



# Comparison Of Selected Lipid Profiles Among Female Boxers Training At Moderate And High Altitudes Of Himachal Pradesh

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## Abstract

The aim of the study was to compare the selected lipid profiles among female boxers training at Moderate and High-Altitude of Himachal Pradesh. The researcher formulated assertive hypotheses to be tested for the selected lipid profiles of female boxers. A sample of 60 female boxers were selected through purposive sampling for the undertaken study. 30 subjects were taken from high-altitude regions (Kinnaur and Shimla districts), while the remaining thirty subjects were selected from moderate-altitude regions (Kangra, Hamirpur, and Mandi districts) of Himachal Pradesh. Lipid profile parameters, namely total cholesterol and triglyceride levels were measured using Biochemistry Analyzer from collected blood samples. Statistical analysis was carried out employing the 't' test to determine the significance differences in the selected variables between the two groups with the level of significance set at  $\alpha = 0.01$ . Results indicated that the female boxers training at high-altitude demonstrated significantly elevated triglyceride levels as compared to those training at moderate-altitude. On the contrary, boxers training at moderate-altitude exhibited markedly elevated total cholesterol levels in comparison to those at high-altitude. The results recommend that altitude plays a role in regulating lipid profile balance amongst female boxers.

**Keywords:** Lipid profile, Boxers, Training, Moderate and High Altitude.

## INTRODUCTION

Altitude training has long been recognized as a significant environmental stimulus influencing physiological and biochemical responses in athletes. Hypobaric hypoxia at moderate and high elevations elicits diverse metabolic and cardiovascular responses that improve oxygen transport, energy consumption, and endurance performance (Levine & Stray-Gundersen, 1997; Sawka et al., 2000; Wilber, 2007). Changes in lipid metabolism are one of these adaptations that scientists are becoming more interested in since they are closely linked to energy generation and heart health. Total cholesterol and triglycerides are two important lipid profile measures that show how well the body adapts to environmental stresses such low oxygen levels (Young et al., 1989; Ranhotra & Sharma, 2010).

Boxing is a very intense fighting sport that needs a unique mix of aerobic endurance, anaerobic power, speed, agility, and muscle strength. Female boxers train very hard, and their bodies need to work well metabolically to keep up with repeated bouts of high-intensity activity. Lipids are an important source of energy during lengthy,

hard workouts, especially when glycogen levels are low (Bassett & Howley, 2000). Studies show that being at a high altitude may change how lipids are broken down by increasing sympathetic activity, making it easier for fat to move around, and changing how substrates are used (Young et al., 1989; Schwartz & Collins, 2007). Long-term exposure to high altitudes has also been linked to biochemical changes that affect metabolic health and cardiovascular risk factors (Manolio, 2007; Libert & Pletcher, 2007).

Himachal Pradesh offers a distinctive natural environment for examining altitude-related adaptations, as athletes in this area consistently train at elevations from moderate to high altitude. Although more and more women are getting into competitive boxing, there isn't much scientific research about how altitude affects the lipid profiles of female boxers. To get the most out of training, improve performance, and keep athletes healthy, it's important to understand these biological reactions. So, the purpose of this study was to look at the lipid profile of female boxers training at moderate and high elevations in Himachal Pradesh and to see how altitude affects the balance of their lipid profiles.

### PURPOSE

The purpose of the study was to compare the selected lipid profiles of female boxers training at moderate and high altitudes in Himachal Pradesh.

### MATERIALS AND METHODS

The researcher undertook assertive hypotheses to investigate the comparison of selected lipid profiles of female boxers training at moderate and high altitudes in Himachal Pradesh. 60 female subjects were selected for the present study. 30 subjects were selected randomly from the high-altitude areas of the Kinnaur and Shimla Districts of Himachal Pradesh, and the rest of the 30 subjects were selected randomly from the Kangra, Hamirpur, and Mandi Districts of Himachal Pradesh. A purposive sampling device was used to select the subjects. The biochemistry analyser was used to measure the lipid profiles. For the purpose of analysis, a 't'-test was used to compute the significance of differences in variables between two groups. Significance level was judged at the 0.01 level of confidence.

