholesterol acyltransferase activity while decreasing hepatic lipase and cholesterol esterified transfer protein activity, both of which are components of reverse cholesterol transport (Lehmann *et al*., 2001).

Despite the well-known benefits of exercise, there are disagreements about which aspect of exercise is more important for improving lipid profile, intensity of exercise (Braun and Rosenson, 2015), frequency (King *et al*., 1995, Kodama *et al*., 2007)length of time (O'Donovan *et al*., 2005)or a combination of intensity and frequency (Braun and Rosenson, 2015). The purpose of the study was to evaluate the serum cholesterol profile among healthy Sudanese under regular exercise.

Materials and Methods

Study population: Analytical cross-sectional study was done in Khartoum city, during the period from March to July 2020. A hundred subjects were enrolled in the study, 50 healthy males have regular physical exercise as case group and other 50 healthy male volunteers havent physical exercise as a control group, the age ranged between 18 to 45 years with their mean 40 years.

Inclusion and exclusion criteria: Sudanese health volunteers with regular physical exercise**,** healthy people who do regular physical exercise. Subjects suffering from any diseases that influence lipid levels such as Diabetes mellitus, obesity, hypothyroidism, hypertension, smoking, and drinking alcohol were excluded.

Sampling and data collection: The sample was collected randomly from Khartoum state. The collection included 50 volunteers and 50 under regular exercise, the data were collected using a questionnaire.The cholesterol profiles were estimated by enzymatic methods using spectrophotometers.

Ethical consideration: Permission to carry out this research was obtained from the department of clinical chemistry, International University of Africa.

Data analysis: The statistical analysis was performed with the computer program known as the statistical package for social science (SPSS) version (25). T.test was used to compare between means. Also for correlation, the Persons correlation test was used.

Results

The age groups were matched in case and control. The common age of the case and control ranged between 18 to 26 years, in case 33(66 %) versus in control 24(48 %). The age ranged between 27 to 35 years, in case 16(32 %) versus in control 18(36 %). The age ranged between 36 to 45 years, in case 1(2 %), versus in control 8(16%), were presented in table 1. The duration of exercise in the case group followed, less than 1yeas 28(56.0 %), 1 to 5years 10(20.0 %), 6 to 10years 2 (4.0 %), and more than 10years 10(20%), were presented in table 2. The (mean±SD) of serum cholesterol, LDL-C and HDL-C in the case of the group respectively were (167.34 ± 46.81mg/dl, 98.58 ± 48.30mgdl, 45.52 ± 7.75mgdl). While the (mean±SD) of serum cholesterol, LDL-C, and HDL-C in the control group respectively were (146.45 ± 35.19mgdl, 74.68 ± 29.32mg/dl, 60.54 ± 18.85mgdl). The serum total cholesterol and LDL-C were significantly lowered respectively in the case then the control group with a p-value (0.029, 0.006), while the serum HDL-C was significantly higher in the case than the control group with a p-value (0.000), were presented in table 3. Their no association between serum cholesterol profile and duration of exercise in the case group was presented in table 4.

Table (1):The age groups from the study population

Age	**Case**		**Control**	
	Frequency	Percent	Frequency	Percent
18 - 26 year	33	66 %	24	48 %
27 - 35 years	16	32 %	18	36 %
36 - 45 years	1	2 %	8	16 %
Total	50	100%	50	100%

Table (2):The duration of exercise in case group (regular exercise)

Duration	**Frequency**	**Percent**
1years	28	56.0 %
1 - 5years	10	20.0 %
6 - 10years	2	4.0 %
more than 10years	10	20.0 %
Total	50	100.0 %

Table (3):The (mean±SD) of cholesterol profile among the study population

Parameters mg/dl (mean ± SD)	**Control n=50**	**Case N=50**	**P-value**
Total cholesterol(mg/dl)	167.34 ± 46.81	146.45 ± 35.19	0.029
LDL-C(mg/dl)	98.58 ± 48.30	74.68 ± 29.32	0.006
HDL-C(mg/dl)	45.52 ± 7.75	60.54 ± 18.85	0.000

Table (4): Correlations between duration of regular exercise and cholesterol parameters.

