

ORIGINAL ARTICLE

**Evaluation of Biochemical Parameters and Serum Enzymes
before and Thirty Days after Creatine Monohydrate
Supplementation Administration in Bodybuilders in Tehran, Iran**

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ABSTRACT

Performance-enhancing nutrients have important role at the beginning of body building exercise to increase the efficiency of organs. Emerging supplements such as creatine that is synthetically prepared have harmful effects on internal organs. The aim of this study was evaluation of the effects of supplements mentioned on bodybuilders during one month. In this study, twenty bodybuilders had been chosen who had no history of any additive materials divided into two groups (control and creatine). A blood samples were taken before the start of the test and then first group was given a placebo and the second group creatine monohydrate. Next, all individuals follow the resistance and stretching exercises for a month. Finally, the second blood samples were taken after 30 days and the serums were separated. After thirty days it was found that intake of creatine had no significant effect on body mass index, serum electrolytes and biochemical factors with the exception of creatinine. Comparison of changes in serum enzymes had not significant difference between creatine and control groups but the changes of HDL, AST and CK showed significant difference in the creatine group, before and after the study. The results obtained in this study were very similar to the results of other researchers, but contradicted with some of the results especially; those studies that reported that using creatine have no harm to organs. From the results, we conclude that taking creatine in bodybuilding has no damaging effects on organs, but it should be used wisely and under consultation of specialist.

Key words: bodybuilding, creatine monohydrate, Enzyme, Iran

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INTRODUCTION

Athletes in each level are always seeking to achieve greater success and one of the tools that have profited of it since very long times is doping which is done by different familiar doping materials such as creatine. One of the widely used supplements among athletes, especially bodybuilders, is creatine monohydrate and there have been mentioned in different studies that one of the side effects of using creatine supplements is body mass increase [1-4].

The results are controversial and contradictory about creatine consumption and its effects on the body. It has been mentioned in some of the studies that acute and chronic administration of creatine supplements has no destructive and side effect on hematological, hepatic, muscular factors and kidney function [5].

It has also been showed that the use of edible creatine monohydrate supplements is lack of any dramatic changes in hepatic function [6]. Even some of the review studies have also concluded that creatine supplement consumption lacks of any kind of side effects on the athletes' health and its consumption has no prohibition [6, 7].

Even some of the studies have shown that short term consumption of creatine has protective effects. The effects of short term consumption of creatine supplement on the cardiovascular damage markers of after a round of exercise among Karate athletes determined that the creatine supplement short term consumption has desired effects on the markers of heart damage, but is effect less in the markers of

vascular damage, therefore according to these results, they concluded that creatine supplement short term consumption has probably protective role against heart damage [8].

Regarding the beneficial effects of creatine has been showed that simultaneous use of resistance exercises and creatine supplement can be helpful for increasing power, especially for better performance of sport activity [9]. But some have rejected these results. It has been determined that besides creatine positive effects on anaerobic performance, it causes cell damage and significant increase of creatine kinase and lactate dehydrogenase enzymes in blood which such effects can be minimized by simultaneous consumption of creatine and carbohydrate [10]. But some researchers have mentioned that long term consumption of creatine monohydrate supplement probably causes undesirable increase of creatine kinase and lactate dehydrogenase enzymes as cell damage indicators [11].

Some studies have considered the long and short terms of sport activity effects on hepatic and cell damages. There has been determined that doing long and short terms sport activities (both) cause muscular damages and it has been seen that CK and LDH enzymes have significant difference among individuals who have done heavy and combinational exercises rather than individuals who have done light ones [12].

The aim of this study was investigation of creatine monohydrate effects on biochemical factors, serum enzymes and electrolytes among bodybuilders in pre and post administration of creatine monohydrate.

MATERIALS AND METHODS

The present study was experimental, double-blind, and pretest-posttest along with control group. Its population was all enrolled body builders of 3 allowed clubs of Tehran, Iran. Among these bodybuilders, the individuals selected who had started exercise recently and had not used creatine supplements _as they say_ before this study. The individuals who had the history of fatty liver, high blood fat, type I and/or II diabetes, individuals who had family (genetic) history, and also individuals who had used creatine and steroid supplements were excluded from this study. After complete explanation of study, there were chosen 20 individuals who had no special illnesses and were quite randomly divided into two groups of 10.

