



Research Article

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Comparison the effect of Beta-Alanine and sodium bicarbonate supplementation on changes LDH and CK in elite men taekwondo

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ABSTRACT

The purpose of this study was to Comparison of effect Beta-Alanine and sodium bicarbonate supplementation on changes PH, blood lactate, anaerobic power and muscle damage indicators in elite men taekwondo. For this reason, 20 elite men taekwondo were selected as subjects and they divided into two groups randomly including Beta-Alanine supplementation (n=10) and sodium bicarbonate supplements (n=10). Beta-Alanine supplementation within 6 weeks Taekwondo training three times a week with Beta-Alanine 3.2 gr per day (3 hours before exercise) consumption. sodium bicarbonate three times a week during 6 weeks practicing Taekwondo with 0/3 gr by weight of sodium bicarbonate (1 hour before the exercise) consumption. Blood sample were taken in before, and 24 hours after taekwondo for assessment LDH and CK. analyzed using the paired t Test with independent t-test ($P < 0.05$). Results showed that 6 weeks of supplementation with Beta-Alanine and sodium bicarbonate supplementation, there was no significant differences between there was no significant differences between lactate dehydrogenase in the group ($P \geq 0 / 05$). there was no significant differences between creatine kinase in the group ($P \geq 0 / 05$). The results showed that Taekwondo with Beta-Alanine and sodium bicarbonate supplementation to prevent an increase in lactate dehydrogenase, and creatine kinase. It seems that 3.2 gr per day beta-alanine supplementation with 0/3 sodium bicarbonate may be effective in preventing fatigue and reduced muscle damage in athletes.

Keywords: Beta-Alanine supplements, sodium bicarbonate supplements, LDH, , CK, elite taekwondo players.

INTRODUCTION

Because of importance of winning among athletes in different fields & their tending to the using various substances, also their side effects, & increasing trend in the use of incorrect drugs & supplements to achieve better performance, this is clear to gaining knowledge & more information in this regard (1). Recent years, in taekwondo using drugs & supplement is so much. Taekwondo fights do 2 minutes in 3 times & with 1 minute breaks between them & if their competition become equal the gold round drawn 2 minutes. During the 2 minutes, they are constantly fighting & exchanged sport techniques, but they spent almost more than 1 minute dances leg, thinking of finding an opportunity to attack the anti-attack. So each time, a mix of combat & rest are represented, periodically. In this interval, fatigue is one of the main obstacles to obtaining successful results during the competition (tournament) (2). So the scientist tried to find a harmless supplement that can reduce energy & decreasing Lactate accumulation & reduce their fatigue. Sodium bicarbonate & Beta-Alanine are such supplements that athletes use them to increase efficiency & decreasing fatigues (3)

Beta-Alanine supplementation is made by amino acids, which are to appear in aerobic & anaerobic capacities, increasing the volume of training time, improving the performance, increasing the carnosine & histidine, changes in

hydrogen ion in blood plasma levels & reduce fatigue affects (4). Beta-Alanine supplementation plays importance role as chemical buffer (5), increasing the level of plasma level in the muscles (6) to presence of histidine enzyme which cause to increasing liver & muscles protein synthesis as well as a chemical intermediate & nervous fatigue factor - muscle, enhance performance & maximum anaerobic training is essential (7). In 2011, a researcher studied on the using Beta-Alanine on the 30 male runner sprinting 400 meters in 1 minute & they used 4.8 grams (dose) for 8 weeks & three times in a week, the results after 8 weeks were; 4.8 percent improvements in endurance performance in high intensity, fatigue times, anaerobic capacity. Also 11 percent improvement happened in total sport times that justify the practice of periodic exercising is because of compatibility between physiological practices (8). In other study that it was done in 2009 on 51 men 24 years old without any exercises, they exercised 8 weeks with using supplementation Beta-Alanine & were measured intense interval exercising & neuromuscular fatigue. Their exercises included sprints 50 & 100 meter to 100% oxygen usages (Vo₂max) & repeats set 6-8 & with 30 seconds breaks between each sets & the amount of supplementation usage was 3.2 grams in three sessions in each weeks. But there were not any significant biochemical changes in 8 weeks (9).

Sodium Bicarbonate is known as factors that neutralize the hydrogen ions for creating carbon dioxide & water, but it is certainly clear its effects on the anaerobic performance & Lactate (10). Most of researches were reported that increasing of anaerobic power & the times of performances after using supplementations (11). Most of the done researches studied on the acute effects of Sodium Bicarbonate just be tested as following a repeat, for example: after 1 intensity reputation session by using this supplementation showed that the amount of Lactate significantly increased following the better performances (12). Research results show that both supplements increased the work load of 9 to 21% & increase of 5.3 to 8.7 percent of the peak performance (13).