Sr. No.	Lipid Profile	Moderate-Altitude (N=30)		High-Altitude (N=30)		M.D.	S.E.D.	“t” Value
		Mean	S.D.	Mean	S.D.			
1	Total Cholesterol	151.27	25.162	151.02	23.873	.250	6.333	.040
2	Triglyceride (TG)	78.78	30.532	113.84	46.934	35.052	10.223	<b>3.429**</b>

\*\* Significant at .01 level of confidence ('t' > 2.660), df=58

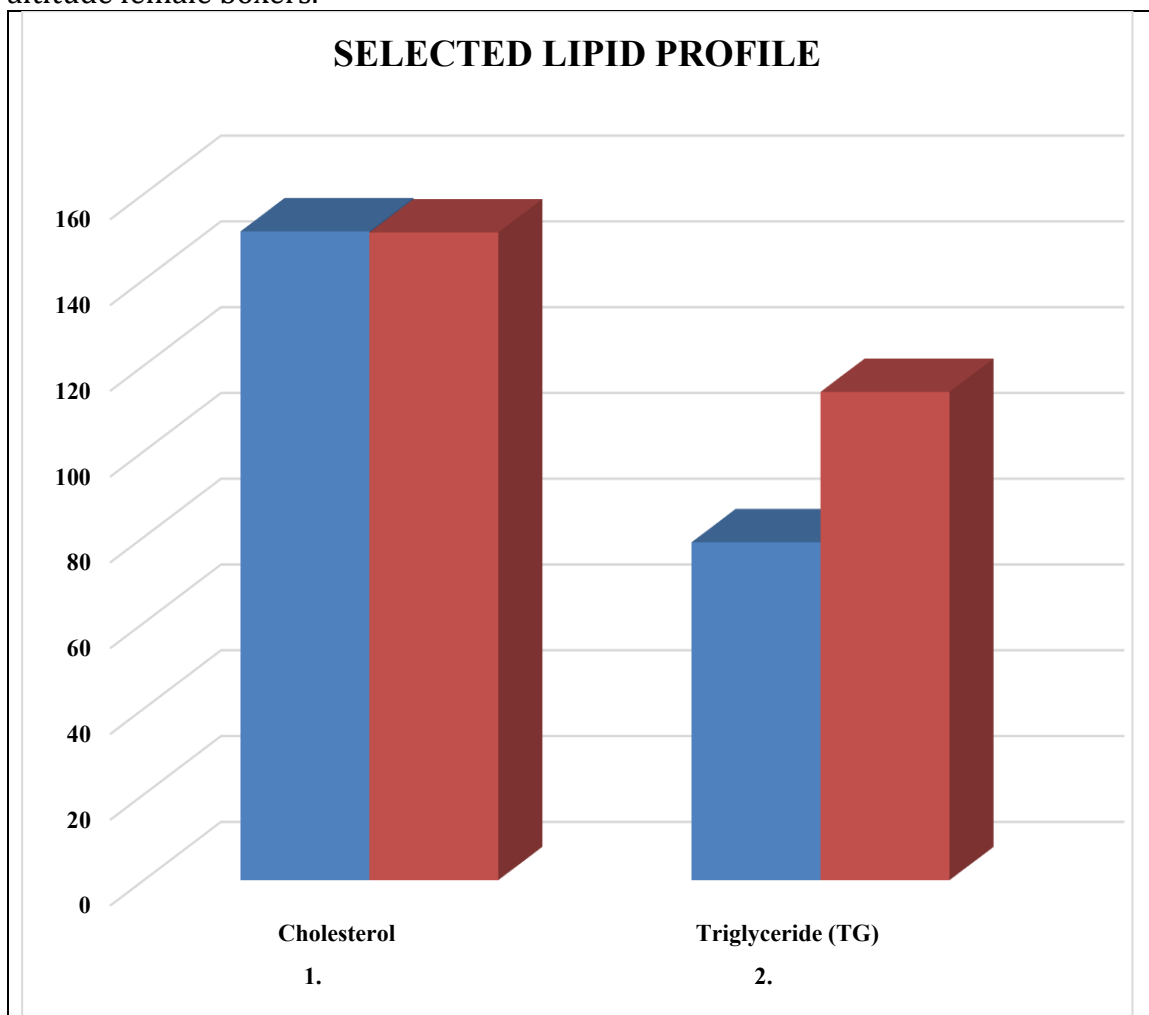
### Interpretation:

It is perceptible from table-1 that the mean values of selected biochemical parameter, namely Cholesterol for moderate and high-altitude female boxers of Himachal Pradesh are 151.27 and 151.02, respectively. The mean difference is 0.250, and the standard deviation came out to be 25.162 and 23.873, respectively. Further, the obtained t-value

of 0.040 (df = 58) is less than the critical value at the 0.05 level; hence, the difference between the two groups is not statistically significant.

