

**Research Article**

## **Dietary Steroid Supplements Effect on Biochemical Parameters in Male Bodybuilders**

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### **ABSTRACT**

**Introduction:** The use of performance-enhancing drugs among athletes is very common, which sometimes associated complications and side effects. This study was conducted for investigate the possible effect of steroid supplementation on biochemical parameters in male bodybuilders in Dehdasht city.

**Materials and Methods:** This was an experimental study in which 20 male bodybuilders were selected in two groups of control and experimental. Bodybuilders in experimental group received steroid supplements of Oxymetholone and Methandrostenolone for six weeks and each week 4 days. Data were analyzed using software SPSS 18 and ANOVA for analysis of data.

**Results:** The results showed that the use of steroid supplementation had no significant effect on serum LDL and FBS. Steroid supplements at  $P < 0.05$  has decreased the iron and BUN levels in the experimental group compared the control group. The consumption of steroid supplements has increased the biochemical tests such as calcium, total protein, uric acid, bilirubin and creatinine levels in the experimental group compared to the control group at  $P < 0.05$ . The liver enzymes of ALT, AST and ALP has been increased in the experimental group in comparison to the control group at  $P < 0.05$ .

**Conclusion:** The results of this study showed that supplements containing steroids oxymetholone and Methandrostenolone induce changes in biochemical parameters especially on liver enzymes and result in, liver diseases may have formed among athletes.

**Keywords:** Biochemical tests, liver enzymes, oxymetholone, methandrostenolone, bodybuilders

### **INTRODUCTION**

In recent years with the development of various sport sciences there has been significant growth in the industry of sports supplements followed by increased incentive use of these supplements to improve health and promote the level of athletic performance. Supplements is a simple definition are means to increase the ability of the body, including the muscles that they can be categorized

in a variety of vitamins, minerals, herbs, amino acids, enzymes, metabolites, steroids, fat burners and stimulants (1, 2).

Today, sports supplements are classified in two categories of legal and illegal, illegal supplements are those substances (drugs) that cause abnormal changes in the level of sport (athletic) performance upgrades and impact on factors such as

stimulating the nervous system, blood pressure and dilation vessels, increasing blood volume and other factors (3). Steroidal compounds are illegal sport material which in the 1950s to 1960s dramatically became common among the athletes (4 -5). So that in 1975 the International Olympic Committee, entered the steroids on the list of banned drugs (3).

The steroids leave two types effect of anabolic and androgenic on users with the androgenic effect includes the development of secondary sexual characters and anabolic effect is the development of the muscles of the body (3, 6). Anabolic - androgenic steroids are synthetic derivative of testosterone. The testosterone is a natural male hormone which in men built by testis (7 - 8).

Steroid abuse can increase muscle mass and increased production of hormones in the bodybuilder athletes (9). Abuse of steroids is accompanied with a wide range of side effects including skin acne, infertility and sterility, Reticulocytosis, aggression, hair loss and hair growth, liver problems, testicular atrophy, deepening of the voice and hypertrophy of clitoris among which liver damage is accounted for the largest share (10- 12).

The liver is the largest gland in the body which involved in many metabolic functions, including protein synthesis and detoxification as well as is the place of disseminating several enzymes, including alanine aminotransferase, aspartate aminotransferase, and alkaline phosphatase (13 - 14). All three enzymes widely exist in the liver and arrival of any damage to liver cells leads to the release of these enzymes in the bloodstream (14). Additionally, the liver is responsible for making a protein called albumin as the main protein in blood and aside protecting the cells against free radicals and elimination toxins, acts as a buffer in the body and maintains osmotic balance (15 -16). Therefore, steroids which interfere in osmotic interaction, can affect the activity of albumin (17).

**Oxymetholone** is one of the most powerfully potent anabolic steroids, commonly known as

Anadrol. **Methandrostenolone** is another anabolic steroid which commonly known as (Dianabol) that can provide massive gains like Anadrol in relatively short order.

Although doping agents (performance-enhancing drugs) are used by uncontrolled in fitness clubs in Iran, but research and study on its effect on liver and biochemical factors hasn't been done and this study aimed to determine the effect of steroid supplements on some the liver and biochemical factors of bodybuilders in Dehdasht city.

## MATERIALS AND METHODS

Ten healthy male bodybuilders who had a drug plan were selected as the experimental group and ten healthy male bodybuilders (without drug) as control group from a sport club (named star) in Dehdasht city. All these bodybuilders have had more than 3 years sport history. The mean age of bodybuilders was  $21.4 \pm 3.5$ , the height mean  $165.1 \pm 16.4$  cm, weight mean  $84.8 \pm 12.5$  kg and body mass index mean  $31.2 \pm 4.6$  kg per meter square (table 1).