Taekwondo is considered as a periodic activity. The main resource of producing the energy, in this kind of activities phosphagen & lactic acid, which is the periodic system resources during the work, are constantly being evacuated & restructuring (2). the production energy process is done by glycolysis after intensity exercises & create Lactate that the amount of it & absorption depends to the exit of the muscles, blood vessels, muscles (14). Lactate dehydrogenase enzymes & Kinase Creatine are enzymes that play role in the anaerobic APT production & also known as oxidative pressure indexes (15). Lactate dehydrogenase (LDH) is found in most of tissues especially in skeletal muscles (16). Since the Lactate dehydrogenase are widely throughout the body & as a result of intense exercise or severe rate increases (17).

The last researches showed that endurance exercises increase the amount of Lactate dehydrogenase & Creatine Plasma Kinase (17). Creatine Kinase is an intracellular enzyme that its concentration is high in the skeletal muscle, myocardium & brain (18). The transfer phosphate form ATP to Creatine means catalyze that it is the results of combination of high-energy phosphor- Creatine (phosphagen). Rupture of the membranes of muscle fibers causes to impaired calcium homeostasis & extracellular calcium influx & activation of arachidonic acid metabolism of arachidonic acid (19). Arachidonic acid metabolism leads to sensitize nerve fibers & leads to chemical, mechanical stimulation of muscle pain & increased levels of Creatine Kinase also have been observed that this process will affect the performance of athletes to continue exercising & the competition the negative effects the interferes (20). So the researchers & experts find the way to can prevent the perhaps harms or decrease them. One of the coping strategies of muscular harms form intensity sports is using the food additive (supplementation) (1). Beta-Alanine & Sodium Bicarbonate is one of the food additives that use for decreasing fatigue, injuries muscles harms (21). According to the surveys, low of studies compare the effects of Beta-Alanine & Sodium bicarbonate supplements on fatigue indexes & muscles harms on male elite taekwondo players. So comparing two doses of certain supplements, Creatine Kinase & Lactate dehydrogenase has seldom been addressed among male elite taekwondo players. In the other hand, the results of researches showed that usage sodium bicarbonate causes side effects such as gastrointestinal problems, & athletes are not so inclined to use this supplement (12) also there is not Beta Alanine in daily foods (22). It seems that a supplement that can replace sodium bicarbonate in addition to improving muscle fatigue & damage to be effective in restoring energy reserves seem necessary. In this study, the researcher compares the trace supplement period Beta-Alanine & sodium bicarbonate in the Lactate dehydrogenase & Creatine Kinase among male elite taekwondo players

EXPERIMENTAL SECTION

The method of doing it was semi-experienced which was field & practical based on the obtained results. The population included male elite taekwondo players in Chaharmahal Bakhtiari that they were health & don't have any

disorders in body & they were 20 persons (age 26.2 \pm 4.26 years old, weight: 69.32 \pm 16.45 Kg, height: 180.6 \pm 6.60 cm)& divided in to the 2 groups 20 persons (Beta-Alanine & sodium carbonate supplements). In order to homogenization they were compered in two groups based on age, height, weight, body volume index (BMI) that there wasn't significant difference among them (table 1). Inclusion criteria included having any diseases, particularly brain disease & any inflammation & surgery, the level of physical & mental health, through questionnaires, medical records were examined in all subjects. Exclusion criteria for the use of performance-enhancing steroids, having cardiovascular disease, diabetes, hormonal disorders, kidney disease & liver surgery, smoking & any intervention was effective on lab results. The implementation, objectives & outcomes research in writing & oral information to participants, they were asked to sign their written consent. Legal permissions & coordination needed to carry out the investigation of the Islamic Republic of Iran Taekwondo Federation in Chaharmahale Bakhtiari. In the one session the participants were familiar with the way of injection & exercises, also measured their height with height gauge 1meter & their weight were measured by scales with accurate 1 kg & BMI were measured by divided weight (Kg) on square of weight. In order to reduce some confounding factors & confounding effect on the results of research & to reduce the effects of food on the measurement indicators, in this session, participants were asked for at least 24 hours before the exercise program & blood of foods ready & also avoid caffeinated beverage. Subjects' blood sampling was measured in two steps 24 hours before exercising & the second step was 24 hours after the last session. In each steps 5ml blood were collected. Taekwondo players exercise 6 weeks (3 sessions in each week) & used 2.3 grams supplementation every day; Beta-Alanine & 3grams sodium bicarbonate were used based on their weights. Beta-Alanine was used 3 hours before exercises & sodium carbonate was used 1 hour before exercises.