Table-1 displays that the mean values of selected biochemical parameter i.e. Triglyceride (TG) volume for moderate and high-altitude female boxers of Himachal Pradesh are 78.78 and 113.84, respectively. The mean difference is 35.052, and the standard deviation came out to be 30.532 and 46.934, respectively. Furthermore, the obtained t-value of 3.429 (df = 58) exceeds the critical value at the 0.01 level; hence, the difference between the two groups is found to be statistically significant.

Figure 1 depicts the graphical representation of the mean values of the lipid profiles of female boxers from Himachal Pradesh at moderate and high altitudes. The lipid profile parameter cholesterol, shows relatively small differences between two groups whereas triglyceride (TG), shows noticeable differences between the moderate and high-altitude female boxers.



**Fig. 1: Graphical Representation of the Selected Lipid Profiles among Moderate and High-Altitude Female Boxers of Himachal Pradesh.**

In conclusion, Figure 1 graphically reinforces the numerical information and highlights the effect of altitude on certain lipid profiles in female boxers from Himachal Pradesh, thus corroborating the results of this study

## DISCUSSION OF FINDINGS

## **1) Total Cholesterol**

The results of the current study showed minor difference in cholesterol between female boxers at moderate and high altitudes, with higher mean values recorded in moderate-altitude boxers (151.27) compared to those at high-altitude (151.02). The calculated t-value (0.040) failed to surpass the critical value at the 0.01 level of significance, no statistically significant altitude-related difference was observed. The lack of a statistically significant variance in this study may be due to the athletic training state and efficient metabolic adaptability of the volunteers, which tend to stabilize lipid profiles despite hypoxia exposure. These finding, aligns with previous research indicating a reduction in total cholesterol with ascending altitude (Sharma et al., 1990; Ranhotra & Sharma, 2010). Prior studies have shown that acclimatization to moderate and high altitudes modifies bodily biochemistry, although the degree of alteration differs among populations and physiological factors (Schwartz & Collins, 2007; Manolio, 2007; Libert & Pletcher, 2007). Current findings indicate that altitude-related effects on cholesterol may be diminished in well-trained female boxers.

## **2) Triglyceride (TG)**

The results of the current study showed a statistically significant difference in triglyceride (TG) between female boxers at moderate and high altitudes, with higher mean values recorded in high-altitude boxers (113.84) compared to those at moderate altitude (78.78). The calculated t-value (3.429) surpassed the critical value at the 0.01 level, signifying a notable altitude-related difference. The elevated triglyceride (TG) levels in high-altitude boxers may be related to hypoxia-induced modifications in lipid metabolism. Exposure to high-altitude hypoxia amplifies sympathetic activity and fatty acid mobilization, resulting in elevated hepatic triglyceride production and diminished triglyceride clearance. Prior research has shown that chronic hypoxia enhances dependence on lipid metabolism and correlates with increased circulating triglyceride levels (Young et al., 1989). The findings show a significant altitude-related variation in triglyceride levels found in the current investigation.

## **CONCLUSION**

On the basis of the statistical analysis and interpretation of the results, it is concluded that a significant difference in triglyceride levels between moderate- and high-altitude female boxers from Himachal Pradesh, with high-altitude boxers exhibiting higher triglyceride levels. But no significant differences were observed in total cholesterol levels between the two groups; moderate-altitude boxers had slightly higher cholesterol levels. The findings indicate that where one lives and practice may exert a selective influence on lipid profiles, particularly triglyceride levels. Cholesterol levels remain rather constant in trained female boxers, regardless of whether they are at moderate or high altitudes.

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