STUDY OF PLASMA LIPID AND LIPOPROTEIN PROFILE IN ELITE WOMEN BOXERS DURING A SIX WEEKS' TRAINING PROGAMME

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ABSTRACT

The present study was undertaken with an objective to frame out the lipid profile of Indian Women Boxers. Women boxing is a newly recognized game and no work has been reported on elite female boxers in India till date. The study was based on a sample of 45 women boxers (age 17 ~ 24 years) attending Senior National Women Boxing Camp at Sports Authority of India. Each subject was evaluated for Lipid Profile variables at the beginning and end of the six weeks training camp. Fasting blood samples were taken from the antecubital vein by venipuncture. Before the samples drawn the subjects were asked to take rest for ten minutes. The blood sample was analyzed by HITACHI UV-2000 spectrophotometer (Japan). Standard techniques and procedures were followed for all the estimation. Volume and intensity of different components of training was measured by observational and physiological methods. Data were subjected to statistical treatment like mean and standard deviation. Test of significance't' – test (for paired sample) was applied to asses the difference in pre & post–test. Results reveal that mean (+/-SD) Cholesterol, Triglyceride, LDL, HDL – Cholesterol and Cholesterol / HDL Cholesterol ratio was 144.7 +/- 3.6 mg%, 59.7 +/- 17.5 mg% 81.4 +/- 21.1 mg% 51.3 +/- 8.2 mg% and 2.8 +/- 0.5 respectively as found in the pre-test. Significant difference ($P < 0.01$) was observed in Cholesterol, LDL-Cholesterol, HDL Cholesterol level in the post–test. The study concludes that women who practice sport of boxing on regular basis have a favorable lipid profile. A significant change in lipid profile of the boxers was observed after 6 weeks' training program.

Key Words: Lipid Profile, Women Boxers, HDL-Cholesterol, Training.

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INTRODUCTION

Understanding of Lipid Profile for any individual help him/her in living a better healthy cardiac-risk free life. Physical training results in an improved lipoprotein patterns, where triglicerides, and LDL cholesterol decreases and HDL-cholesterol increases.[1] Previous studies in adult male and female reveal that cholesterol tends to be higher in female and regular exercise has no effect on total cholesterol.[2] It has also been reported that men and women maintained on a constant composition diet during a six weeks exercise regimen failed to lower their triglyceride concentration despite increase in VO_2.[3]

In recent times study has been carried out to show the effect of different types of sports on plasma lipid profiles.[4] It revealed that persons who practice sports involving a high level of physical exertion (volleyball and soccer players) had a less favorable lipid profile compared to control subjects. In contrast, swimmers had a more favorable lipid profile. In an another study[5] on high performance rhythmic female teenager gymnasts it was concluded that the intensive exercise induces a protective lipid profile. Study by Tsai et al., 2003[6] reported that 12 weeks of Tai Chi Chuan exercise training could increase HDL-cholesterol and decrease total cholesterol level significantly. A study[7] on pubescent athletes practicing different sports reported significant sport-specific variations was observed in lipid profile pattern.

Keeping in view all these facts, this study was conducted on Indian women boxers. Women boxing is a newly recognized game and till date no work has been reported on lipid profile of women boxers in India. The present study was aimed to frame out the Lipid Profile of National Women Boxers and find out the benefit of a six weeks training program on it.

MATERIALS AND METHODS

A total of 45 female boxers (age range 17~24 years) volunteered to participate. Subjects were selected from Senior Women National Boxing Camp held at Sports Authority of India. They all were national level boxers and had a minimum of 3 years boxing training. They also had the experience of participating in district level and state level competitions. All institutional policies concerning the use of human subjects in research were followed.

Each subject was evaluated for Lipid Profile at the beginning and end of the six weeks' training camp.

Fasting Blood samples were taken from the antecubital vein by venipuncture. Before the samples drawn the subjects were asked to take rest for ten minutes. The blood sample was analyzed by HITACHI UV-2000 spectrophotometer (Japan) following standard methodology.

Cholesterol, triglycerides were estimated by enzymatic assess method using Ranbaxy make kits. HDL-Cholesterol was estimated using PEG enzymatic method, LDL-Cholesterol was calculated using Friedwald and Fredricson's formula: LDL-Cholesterol = Total Cholesterol – Triglycerides / 5 + HDL – C. Cholesterol / HDL-Cholesterol ration was calculated from the value of Cholesterol and HDL-Cholesterol.