Prescribing creatine to bodybuilders

Control group: individuals who placed in this group were those body builders who received no kinds of supplements during the study but they had daily 500 cc red grapes juice as placebo.

Creatine group: they used creatine monohydrate 300 g/d for a month and twice a day. The dose used for each person was achieved based on each person's weight.

Blood tests were performed after 48 hours rest in bodybuilders and because of the enzymes stability, this test was done in the morning.

The samples taken by individuals included:

- 1-the day before starting the period in athletes,
- 2-15 days after starting study,
- 3-the day 30 after giving supplement,
- 4-15 days after interrupting creatine supplement,

Sampling

It was bled of forearms of all individuals in fasting status and before starting sport activity for this case; samples were transformed to laboratory less than 2 hours and the variables studied were measured. Serums were isolated by centrifuges (Routine 28-Behdad) at 4000 rpm for 10 minutes, and then serums were measured by autoanalyzer device BT3000 plus (Biotechnica, Italy).

Exercise schedule

Some of those bodybuilding resistance trainings were selected that in training time involved all large muscles of the body. Trainings were done with regular sequence and muscle groups employed alternatively; 10 moves were done every day.

The load of working in each training day was 60-65% of a repetition maximum. Determining the repetition maximum in each person was obtained using the following formula:

$$\text{Repetition maximum} = \frac{\text{moved weight (kg)}}{1.0278 - (\text{repetition number to fatigue} * 0.0278)}$$

Among each resistance training that each person did, he took rest for 1-2 minutes.

The accomplished resistance trainings included chest move with device, crunch with rope, forearm with a barbell vice versa hand, lying barbell triceps, scroll bars, bench press with gathered hand, underarm stretch with high wirepuller, leg stand, and horizontal bar, pull down with gathered hand, rowing with barbell, biceps with device and upper chest with barbell.

Data were analyzed in SPSS 21 by ANOVA method, besides each person and each group data before and after supplement and resistance exercises were considered by repeated measurement test (P value < .05).

RESULTS

The variables in this study were divided into 3 groups including biochemical factors, serum enzymes and electrolytes and appropriate analysis tests were done according to each of them. The biochemical measured factors involving fasting blood sugar concentrations, cholesterol, LDL, HDL, TG, BUN, *creatin*e and albumin; moreover the enzymes measured were AST, ALT, LDH, ALP, and GGT as well as sodium and potassium were in electrolytes group.

The individuals of two creatine and control groups were lack of significant difference in age, height and body mass index before starting the study and also there were no significant differences between two groups among biochemical factors, serum enzymes and electrolytes at the beginning. 30 days after consumption of creatine supplement, it was determined that despite the increasing of BMI in creatine group (from 25.28 to 25.62) but no significant differences have been shown between creatine individuals and control groups (from 24.27 to 24.28).

Comparing the results of biochemical factors between two groups after 30 days creatine consumption, determined that despite the major changes in biochemical factors, the level of *creatin*e was only significant between two creatine and control groups (P value = 0.014). Comparing the results of electrolytes and serum enzymes between two creatine and control groups after 30 days showed that there was no significant difference between the individuals in two groups.

Changes of each variable were separately considered in groups and the results showed some interesting points, which the results of this consideration has been indicated at Table 1.

Table 1: repeated measurement test for each variable

Variable	Groups Sphericity Assumed sig	
	Control	Creatine
FBS	0.143	0.099
Cholesterol	0.172	0.279
LDL	0.074	0.098
HDL	0.065	0.014
Triglyceride	0.239	0.103
BUN	0.467	0.183
Creatinine	0.333	0.290
Albumin	0.615	0.557
AST	0.037	0.012
ALT	0.018	0.109
LDH	0.281	0.445
CK	0.001	0.002
ALP	0.277	0.756
GGT	0.043	0.803
Sodium	0.835	0.536
Potassium	0.339	0.130

The Table 1 shows that significant difference in control group is just observed about AST, CK, and GGT variables before and after studying, therefore it can be concluded that doing heavy exercises have some side effects on liver and muscles which its cause must be stemmed out, too. Besides, AST, CK, and HDL variables in creatine group have significant difference before and after creatine consumption and due to this fact that AST and CK have also significant difference in control individuals, it cannot be definitely expressed that this difference in creatine group is because of creatine consumption and/or doing resistance exercises.