Table (1): comparing the general & physiological characteristics among different groups in the basic situation

Statistic variable	t	p
Age (years)	0.448	0.66
Height (M)	0.708	0.55
Weight (Kg)	0.393	0.760
BMI	0.691	0.571
The highest level of consume oxygen (ml/kg)	1.45	0.23
Fat percentage	0.077	0.971

In the recent research, a 6-week exercising program for taekwondo includes interval training, speed, plyometric, Mitt the fight. Exercising intensity controlled their heart rates before, during & end of exercising. The total volume of weekly training for six weeks is presented in Table 3-2 (23).

Table (2): the mean of specified time to each exercise during 6 weeks

Kind of exercise	time	intensity	Set
General & specific heat	10-15 seconds	-	-
Roping	60 seconds	Vo2 75-85%	6
Toning & review techniques	3 minutes	Power 70-80%	6
Struggle	2 minutes	Power 80-90%	5
Mitt in the moment, Pal chagi enforcement techniques (Ap dolyo chagi, Dolyo chagi,...) in the case of an attack, anti-attack & combination	60 seconds	Power 80-90%	6
Step sweep	30second	Power 80%	10
Harvard step	30seconds	Vo2max 75-85%	10
Explosive cache	30 seconds	Power 80%	10
Shot 2 feet to exercising dummy	20 seconds	Power 70-80%	10
Juking+ jump at the same time	10 seconds	Power 70-80%	8
Medicine ball throw the ball long & leakage	40 seconds	Power 70-80	6
cool	10 minutes	-	-

After fill out the medical history & consent forms 24 hours before exercising & the supplementation uses on fasting in the on fasting in the presence of specialized laboratories & 5 ml of blood was taken from a vein in their arm. After being centrifuged to separate serum & in a freezer at -30 ° C was maintained for the laboratory. After 6-week taekwondo exercises along with using Beta-Alanine & sodium bi-carbonate supplements (table3-2), at the end of 6weeks, 24 hours after exercising the injection was done again (in fasting blood) anthropometric indices anaerobic placing at the end of the period was made again to determine Lactate dehydrogenase enzymatic methods with kits

manufactured by Roshd company made in Germany that used Cubas 400. Subjects' Creatine Kinase is specified by enzymatic methods with kits German & Cubas 400.

The analysis data was done in two level; descriptive & deductive. The descriptive level used statistic indexes such as: mean, standard deviation, in the deductive level for surveying the changes before & after exercises was used dependent & independent t-tests (the differences between after & before mean). in this study P-value was lower than 0.05 & it was significantly, all calculation was done by SPSS version 21.

RESULTS

Subjects' physiological & general characteristics; age, weight, height, BMI, Vo₂ max mean & standard deviation are presented in table (3).

Table (3): Mean & standard deviation subjects' physiological & general characteristics in the basic step

Variable (group)	Sodium bicarbonate	Beta-alanine
Age(year)	25.5+/-2.50	26.2+/-4.26
Height (Cm)	179.29+/-6.63	180.6+/-6.60
Weight (Kg)	70.07+/-15.7	69.32+/-16.45
BMI (Kg/m ²)	21.02+/-3.60	22.41+/-8.50
Highest level of oxygen consumption for each Kg	41.44+/-6	42.31+/-8.50

For comparison the differences between data was used pre-test & post-test of independent t. regarding to the p-value (0.05) in table (4), the effects of exercises & supplement were not significant ($p \leq 0.001$). in the other words there wasn't significant difference between pre-test & post-test various groups (sodium bicarbonate & Beta-Alanine groups regards of Creatine Kinase & dehydrogenase lactate).

Table (4): comparison between Creatine Kinase (moles per L) & dehydrogenase Lactate (moles per L) after & before exercising & supplementations by using dependent t-test

Statistic indexes	Mean+/-SD		Freedom rate	t	P-value
	Pre-test	Post-test			
Variables					
Lactate dehydrogenase (Beta-Alanine)	194.1+/-37.81	209.7+/-39.19	9	-2.16	0.05
Lactate dehydrogenase (Sodium Bicarbonate)	199.9+/-2.96	210.4+/-36.18	9	-0.652	0.53
CaratineKinase (Beta-Alanine)	210.2+/-37.81	209.7+/-39.19	9	-0.019	0.98
CaratineKinase (Sodium Bicarbonate)	233.7+/-39.19	239.6+/-36.18	9	-0.128	0.9

Table (5): the mean & SD of Creatine Kinase (moles per L) & dehydrogenase Lactate (moles per L) in subjects with sodium bicarbonate (n=10), Beta-Alanine (n=10) & independent t-test (differences between pre-test & post-test) for comparisons group variables

Variables	subjects		The results of independent t-test		
	Beta-Alanine SD+/-M	Sodium CArbonat SD+/-M	Freedom Rate	T score	P-value
Lactate dehydrogenase	199.9+/-2.96	210.4+/-36.18	18	-0.296	0.77
Creatine Kinase	209.7+/-39.19	239.6+/-36.18	18	-0.122	0.9

Independent t-test results showed that the Lactate dehydrogenase & Creatine Kinase levels in the groups studied Taekwondo exercises after 6 weeks of Beta-Alanine supplementation with sodium bicarbonate & there is no significant difference ($0.05 / 0 \leq P$).