Training Monitoring

Intensity of endurance, speed/speed endurance and technical training were measured through heart rate monitoring using Sport-Tester (Polar, Finland) PE-3000. For volume monitoring total time duration of each specific component of training program (endurance/speed and speed endurance/strength/techniques/sparring) was calculated and presented as percentage of total training span.

Intensity percent of technical and endurance training were calculated using Karvonen's formulae.[8] Intensity of speed/speed endurance training and sparring was expressed as % of maximum heart rate.

Training was 6 days a week, daily 2 sessions for 4 days and only one session for two days for the first 2 weeks of the camp. Each session was on average 1 hr 30 minutes duration.

For the last 4 weeks of the camp, boxing sparring was organized once in a week and on sparring days no other mode of training was administered. Each sparring was of 3 rounds, each round of 2 minutes duration in between a recovery of 1 minute. On other 5 days there were 2 sessions, Sunday being the rest day. Training sessions were 1.5 to 2 hours' duration.

Data Analysis

All the values are expressed as Mean +/- Standard deviation. For statistical analysis of pre- and post-test results, students' 't' test (for paired sample) was applied. Correction – coefficient among the variables were computed (Table I).

Statistical Package for Social Sciences (SPSS) MS windows Release 6.1 was used for statistical analysis.

RESULTS

The 20 women boxers had a mean age of 19.7 +/-2.2 yr., body height of 159.9+/-4.8 cm, and body weight of 56.6 +/-7.1 kg.

The results of pre and posttest of lipid profiles are presented in Table II.

Table III depicts the intensity allocated for different components of training.

Volume distribution for different components of training were as follows: Technique-74%, Endurance-8%, Speed / speed endurance-3% and strength-1% and boxing sparring-1%.

Table I: Correlation – coefficients among the variables

Variables	Cholesterol	Triglyceride	LDL Cholesterol	HDL Cholesterol	Cholesterol/HDL-Cholesterol Ratio
Cholesterol					
Triglycerides	0.1888				
LDLCholesterol	0.9681 **	0.1703			
HDLCholesterol	0.4883 **	-0.3306	0.2626		
Cholesterol/HDL-Cholesterol Ratio	0.6138 **	0.5164 **	0.7670 **	-0.3862 **	

** *Correlation is significant at the 0.01 level (two tailed)*

* *Correlation is significant at the 0.05 level (two tailed)*

Table II: Lipid profiles of women boxers and changes after 6 weeks of training. (Mean ± SD)

Parameters	Pre-Test, n=45		Post-Test, n=45		Significance
	MEAN	SD	MEAN	SD	
Cholesterol(MG%)	144.7	3.6	157.0	27.6	**
Triglycerides (MG%)	59.7	17.5	64.2	18.9	NS
LDLCholesterol (MG%)	81.4	21.1.	88.8	23.7	**
HDLCholesterol(MG%)	51.3	8.2	53.3	8.3	**
Cholesterol/HDL Cholesterol Ratio	2.8	0.5	2.8	0.4	NS

P<05

****P<.01***

NS-Not significant

Table III: Intensity %f different components of training (Mean ± SD)

Parameters	Technique	Endurance	Speed/speed endurance	Sparring
Average intensity%	59.5 ±8.4	79.6 ± 9.9	81.4 ± 4.8	94.6 ±3.6

The cholesterol and triglycerides level of the women boxers as found in the pretest were 144.7 +/- 3.6 mg% and 59.7 +/- 17.5 mg% respectively. The mean LDL cholesterol was 81.4 +/- 21.1 mg%. The mean HDL cholesterol was 51.3 +/- 8.2 mg%. The mean cholesterol / HDL-Cholesterol ratio was 2.8 +/- 0.5. Significant increase (p<. 01) was observed in HDL-Cholesterol after 6 weeks training program.

DISCUSSION

The mean cholesterol level of the boxers in pre-test was 144.7 +/- 3.6 mg%. Ideally, serum cholesterol should be below 180 mg, the level found in population where heart disease is nonexistent.[9] Studies by Stamler et al., 1986 (10) reported cholesterol level of less than 181 mg is associated with a factor of increased risk of 1.00 only. At the end of the camp total cholesterol increased significantly (p<. 01). Previous studies in adult male and female reveal that cholesterol tends to be higher in female and regular exercise has no effect on total cholesterol.[2] This increase may be due to intake of poly-saturated fatty acid or rich fat diet.