**Table 1.** Demographic data in male bodybuilders

Parameter name	Values
Age (year)	$21.3 \pm 4.5$
Height (cm)	$165.16 \pm 1.4$
Weight (kg)	$84.12 \pm 8.5$
BMI ( $\text{kg}/\text{m}^2$ )	$31.4 \pm 2.6$

All the values are expressed in mean  $\pm$  S.D. BMI : Body Mass index

Before beginning the study, written informed consent was obtained from all subjects. Noteworthy the experimental group due to their intention to participate in national competitions have decided to use steroids and this group of bodybuilders in coordination with their coaches have been taking supplements on the agenda, so the researchers morally had no involvement in consumption of supplements and researcher agreed with bodybuilders that at the beginning and end of their one-month training program blood sample is taken from them and all 20 athletes were examined by the general practitioner and their health was approved. Before conducting the

research, 5 ml of blood from a vein in the left hand and in a quite comfortable sitting position after 48 hours rest (without training) was taken, then volunteers for six weeks and each week for four sessions done intensive bodybuilding training. The control group in the training course was not taking any medication and the experimental group used steroids drugs of Oxymetholone and Methandrostenolone (manufactured by pharmaceutical company of Razi Iran) in tablets 50 mg. The use of drugs in experimental group began 4 times a week and in the morning of training from 1.4 tablets in first week and continued until 2 tablets in the sixth week. After six weeks of training and rest for 48 hours by the experimental group for the second time, blood samples were taken from both control and experimental groups. After blood collection to measure biochemical factors, the auto analyzer system CRONIX 801 -AT (Merck, Germany) was used, the kits used in all experiments (tests) have been the product of Pars-Azmoon[test] company. For statistical analysis software SPSS23 and ANOVA and t-student tests were used.

## RESULTS

The results of this study indicated that consuming bodybuilding supplements no significant change has been occurred in the FBS level. BUN levels in the experimental group compared the control group has been significantly decreased at  $P < 0.05$

with from 15.6mg/100ml in the control group has reached 13.2 mg/100ml in the experimental group. The creatinine levels in the experimental group compared the control group has been significantly increased at  $P < 0.05$  with from 1.15mg/100ml in the control group has reached 1.31 mg /100ml in the experimental group. The total protein in the experimental group than the control group significantly at  $P < 0.05$  increased, so from 6.8mg/100ml in the control group has increased to 7.9mg/100ml in the experimental group. The calcium concentration in the experimental group than the control group significantly at  $P < 0.05$  increased, so from 8.9mg/100ml in control group reached to 9.5mg/100ml in the experimental group. Their on levels in the experimental group compared the control group has been significantly increased at  $P < 0.05$  with from 108.5 mg/100ml in the control group has reached 87mg/100ml in the experimental group. The results showed that bodybuilding supplements had no significant effect on LDL. Bilirubin levels in the experimental group compared the control group has significantly increased at  $P < 0.05$  as of from 0.91mg/100ml in the control group increased to 1.19mg/100ml in experimental group. The amount of blood Uric Acid in the experimental group compared the control group has significantly increased at  $P < 0.05$ , so from 4.8 mg/100ml in control group reached to 6.3mg/100ml in the experimental group.

**Table 2.** Biochemical test concentration in male bodybuilders with Dietary Steroid Supplements

Parameters	Control Group		Experimental Group	
	Pre- test	Post test	Pre- test	Post test
FBS	89.7 ± 9.5	93.9 ± 8.6	86.4 ± 4.5	90.5 ± 6.6
BUN	15.4 ± 6.6	15.6 ± 4.3	16.2 ± 3.4	13.4 ± 2.3*
creatinine	1.15 ± 0.42	0.88 ± 0.38	1.04 ± 0.26	1.31 ± 0.67*
Total protein	6.8 ± 0.83	6.1 ± 0.75	6.48 ± 0.96	7.9 ± 0.49*
Calcium	8.5 ± 1.6	8.1 ± 0.47	8.2 ± 0.56	9.5 ± 0.56*
Iron	108.12 ± 5.6	102 ± 6.7	104.5 ± 6.2	87 ± 8.5*
LDL	95.15 ± 6.2	78.1 ± 3.6	93.1 ± 6.6	97 ± 9.3
Total Bilirubin	0.85 ± 0.31	0.8 ± 0.24	0.89 ± 0.21	1.19 ± 0.29*
Uric Acid	4.6 ± 0.81	4.2 ± 0.41	4.5 ± 0.34	6.3 ± 0.32*

\* denotes statistical significance in comparison to pretest at  $p \leq 0.05$ . Experimental Group ( $n=10$ ) and in controls ( $n=10$ )

All the values are expressed in mean  $\pm$  S.D. Statistical analysis was carried out by One-way ANOVA followed by Tukey's multiple. FBS fasting Blood Sugar; BUN Blood Urea Nitrogen; LDL Low Density Lipoprotein