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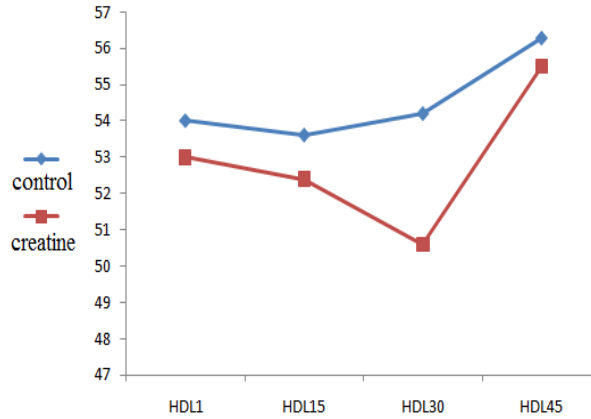


Diagram 1: HDL comparison at 4 times of study in intergroup and inside group state

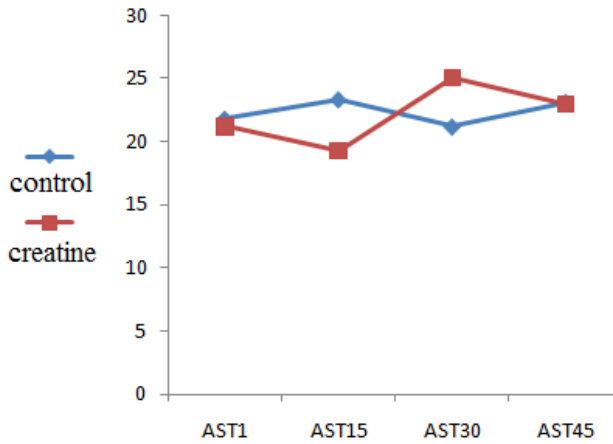


Diagram 2: AST enzyme comparison at 4 times of study in intergroup and inside group state

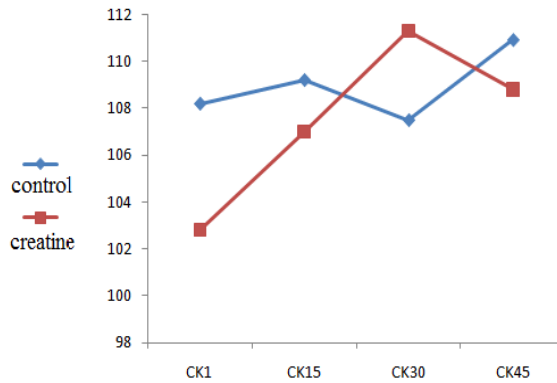


Diagram 3: CK enzyme comparison at 4 times of study in intergroup and inside group state

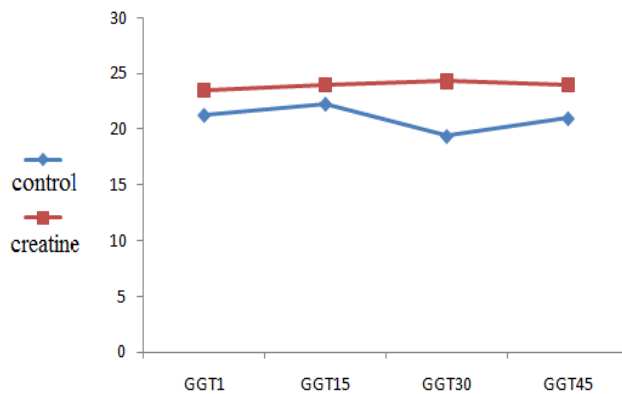


Diagram 4: GGT enzyme comparison at 4 times of study in intergroup and inside group state

DISCUSSION

Bodybuilding is one of the fitness sports among youth. One of the ways of increasing efficiency in resistance trainings is using nutrition and injection supplements which creatine monohydrate has dedicated the most consumptive cases to itself, but its consumption has unwanted side effects, therefore the aim of this study was considering this supplement effects on biochemical factors, serum enzymes, and electrolytes in Tehran body builders.

