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## Effects of exercise on lipid parameters of normal male subjects, with and without using power enhancing drugs.

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### Abstract

Exercising is largely believed to reduce the chances of cardiovascular disorders. Many people opt for fat-burning workouts to achieve a lean physique while others aim at getting a well-muscled body. The latter being a long and tiring process, pushes many people to opt for various power enhancing drugs, for boosting their athletic endurance and increasing the muscle bulk. We evaluated and compared the effects these drugs have had on, lipid parameters of male subjects. Peripheral blood samples were tested for levels of Total cholesterol, high density lipoproteins, low density lipoproteins, triglycerides and very low density lipoproteins. The results showed that drugs exerted a profound effect on all lipid parameters, suggesting that users are prone to various cardiovascular risks. It is suggested that the widespread usage of such drugs should be discouraged among the youth.

**Keywords:** Exercise, power enhancing drugs, steroids, lipid parameters, cholesterol, PED

### 1. Introduction

Exercising is largely believed to reduce the chances of cardiovascular disorders. Many people opt for fat-burning workouts to achieve a lean physique while others aim at getting a well-muscled body. The latter being a long and tiring process, pushes many people to opt for power enhancing drugs, for boosting their athletic endurance. A regular and strenuous training in a gym results in a better-shaped body. To get noteworthy physical changes in least possible time, youngsters opt for Power Enhancing Drugs (PED)

PED use help boosting performance in athletes and among non-athletes, improve appearance [1]

Various synthetic compounds can be included in the list of PEDs. These include steroids, erythropoietin, creatine, protein and zinc supplements among others. Together with increasing the muscle bulk, they exert highly undesirable effects on normal physiology

Regular aerobic exercise (brisk walk and jogging), decreases total cholesterol, LDL, Triglycerides, Apolipoprotein B, Cholesterol/HDL ratio while increasing HDL levels [2]. Total cholesterol levels are lower in persons with high aerobic fitness, whereas these are higher in individuals of low aerobic fitness. It is yet to be demonstrated conclusively that exercise training lowers total cholesterol.

**1.1 Steroids:** The synthetic derivatives of testosterone, known as anabolic androgenic steroids (AAS), are misused in supraphysiological doses by athletes and adolescents [3]. Androgen antagonists block exercise induced muscle hypertrophy [4] supports a physiological role for androgen receptors in exercise-induced muscle hypertrophy. Whether anabolic steroids bind to androgen receptors on skeletal muscles or some other receptors, it is still under investigation [5], whose quantity differs from muscle bed to muscle bed. In human, their expression higher in the muscles of the neck and chest girdle, in comparison to the limbs [6].

Creatine is commonly used by amateur athletes, and its regular usage does not appear to exert negative influence on kidney excretion or liver enzymes [7] Skeletal muscles are the main sites where Almost all the Cr in the body is located, either the free (Cr: approximately 40%) or phosphorylated (PCr: approximately 60%) form, this represents an average Cr pool of about 120-140 g for an average 70 kg person [8]. Creatine increases an athlete's ability to rather than increasing strength; [9].

EPO. Average hematocrit for males is 46%. EPO is abused by the administration of Recombinant human erythropoietin (rHuEPO), its effects last several days after its last intake. Theoretically, more RBC means more efficient oxygen delivery to tissues. Thus, endurance athletes who put some extra strain in exercise use EPO.

Protein supplements Arginine, histidine, lysine, methionine, ornithine, and phenylalanine may

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stimulate the release of growth hormone, insulin, and/or glucocorticoids, thereby promoting anabolic processes [10]. Intravenous arginine and ornithine infusion have been used clinically for stimulating growth hormone release [11]. Ingestion of protein with carbohydrate has been reported to increase insulin and/or growth hormone levels to a greater degree than ingestion of carbohydrate alone [12]. The independent effect of exercise type (aerobic v/s resistance training) on total cholesterol, HDL-C, LDL-C, and triglyceride levels is not fully confirmed. Regular physical activity positively influences serum lipid and lipoproteins [13].

**1.2 Objective**

To evaluate and compare the changes in lipid parameters of normal individuals to that of the athletes not using PED and the athletes using PED.