Both at the beginning and the end of the camp LDL-Cholesterol level was within the normal range.[9] However, in the post-test LDL-Cholesterol also showed significant increase. It is in agreement with the fact that LDL-C is directly associated with cholesterol. A highly significant correlation is observed between cholesterol and LDL-C. Studies by Higuchi et al.[11] reports that exercise has little effect on LDL-C.

Triglyceride level showed a slight increase in post-test, which was not statistically significant. Earlier studies revealed that men and women maintained on a constant composition diet during a six-week exercise regimen failed to lower their triglyceride concentration despite increase in VO_2.[3] Even a yearlong study of healthy sedentary men also failed to show a reduction of serum triglycerides after exercise conditioning.[12]

Following training significant increase (p<.01) was observed in HDL-Cholesterol. It is well recognized that physical activity amongst boys improves the HDL-C level in the post-pubertal stages, however the relative increment is higher in males as compared to females. Moll et al., 1979[13] pointed out that normally even untrained women have higher HDL-C than trained men do. Thus starting at high level female may not be able to increase them as easily and hormonal factors leading to greater level of HDL-C in females and lower level in males initially counter the expected adaptation of exercise.

In our study the improvement in HDL-Cholesterol is significant. There is no significant change in triglyceride level. There are evidences that endurance type training of moderate intensity results in more pronounced changes than high intensity.[1] A Study by Durstine et al., 2001[14] reveals that physical activity performed at moderate intensity can increase HDL-Cholesterol level and greater changes can be expected with additional increases in exercise training volume. In our case of 6 weeks training program, from training volume & intensity it is very clear that training stimulus was mainly on endurance type of moderate intensity. A recent study by El-Sayed et al., 2005[15] reported that arm-cranking exercise of 60-65% VO_2 peak intensity for 12 weeks resulted in increase of HDL-C in individuals with spinal Cord injury as well as in able-bodied subjects.

In well-trained subject the muscle lipoprotein lipase activity is elevated. This activity in skeletal muscle tissue is directly correlated to the capillary density of the muscle.[16] In the fasting state 50% of the hydrolysis of circulating triglycerides takes place in skeletal muscle and only 25% in adipose tissue.[17] There is a negative

relationship between fasting serum triglyceride concentration and skeletal muscle lipoprotein lipase activity.[18] The increase in capillary density per mm^2 is not evident until after the 6 weeks of training, which, fits well with the time course of triglycerides and HDL- Cholesterol changes. A study by Stubbe et al., 1983[19] reports that in 6 weeks, training duration there is no alteration in muscle lipoprotein lipase activity. In another study by Nikkila et al., 1978[20] reported good correlation between adipose tissue lipoprotein lipase activity and HDL-Cholesterol in well-trained men and women. Recent study by Perreault et al., 2004[21] has shown that there are gender specific differences in lipoprotein lipase activity in response to exercise and muscle LPL activity changes is less in women. From the above findings, it seems that in our study the improvement of HDL-Cholesterol may be due to adipose tissue lipoprotein lipase activity and as muscle lipoprotein lipase activity does not show any change until after 6 weeks of training significant change is not observed in triglyceride level.

The mean cholesterol/ HDL-cholesterol in the pre-test and post-test were 2.8 +/- 0.5 and 2.8 +/-0.4 respectively. No change was observed in this ratio. Earlier studies reported the importance of this ratio as one of the best predictors of heart disease risk. When the ratio is low (<3) the risk of CAD is low; but when the ratio goes up (>6) the risk climbs. The ratio holds up as a predictor in spite of the absolute level of cholesterol. As the ratio climbs above 4.0 the risk increases and when it exceeds 6.0 the risk becomes serious. In our study, both the values obtained in pre and post-test are below 3 which is in the normal limit.[9]

CONCLUSIONS

The lipid profiles of Indian women boxers are within the desired level i.e. they are in the low risk zone of coronary artery disease. It is concluded that women who practice sport of boxing have a favorable lipid profile. It also concluded that the 6 weeks training camp was able to increase HDL-Cholesterol level of the boxers and other changes in lipid profiles in response to exercise agreed with that of the previous reports.

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