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Original Article

Comparison of Lipid Profile of Sedentary Workers with the Athletes Undertaking Aerobic Exercises Regularly

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Abstract

Background: Incidence of cardiovascular disease has increased rapidly in India. Serum lipid levels are among the most important causative factors which in turn related to lifestyle of an individual.

Aim: This study was aimed to compare the lipid profile of sedentary workers with the athletes undertaking exercises regularly.

Materials and Methods: It was a cross sectional analytical study. It was undertaken among 150 adult males of age 20-50 years. Participants were selected on the basis history of regular exercise and apparently healthy adult males with no athletic or exercise activity for comparison. Known sufferers of hypertension, dyslipidemia or on anti-hyperlipidemic drugs were excluded. All five athletic clubs in district town of Birbhum were selected for data collection. Estimation of serum lipids was done at the biochemistry laboratory of the district hospitals.
Results: Mean total Cholesterol level (mg/dl) of the non-athletes (208.7 ± 30.7) was found to be more than athletes (197.3 ± 71.1) and the finding was statistically not significant (p = 0.21). Mean LDL level (mg/dl) non-athletes (131.5 ± 24.3) was found to be more than athletes (107.5 ± 15.5) and the finding was statistically significant (p=0.000).

Conclusion: Regular physical activity improves the HDL cholesterol which is known cardio-protective. Though the total cholesterol was lower in athletes compared to those with sedentary life style but the finding was not statistically significant. This study did include the diet history of the participants.

Key words: Lipid profile, Sedentary, Exercise

Introduction

Over the years the incidence of cardiovascular disease has increased manifold in India as well as the rest of the world. It has become a significant cause of morbidity and premature deaths worldwide.[1] Several risk factors are responsible for this increase including hyperlipidemia, aging, hypertension, smoking and diabetes. Hyperlipidaemia is described as an increase in the levels of lipids circulating in the blood, leading to the deposition of the same in blood vessels of the body particularly the coronary arteries. This contributes to the formation and atherosclerosis which is forerunner of cardiovascular disease.

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The American College of Sports Medicine (ACSM), 2013, defines exercise as a "planned, structured and repetitive bodily movement done to maintain or improve one or more components of physical fitness."[2] Exercise has been reported to decrease the incidence of cardiovascular disease primarily through a decrease in atherogenesis by favourably altering the lipid profile.[3] However; this effect varies considerably among exercise intervention studies.[4]

Several mechanisms, occurring simultaneously are responsible for the decrease in atherogenesis and cardiovascular disease in humans. The most consistent finding is an increase in the levels of HDL. HDL exerts its anti-atherogenic effect through the transport of cholesterol from the peripheral tissues (including arteries) directly to liver by a reverse cholesterol transport processes.[5,6]

The response of LDL to exercise is somewhat more complex and studies have reported inconsistent findings. While some studies have reported a decrease in the levels of LDL following exercise, others have failed to demonstrate the same. Exercise has also been shown to decrease the total cholesterol, triglyceride and ratio of total cholesterol to HDL-cholesterol. Body weight losses decrease cholesterol and triglyceride level and also lead to a decrease in cardiovascular risk. [7]

With this background the present study was carried out to compare the lipid profile of sedentary workers with the athletes undertaking aerobic exercises regularly.

Materials and Methods

It was an analytical study with cross sectional design. The study was undertaken in the Birbhum district of West Bengal. The study duration was 1 year (January 2016 to December 2016). Participants were 150 adult males aged 20-50 years. No female participants were available at those athletic clubs. Among them, 75 were athletes and involved in regular athletic or sports activity. Another comparison group of same number of apparently healthy adult males of sedentary workers (office workers) without any regular exercise and sports activities. Known suffers of hypertension, dyslipidemia or on anti-hyperlipidemic drugs for any reason and any diagnosed cardiovascular disease was excluded from the study.

The sample size is calculated based on the difference between two means, using the LDL levels of 125.30 in the sedentary group and 105.75 in the exercising group based on the study by Gandarpur ASK.[7] Considering a 95% confidence interval and a 80% power of the study the minimum calculated sample size was 74 in each group. The final sample contained 75 participants in each group.