**2. Material and Methods**

The study was conducted on 135, healthy male subjects, in the age group of 19-31, bearing weight in the range of 61kg to 138 kg and height in the range of 5 ft 6 inches to 6 ft 3 inches. A consent form was signed by each subject before participating in this research project. These subjects were then divided into

the following groups

**i. Standard (STD)**

30 subjects, as a control who did not exercise

**ii. Exercising without Using PEDs (W/O)**

28 subjects who have been doing regular exercise in a gym for more than three years, without using PEDs

**iii. PED's USERS**

**•PED's USERS**

75 subjects, who have been doing regular exercise in a gym for last four to nine consecutive years and have been using PEDs for at least three years. These include:

S; 10 steroid users

SE; 6 steroids+EPO users

SC 8 1.steroids+creatine users

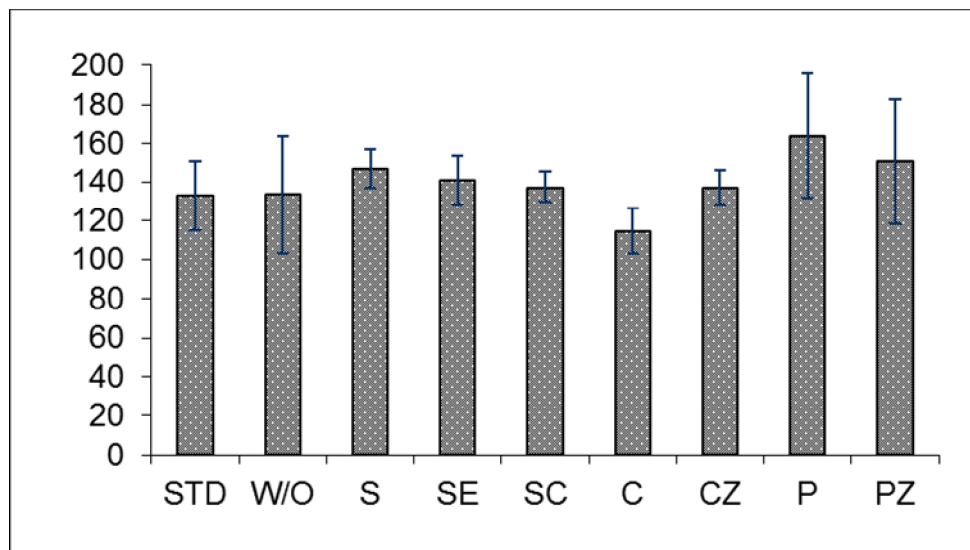
C; 7 creatine users

CZ; 13 creatine+zinc users

P; 19 protein users

PZ 12 protein+zinc users

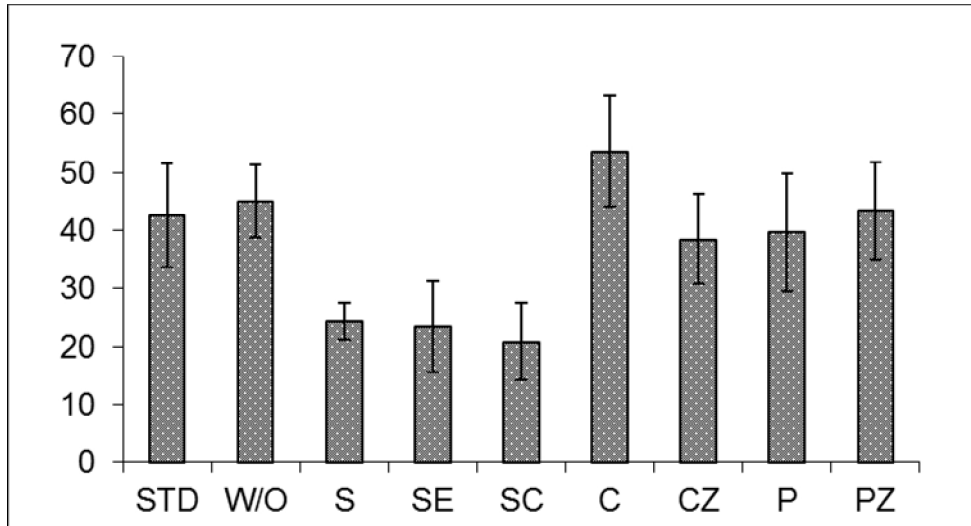
**3. Results and Discussion**



**Fig 1:** Total Cholesterol (mg/dl)

The association between high serum cholesterol levels and the incidence and severity of coronary heart disease is recognized as causal by the National Heart, Lung, and Blood Institute [14]. It was concluded in a research that habitual physical training favorably altered the serum lipid and lipoprotein profiles [15]. Regular aerobic exercise favorably alters lipid profile and reduces risks for cardiovascular disease [16]. In the present study Total cholesterol (Tchol) was found increased significantly in group P and group PZ (p<0.05). The usage of steroids and protein supplements led to an increase in the serum total cholesterol. The results here suggest that the individuals from these three groups are at a high risk of CVD. The results of groups SC and SE showed an increase too, however the increase was not significant, suggesting that steroids when taken in combination with either creatine or erythropoietin, is not leading to a significant increase in total