The results of bodybuilding supplementation consuming on changes in liver enzymes showed that at  $p < 0.05$  level, the amount of liver enzyme activities significantly increased so that the mean of AST from 24.3 u / L in the control group was significantly increased to 28.5 u/L in the experimental group. The mean of ALT from 19.3.6 u/L in the control group, was significantly increased to 29.6u/L in the experimental group. The mean of ALP from 215.6u/L in the control group was significantly increased to 275.8u/L in the experimental

**Table 3.** Antioxidant activity in male bodybuilders with dietary Steroid Supplements

Parameters	Control Group		Experimental Group	
	Pre- test	Post test	Pre-test	Post test
AST	24.3 $\pm$ 3.6	23.4 $\pm$ 1.3	20.4 $\pm$ 4.6	28.5 $\pm$ 5.3*
ALT	19.3 $\pm$ 3.4	20.25 $\pm$ 1.4	20.5 $\pm$ 3.6	29.6 $\pm$ 6.4*
ALP	215.25 $\pm$ 6.4	210.2 $\pm$ 7.4	219.18 $\pm$ 6.4	275.8 $\pm$ 8.6*

\* denotes statistical significance in comparison to pretest at  $p \leq 0.05$ . Experimental Group ( $n=10$ ) and in controls ( $n=10$ )

All the values are expressed in mean  $\pm$  S.D.

Statistical analysis was carried out by One-way ANOVA followed by Tukey's multiple. aspartate transaminase (AST), alanine transaminase (ALT), alkaline phosphatase (ALP).

## DISCUSSION

It is likely some athletes at competitive levels to achieve high levels of performance do too much exercises. In such cases they likely to enhance their performance use or resort the materials which are designed to improve the physical strength, mental power or mechanical stimulation. In recent years hundreds of food supplements have been marketed for athletes. Most of these products such as sports drinks and steroid and protein powders have been designed for adequate access to fuel and its optimum utilization before or during exercise, increasing energy regeneration after training, increasing the exercise pressure bearing or return to the original state of the practice (18).

Consuming steroid supplements followed by several side effects for athletes that increased lipids such as cholesterol, triglycerides and LDL can be noted (19).

The results of this study showed that among studied biochemical parameters, in the FBS and LDL levels no significant change was

observed. In the study by Dorry and colleagues (2010) it was found that steroid abuse is effective in increasing FBS and LDL which is not consistent with this research (20).

The use of steroids and sports supplements among athletes of bodybuilding in Iran is more than 40 percent that can cause various complications on cells in the body (21). Increased consuming of steroid supplements contributes in biochemical disorder and increasing some parameters (22). The results of current study showed that BUN, creatinine, total protein, calcium, total bilirubin, and uric acid at a level of  $P < 0.05$  has been significantly increased. In a study, Andrew and colleagues (2006) investigating liver and biochemical tests of bodybuilders who use steroid during the practice found that liver and biochemical tests depending on the amount used were increased significantly with the findings of this research line is (23). Also, the results of this study is consistent with Koochter and colleagues (2002) study who investigated the effects of steroidal supplements on blood parameters and the results showed at level of  $P < 0.05$  steroid hormones lead to an increase in calcium, iron, protein and uric acid (24).

The use of steroid supplementation may induce anemia and destroy the immune system in athletes

(25). The results of this study showed that at level of  $P < 0.05$  steroid supplementation in reducing the amount of iron and BUN has been effective. The results of this study are consistent with the findings of study conducted by Dorry and colleagues (2010) who examined the effects of anabolic and androgenic steroids on biochemical tests in male bodybuilders athletes in the Jahrom city, and the results showed that hematocrit, hemoglobin and reticulocytes as a result of oral steroids use increased and the iron concentration in the blood decreased (20).

The liver has abundance androgen receptors that they are sensitive against steroid compounds. Furthermore, the liver is the main organ for metabolism of steroids, thus the use of steroids can be one of the factors causing injury in the liver (26).

Changes in the structure of steroids such as oxymetholone, methyl testosterone, oxandrolone and Dyanabvl can be one of the main reasons for the increase in liver enzymes in the blood (17).

In current study ALT, AST and AST activities showed significantly increased at the level  $p < 0.05$ . The results of this study are in line with the study of Sookas and colleagues (2004) (27). In a study by Rashid lamir (2013) showed that the liver enzyme of ALT, AST and ALP activities have been decreased significantly, which is not consistent with the findings of this study (28).

## CONCLUSION

The results of this study indicated that with consuming steroid supplements of oxymetholone and Methandrostenolone biochemical parameters and liver enzymes except FBS and LDL have been changed at level  $P < 0.05$ . Liver enzyme activities, creatinine, total protein, calcium, total bilirubin, and uric acid has been increased as well as iron and BUN concentration were decreased.

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