All five athletic clubs in and around the district town of Birbhum were selected for data collection. Line listings were done for athletes and non-athletes of each club and 15 athletes were selected in athlete group and 15 non-athlete office staffs were randomly selected in non-athlete group for comparison from each of the clubs from those who gave consent for participation. Total 391 persons gave consent for participation in this study. Club-1 had 47 athletes and 30 non-athlete staffs who gave consent. Club-2 had 40 athletes and 31 non-athlete staffs who gave consent. Club-3 had 51 athletes and 34 non-athlete staffs who gave consent. Club-4 had 43 athletes and 30 non-athlete staffs who gave consent. Club-5 had 52 athletes and 33 non-athlete staffs who gave consent. Total 75 athletes and 75 non-athlete staffs were selected as study participants from 5 clubs. Total study participants for study were 150 comprising 75 athletes and 75 non-athletes.

Participants were intimated about the details of the study and their support and cooperation were sought. They were assured that their participation in the study is voluntary and confidentiality and anonymity of data were ensured. Data on exercising were collected by interviewing the respondents with the help of a predesigned and pretested schedule.

5 ml venous blood was collected from the ante-cubital vein of each subject after an overnight fast of 12-14 hours between 8am and 9 am in the laboratory. Serum was separated within one hour of the blood collection and stored at -20^{0}C until analyzed for lipid profile. Estimation of serum lipids by quantitative

EIA method using ERBA-XL-600 (Full auto Analyser) and ERBACHEM-5-B2 (Semi auto analyser) at the biochemistry laboratory of the Birbhum district hospitals using the same algorithm. Dietary history of the participants was not taken and may be considered as the limitation of the study.

Informed consent was taken from each and every participant after describing all the details of the study and they were assured about the confidentiality and anonymity.

Collected data were checked for consistency and completeness and were entered in Microsoft Excel data sheet. Data were organized and presented using the principles of descriptive statistics. Analysis was done using SPSS version 22 software. Independent sample T test was done to compare means of different values of serum lipid profiles between the two groups. These comparisons were also checked for statistical significance taking Confidence Interval (CI) of 95%.

The study was approved by the Institution Ethics Committee of Budwan Medical College and Hospital with the letter number BMC/PG/1216. Study subjects were also assured about the confidentiality and anonymity of the information and their consent was taken before examination.

Results

The Mean weight (in kg) of the non-athletes (74.4 ± 9.3) was found to be more than athletes (68.8 ± 7.2) and the finding was statistically significant (p = 0.000). Mean height (in meters) of athletes (2 ± 2.1) was found to be more than non-athletes (1.6 ± 0.1) though this finding was not statistically significant (P= 0.16) Mean BMI non-athletes (27.2 ± 4) was found to be more than athletes (25.2 ± 3) and the finding was statistically significant (p = 0.001). Mean Waist-Hip ration (WHR) non-athletes (0.9 ± 0.04) was found to be more than athletes (0.8 ± 0.08) and the finding was statistically significant (p = 0.009). Mean Abdominal skin-fold thickness (in millimetres) non-athletes (26.3 ± 2) was found to be more than athletes (24.3 ± 1.2) and the finding was statistically significant (p = 0.000). **(Table 1)**

Mean total Cholesterol level (mg/dl) of the non-athletes (208.7 ± 30.7) was found to be more than athletes (197.3 ± 71.1) and the finding was statistically not significant (p = 0.21). Mean Triglyceride level (mg/dl) of non-athletes (158.3 ± 32.2) was found to be more than athletes (139.1 ± 11.9) and this finding was statistically significant (P= 0.000). Mean LDL level (mg/dl) non-athletes (131.5 ± 24.3) was found to be more than athletes (107.5 ± 15.5) and the finding was statistically significant (p = 0.000). **(Table 2)**

Table 1: Comparison of physical characteristics and addiction among athletes and non-athletes

(n=150)

Variables of physical characteristics	Mean ± SD			t value	p value
	Population	Athlete	Non-athlete		
Mean age	31.8 ± 8	32 ± 8.3	31.7 ±7.8	.22	0.824
Weight	71.6 ± 8.8	68.8 ± 7.2	74.4 ± 9.3	-4.15	0.000*
Height	1.7 ± .1	1.7 ± .09	1.7 ± 0.1	0.16	0.78
BMI	26.2 ± 3.7	25.2 ± 3	27.2 ± 4	-3.6	0.001*
WHR	0.8 ± 0.08	0.8 ± 0.1	0.9 ± 0.04	-2.7	0.009*
Abdominal skin-fold thickness	25.3 ± 1.9	24.3 ± 1.2	26.3 ± 2	-7.4	0.000*
Smokers#	74 (49.3%)	19 (25.3%)	55(73.3%)	34.57##	0.000*
Alcohol#	81 (54%)	43 (57.3%)	38 (50.7%)	.67##	0.413