Lipids parameter		Cholesterol mg/dl	LDL mg/dl	HDL mg/dl
Duration	Pearson Correlation	r= 0.087	r= -0.042	r= 0.080
	Significant	P= 0.548	P = 0.772	P = 0.581
	N	50	50	50

Discussion

The serum total cholesterol and LDL-C were significantly much lowerin subjects with physical activity than without physical activity, while the serum HDL-C was significantly higher in people with regular exercise compared without regular exercise. Our findings corroborate those found in HDL studies, In research on physical fitness, an increase in HDL levels is more common than a decrease in total cholesterol or LDL levels (Durstine *etal*., 2002). Unlike research that found that the amount of exercise, rather than the strength of the exercise, determined a greater difference in plasma lipoprotein concentrations, this study found that the amount of exercise, rather than the intensity of the exercise, determined a greater difference in plasma lipoprotein concentrations (Wood *et al*., 1983, Kokkinos *et al*., 1995, Kodama *et al*., 2007). Cross-sectional research of 12,688 participants from the Brazilian Longitudinal Study of Adult Health was close to ours (Silva *et al*., 2016).Although the mechanism of exercise-induced lipid changes is unclear, exercise itself may increase blood lipid consumption hence decreasing lipids levels (Earnest *et al*., 2013). The liver X receptor (LXR) is a nuclear receptor transcription factor that plays an important role in cholesterol metabolism in the liver Low-intensity exercise resulted in a substantial increase in LXR expression in humans, according to a report.

(Butcher *et al*., 2008). Similar parameters study showed that LXRα expression was significantly elevated 2.8 fold in exercised rats than the control group (Kazeminasab *et al*., 2017),LXR has been shown to play a role in controlling ABCA1 expression. As a result, exercise can boost the reverse cholesterol transport process by inducing higher LXR and ABCA1, resulting in higher plasma HDL-C levels. According to George *et al*., 2005, the mean total cholesterol level in the case group is substantially lower than in the control group. (Montoye *et al*., 1959, George *et al*., 2005),According to George and Kristi who find a decrease in blood total cholesterol and a slightly lower mean LDL level in the case group relative to the control group (Harley *et al*., 1980), According to G. Harley Hartung and William G. Squires, the mean HDL level in the case group is substantially higher than in the control group (Harley *et al*., 1980),there is no connection between lipid profile and exercise length, as shown by the correlation between lipid profile and exercise duration. The study findings indicate that health education, exercise, and diet management are essential factors in reducing body weight in obese subjects.

Conclusion: Regular Exercises had lower serum cholesterol and higher serum HDL-Cand also had acted to prevent harm frombeing very overweight and disease of the heart and blood vessels.

References

Braun LT, Rosenson RS. Freeman MW, editor; Waltham MA. (2015). Effects of exercise on lipoproteins and hemostatic factors. Available from: http://www.curenarm.net/UPTODATE/contents/mobipreview.htm?11/49/120063?source=see_link.

Butcher LR, Thomas A, BackxK(2008). Low-intensity exercise exerts beneficial effects on plasma lipids via PPARgamma. Med Sci Sports Exerc. Jul;40(7):1263–70.

deMunter JS, van Valkengoed IG, Stronks K, Agyemang C.(2011).Total physical activity might not be a good measure in the relationship with HDL cholesterol and triglycerides in a multi-ethnic population: a cross-sectional study. Lipids Health Dis. 10:223.

Durstine JL, Grandjean PW, Cox CA, Thompson PD. (2002).Lipids, lipoproteins, and exercise. J CardiopulmRehabil.22(6):385-98.