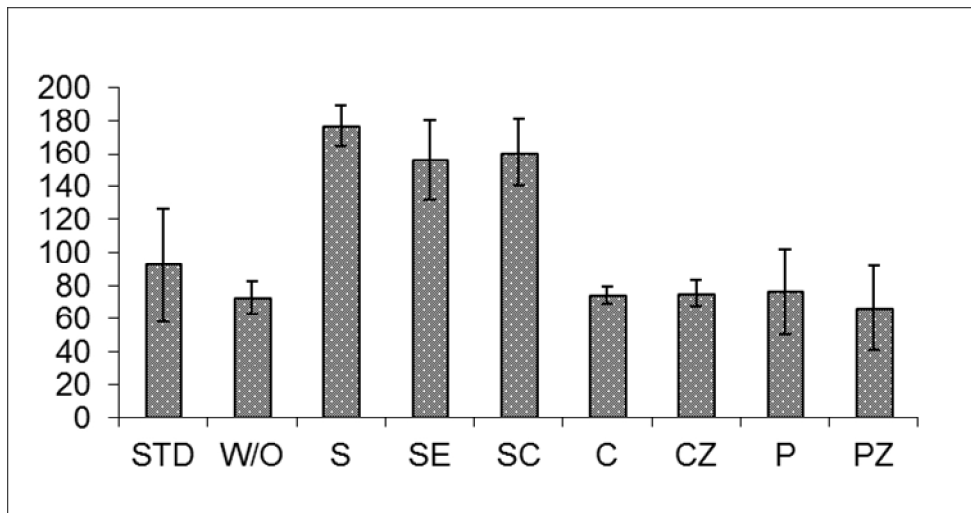
cholesterol than when taken alone. Groups W/O, SE, SC and CZ showed a similar Tchol index as the standard group, showing that the cholesterol level in these individuals is similar to normal population of Karachi in that age group. Similar to these results, no differences in lipid profiles were found between control subjects and endurance athletes [17]. The most remarkable feature of these results was a significant decrease in cholesterol level of group C individuals, which probably reflects the intensity of their workout regime, so that their cholesterol level was significantly lower than the standard group (p<0.05). A certain percentage reduction in a person's total serum cholesterol level reduces the risk of coronary heart disease almost twice [18] Hence, it can be stated that group C has ideal total cholesterol when it comes to the population of this particular age-group in Karachi.



**Fig 2:** High Density Lipoproteins (mg/dl)

HDL-C is proposed to be having an inverse relationship with coronary heart disease, whereby they offer a protecting mechanism against the development of CHD [19]. Individual as who have been bed ridden for 3-6 weeks are reported to have a significant decrease in HDL-C levels [20]. Aerobic fitness and exercise reduces total cholesterol, low-density lipoprotein cholesterol (LDL-C), and triglycerides, elevating HDL-C values. HDL was found significantly higher in individuals of group C ( $p < 0.05$ ) thereby further cementing the observation that the individuals of this group have a lipid profile even better than the standard group. Endurance-trained athletes have much higher HDL-C values compared to sedentary populations [21]. HDL was also found increased in group W/O and group PZ, however, this increase was not significant ( $p < 0.05$ ).

The results of groups S, SE, SC, were indeed alarming. The HDL level was significantly decreased in the individuals of this group ( $p < 0.05$ ). This suggests that steroidal intake have played havoc with their lipid profile, having predisposed them to a variety of CVD. In groups CZ and P, HDL level was also decreased, but the decrease was not found to be significant ( $p < 0.05$ ); However, The usage of Zinc in combination with creatine might have caused this decrease, but the decrease in group P is more than PZ suggests that zinc alone is not the cause. However, a study found no differences in lipid profile between control subjects and wrestlers with a 10-year experience and suggested that wrestling training, consisting predominantly of anaerobic and strength exertions, was insufficient to stimulate a rise in HDL-cholesterol level in 2005 [22].



**Fig 3:** Low Density Lipoproteins (mg/dl)

LDL-C is proposed to be more highly associated with CHD than total cholesterol [23]. It may directly contribute to the cellular alterations of the inner walls of arteries, which ultimately lead to the development of atherosclerotic plaque [24].

In the present study LDL was found significantly higher in

AAS users, S taking the lead followed by SC and SE. All other groups showed significantly lower LDL values, much lower than standards themselves. The results suggest that AAS users are at very high risk of developing CVDs. While other supplement users have a very safe range of LDL, suggesting a healthier state.