Proportions

Chi square test

*Statistically significant

Table 2: Comparison of Lipid profile among athletes and non-athletes (n=150)

Lipid profile (mg/dl)	Mean ± SD			t value	p value
	Population	Athlete	Non-athlete		
Total Cholesterol	202.9 ± 54.9	197.3 ± 71.1	208.7 ± 30.7	-1.28	0.21
Triglyceride	202.9 ± 54.9	139.1 ± 11..9	158.3 ± 32.2	-4.9	0.000*
LDL	119.5 ± 23.6	107.5 ± 15.5	131.5 ± 24.3	-7.2	0.000*
HDL	50.5 ± 7.9	53.8 ± 7.9	47.1 ± 6.5	-5.6	0.000*

Discussion

The aim of the present study was to examine the blood lipid levels of people engaged in regular physical activity with a cohort of age matched males with a sedentary lifestyle. Several changes that have been reported with exercise on the post-prandial lipid levels could not be elicited in the present study. The present study could not control for many confounders like weight, BMI, WHR, Abdominal skin fold thickness and smoking, these may have influenced the final results. Since all blood was collected in the empty stomach, only the relation between the fasting lipid levels and exercise could be elicited.

The mean HDL level (mg/dl) athletes were significantly more than non-athletes. HDL-C has been described as the most sensitive fraction of the total cholesterol levels that has been to be consistently affected by exercise.[8] Increases in HDL levels of 1.8 mg/dl and 7.2 mg/dl has been reported in males and females respectively, following 12 and 16 weeks of exercise training.[9,10] Among 111 people and with a 24 weeks training exercise program, Kraus et al. reported an increased serum LDL-C by 4.3mg/dl.[11] O'Donovan et al. also showed a similar increase in the serum HDL-C by 1.4mg/dl among 64 men result with a 24 weeks exercise program.

However, the results may have been influenced by other factors like life style modifications, diet or medications. A meta-analysis based on electronic database searches of MEDLINE (1966-2005) for randomized controlled trials, that examined the effect of exercise training on HDL-C level, among patients not on medications or dietary therapy, showed that the effect of aerobic training resulted in a 2.53-mg/dL elevation of net HDL-C change.[4] Durstine et al. suggested that a minimum exercise volume may exist above which an HDL-C elevation occurs.[12] Verification of the same was beyond the scope of the present study.

In addition to quantitative changes, qualitative changes in HDL have also been linked to improvements in cardiovascular risks. However, the mechanisms of the improved HDL function are unclear. Improvement in cholesterol efflux capacity and the antioxidative and anti-inflammatory properties of HDL have been proposed to explain the same.[13]

In the present study, the mean Triglyceride level of people with regular exercise was found to be significantly lower than people with a sedentary lifestyle. LeMura et al. reported a decrease in serum fasting triglyceride by 1.6 mg/dl following a 16 weeks of exercise training among 12 women.[14] Another study by Kraus et al reported a significant decrease of 28.4mg/dl in triglyceride levels in their study among 111 people and with a 24 weeks training exercise program.[11] In the same study that reported an increase in LDL-C levels following a 24 week exercise programme, O'Donovan et al. also showed an increase in TG levels by 2.2 mg/dl at the end of the study period.[15]

People with a sedentary lifestyle had a significantly lower mean LDL level (131.5 ± 24.3 mg/dl) the exercising group (107.5 ± 15.5 mg/dl) Unlike HDL-C, LDL-C levels following exercise has shown inconsistent and conflicting results after only low- and moderate-intensity exercise.[3] While some studies have shown a decrease in the mean LDL-C level among both men and women over a 12 – 24 week period of exercise,[10,11,14] other studies have shown a completely opposite result with 24 weeks exercise program which increased the serum LDL-C by 3.1mg/dl among 64 men.[15] It has been proposed that the decrease in LDL-C levels were due to many factors including changes in the body weight, or a reduction in the total body fat,[16] rather than a direct decrease in the LDL-C levels. A decrease of 0.8 mg/dL

per kilogram of body weight loss has been proposed. [17] Like in HDL-C, in addition to quantitative changes in HDL levels, qualitative changes in article size of the LDL has been proposed with conflicting results. [18,19]

Conclusions

Regular physical activity improves the HDL cholesterol which is a known cardio-protective factor of lifestyle. Though the total cholesterol was lower in athletes compared to those with sedentary lifestyle in comparison group but the finding was not statistically significant.

Limitation:

This study was entirely based on the findings of serum lipid levels of athlete group and non-athlete comparison group and did not include the dietary history of the study participants as a limitation to be considered.

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