Earnest CP, Artero EG, Sui X.(2013). Maximal estimated cardiorespiratory fitness, cardiometabolic risk factors, and metabolic syndrome in the aerobics center longitudinal study. Mayo Clin Proc.;88(3):259–70

George A.K and Kristi S.K. (2005). Aerobic exercise and lipids and lipoproteins in men: a meta-analysis of randomized controlled trials. J Mens Health Gend .;3(1):61-70. doi:10.1016/j.jmhg.2005.09.003.

Halverstadt A, Phares DA, Wilund KR, Goldberg AP, Hagberg JM. (2007). Endurance exercise training raises high-density lipoprotein cholesterol and lowers small low-density lipoprotein and very-low-density lipoprotein independent of body fat phenotypes in older men and women. Metabolism.;56(4):444-50.

Harley Hartung& William G. Squires (1980).Exercise and HDL Cholesterol in Middle-Aged Men, The Physician, and Sportsmedicine, 8:1; 74-79.

Kazeminasab F, MarandiM,Ghaedi K.(2017).Effects of a 4-week aerobic exercise on lipid profile and expression of LXRα in rat liver. Cell J.;19(1):45–9.

King AC, Haskell WL, Young DR, Oka RK, Stefanick ML. (1995). Long-term effects of varying intensities and formats of physical activity on participation rates, fitness, and lipoproteins in men and women aged 50 to 65 years. Circulation. 91(10):2596-604.

Kodama S, Tanaka S, Saito K, Shu M, Sone Y, Onitake F.(2007). Effect of aerobic exercise training on serum levels of high-density lipoprotein cholesterol: a meta-analysis. Arch Intern Med. 167(10):999-1008.

Kokkinos PF, Holland JC, Narayan P, Colleran JA, Dotson CO, Papademetriou V. 1995. Miles run per week and high-density lipoprotein cholesterol levels in healthy, middle-aged men: a dose-response relationship. Arch Intern Med.; 155(4):415-20.

Kraus, W.E., Houmard, J.A., Duscha, B.D., Knetzger, K.J., Wharton, M.B., McCartney, J.S.(2002).Effects of the amount and intensity of exercise on plasma lipoproteins.New England Journal of Medicine, 347(19), pp.1483-1492.

Lehmann R, Engler H, Honegger R, Riesen W, Spinas GA. (2001). Alterations of lipolytic enzymes and high-density lipoprotein subfractions induced by physical activity in type 2 diabetes mellitus. Eur J ClinInvest.31(1):37-44.

Montoye, H.J., Van Huss , W.D., Brewer, W.D., Jone E.M., Ohlson, M.A., Mahoney, E. and Olson, H. (1959).The effects of exercise on blood cholesterol in middle-aged men. The american journal of clinical nutrition, 7(2), pp.139-145.

O'Donovan G, Owen A, Bird S, Kearney EM, Nevill AM, Jones DW.(2005). Changes in cardiorespiratory fitness and coronary heart disease risk factors following 24 wk of moderate- or high-intensity exercise of equal energy cost.JAppl Physiol.98(5):1619-25.

Romero Moraleda B, Morencos E, Peinado AB, Bermejo L, GomezCandela C, Benito PJ.(2013). PRONAF Study group. Can the exercise mode determine lipid profile improvements in obese patients? NutrHosp 28(3):607-17.

Silva, R.C.D., Diniz, M.D.F.H.S., Alvim, S., Vidigal, P.G., Fedeli, L.M.G. and Barreto, S.M. (2016). Physical activity and lipid profile in the ELSA-Brasil study. Arquivosbrasileiros de cardiologia, 107, pp.10-19.

Wood PD, Haskell WL, Blair SN, Williams PT, Krauss RM, Lindgren FT.(1983).Increased exercise level and plasma lipoprotein concentrations: a one-year, randomized, controlled study in sedentary, middle-aged men. Metabolism. 32(1):31-9.