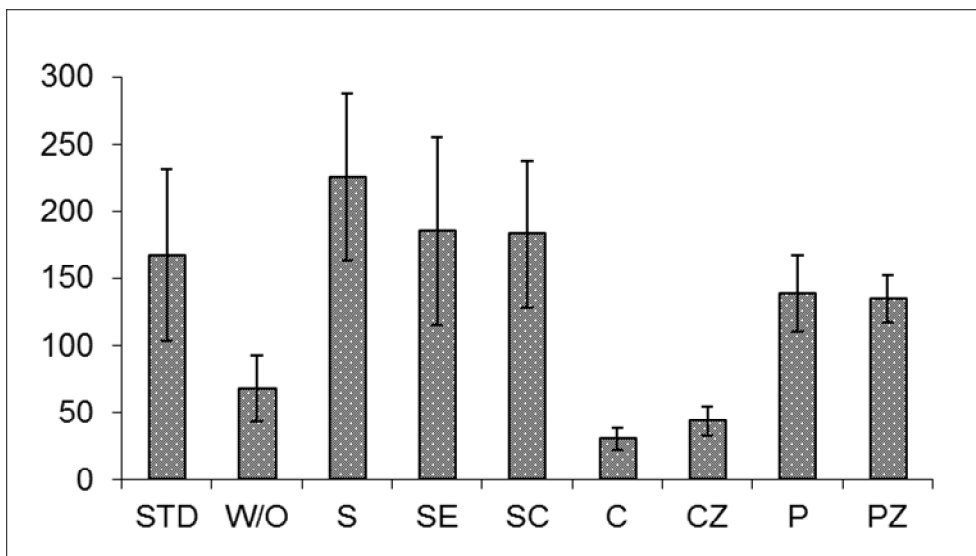


Fig 4: Triglyceride level (mg/dl)

In contrast to the variable effects of exercise on total cholesterol, endurance exercise shows a marked decrease in triglycerides [25]. TG also showed a similar trend in this study, AAS users took the lead, group S showed a significant increase whereas an increase was seen in group SE and group SC, predisposing them to all high-cholesterol related diseases. All other groups showed a much lower TG ratio than standard,

suggesting a much healthier state. Group W/O showed significant lowering of TG, further showing the positive effect exercise has had on the lipid profile. Users of creatine and its combination with Zn also had very low TG values. A study reported lower HDL cholesterol in rugby players than in control subjects, although TC and TG were decreased in the former group and LDL-cholesterol did not change [26].

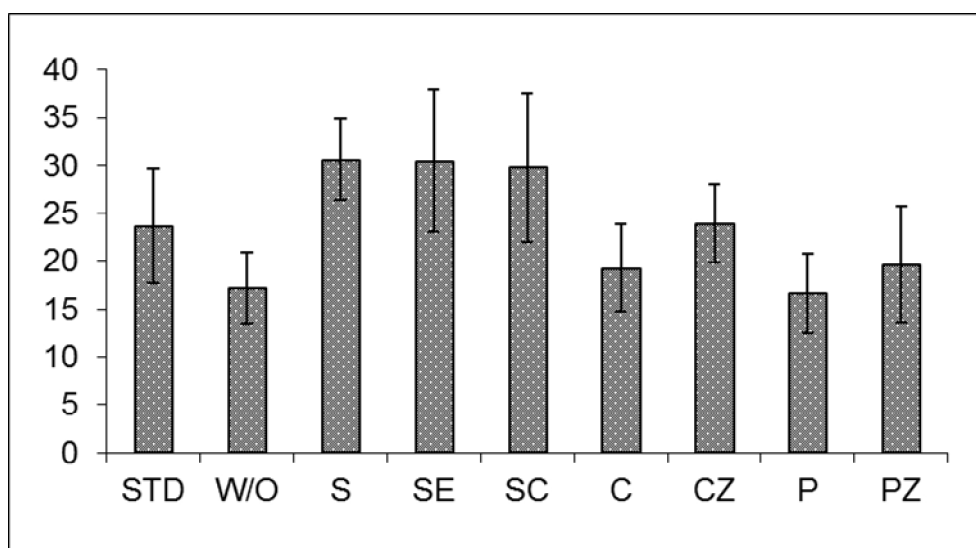


Fig 5: Very Low Density Lipoprotein (mg/dl)

vLDL are like chylomicrons but containing a little less triglyceride, primarily muscles and not fat tissue take up the fatty acid released from vLDL, the resulting vLDL remnants, instead of being removed in the liver as in the case of chylomicrons, is partially converted into LDL. vLDL was found significantly higher in users of AAS, group S and group SE showing a similar increasing pattern while that of group SC was also high, but lower than the two. Group CZ showed similar range as standard while that of groups PZ, C, W/O and P were lesser than the standard, group C and group W/O were among the least, while group P showed a significantly lower vLDL level.

**4. Conclusion**

Endurance training have been associated with a decrease in

blood cholesterol thereby aiding a healthier physiological state, however, the unchecked usage of PED especially AAS has predisposed the users to various CVD. The individuals using other PED such as protein or creatine, or even those who have been working out without any ergogenic aids have shown a way healthier Lipid profile, further cementing the idea that exercise reduces the vulnerability of an individual towards CVD. These findings emphasize on a regular and uninterrupted exercise plan that must be followed ‘day in day out’ in order to translate maximum benefits of exercise on lipid parameters.

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