It has been mentioned in different studies that one of the side effects of using creatine supplements is body mass increase [1-4], which these results were in line with this study results. In the present study, BMI between the individuals of these two groups was measured and compared together at a day before starting the study and at the last day of it and despite the increasing BMI between control and creatine groups from 25.28 and 26.94 values to 25.62 and 27.18 values respectively, there was no significant difference between them.

The factors were classified in three different groups in this study and after 30 days creatine supplement consumption along with doing resistance exercises, there were seen no noticeable differences in biochemical factors between creatine and control groups individual except creatine which this difference was significant between control and creatine groups (P value= 0.014).

The results of this study were in line with Rogers et al., results who observed that changes of total cholesterol level, HDL, LDL, and triglyceride in both creatine and control groups were not significant than the time before starting the study [13]. Changes of creatine level in this study were in line with Souza, Miranda et al results who reported higher level of creatine and urea in creatine group in comparison with control group (P < 0.005) [14].

It was determined in Schilling, Stone et al., study that creatine concentration had shown increase in individual whom their times of consuming is less than one year and/or between 1-4 years which it was only significant in the last group rather than control group (P value<0.05). They also reported that total cholesterol levels, HDL-C, and LDL-C in these groups had huge reduction to control group but the difference was not significant [15].

In the present study, the comparison of AST, ALT, GGT, LDH, ALP and CK serum enzymes had not significant difference between control and creatine groups at the beginning and ending of study. Despite some changes were detected in some of them after 30 days which none of them was significant.

The present study results were in line with Souza, Miranda et al., results that reported significant increase in AST, ALP, and ALT enzymes in comparison with control group after 8 weeks creatine supplement (P value<0.005) [14].

The results of serum enzymes consideration in the present study were in line with Robinson; Sewell et al., study results that ALT, CK, GGT and ALP enzymes levels had not significant difference in creatine and control individual before and after 6 weeks intergroup and inside group training [5]. These results were similar to other studies for example, in Waldron et al., study considering BUN level, direct and total bilirubin, albumin, creatine and also ALT, ALP, and AST enzymes showed no significant change before starting intervention and after 6 weeks creatine supplement prescription that it be the marker of stress in liver [6], thus their results were in line with other studies results [3, 5, 15-17].

In the present study, sodium and potassium were considered before starting the study but there was not seen significant difference between the two groups of study. This study results were in line with Robinson et al., results that the level of sodium and potassium electrolytes showed no significant differences between creatine and control group individual before and after the time of study on intergroup and inside group [5].

It was determined in the present study that after 30 days stretching and resistance trainings, some changes in variables were observed in each group of individual by repeated measurement test. In control group, the AST, CK, and GGT enzymes showed significant difference before and after the study which these results were support the Bashiri et al., results that reported significant increase in activity of CK and LDH (CK 15%, LDH 13%) before and after the study in placebo-training group [11]. It can be concluded from these results that doing heavy exercises have some side effects on liver and muscles that its cause must be stemmed out.

Besides, after 30 days stretching and resistance trainings along with daily consumption of creatine in creatine group, AST, CK, and HDL variables had difference but due to this point that AST and CK had also significant difference in control individual, it could not be definitely mentioned that this difference was due to creatine consumption and/or doing resistance exercises. This study results were in line with Bashiri et al., study results that reported increase the activity of CK and LDH (CK 83%, LDH 90%) before and after the study in creatine-training group [11].

CONCLUSION

Due to the results of this study, it can be concluded that if heavy exercises like body building be not under a sport expert, it can have adverse effects on different tissues of the body. Besides, such risks can be higher in those individual who simultaneously consume creatine supplement, therefore this study suggests that such sports must be done under the supervision of sport experts and if individual desire to consume different supplements, they must do so under supervision of an expert of it.

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