DISCUSSION AND CONCLUSION

This research was done with the goal of comparison between the effects of using Beta-Alanine & Sodium Bicarbonate on Lactate dehydrogenase & Creatine Kinase among male elite taekwondo players. It should be noted that in the last studies, there weren't any researches in about Bicarbonate on Lactate dehydrogenase & Creatine Kinase among male elite taekwondo players.

The results showed that the amount of intra-groups of Lactate dehydrogenase & Creatine Kinase in Beta-Alanine & Sodium Bicarbonate were not significant statistically ($P \geq 0.05$). The results of recent research are same as Gadniss et

al (2010), Kashef et al (2012) & are not same results researches were done by Naton & Thomson (2001), Hafman et al (2008) (12, 13, 23, 24) maybe because of dissimilarity in exercises planning, time & exercising intensity. Kashef et al (2012) studied on the 36 male athletes 15-18 years old by using Creatine supplementations & combining creatine- carbohydrate on anaerobic power & muscular damage indexes in 3 sessions with sprints during 5 days. The results showed that Creatine moreover positive effects on anaerobic performances, caused to creating cellular damages & increasing the Creatine Kinase & Lactate dehydrogenase enzymes in blood were significant as using Creatine Kinase & Lactate dehydrogenase combination increase & prevent cellular damages (13). MaNaton & Thomson (2001) studied on the 40 health students by using E Vitamin & aerobic exercise on CK, LDH & lactate. The mean of ages were 21 years old & per day used 400 Milligram E vitamin supplementation during 8 weeks that the results showed that doing aerobic exercises with using E vitamin made significant differences the amount of Lactate in break times & after exercising, but there wasn't any changes in the amount of CK, LDH enzymes among 4 groups (23).

The recent research results showed that doing intensity taekwondo & Beta-Alanine & Sodium Bicarbonate caused to increasing fatigue indexes among taekwondo players. Lactate dehydrogenase is a kind of enzymes that may be useful in exchange pyruvate & Lactate through oxidation-reduction activity of serum Lactate dehydrogenase NADH & NAD & it is sign of cell damage & increased specific iso-enzymes in diagnosis of non-traumatic acute (25). Muscle Lactate dehydrogenase activity associates with muscle fiber composition (26). Enzymatic degradation occurs mainly in the liver, especially Kupffer cells that have receptors that are directly involved in the clean-up LDH4 iso-enzyme (27).

Lactate dehydrogenase & Creatine Kinase are enzymes that have important role in the anaerobic ATP & oxidative stress are known indicators (15). Upon entering Beta-Alanine to nerves muscle cells of histidine & carnosine in skeletal muscle due to increased Lactate dehydrogenase prevent (28). Given that Beta-Alanine supplement is an amino acid & amino acid structure composed of skeletal muscles (29).

Low & limited researches were done related to sodium bicarbonate on Lactate dehydrogenase & Creatine Kinase usages. Sodium bicarbonate can play a role in reducing acidity due to lactic acid production & acidification (10). Lactate dehydrogenase may be reduced by taking this supplement. Possible mechanisms of Lactate dehydrogenase decreased due to lower production of lactic acid neutralized by sodium bicarbonate (30). Bashiri et al (2012) studied on the non-athletes male students with 22 years old with long of using monohydrate Creatine on most of cellular damages indexes that the results showed that there were effects on long terms of using monohydrate Creatine supplements & also false increasing the Creatine Kinase & Lactate dehydrogenase enzyme as cellular damage (31). Also sodium bicarbonate prevent the increasing the Creatine Kinase & fatigue indexes indirectly by decreasing the Lactate Acid. Sodium bicarbonate to neutralize lactic acid & reduce muscle, sarcomere Lactic acid maintains structure & prevents an increase in Creatine Kinase (32). Since Creatine Kinase is found exclusively in muscle cells & heart as a valid index is considered as muscle cell membrane permeability. The destruction & damage sarcomere Z-lines cause to release the muscle enzymes into the intercellular fluid leads (20). In this study Beta-Alanine & sodium bicarbonate in a ratio causes an increase in Lactate dehydrogenase & Creatine Kinase.

The main questions that surveyed in this study are that whether using a period of Beta-Alanine & sodium carbohydrate supplementation effect on hydrogenous Lactate in Taekwondo exercise? The results showed that using them & exercising prevents to increase the hydrogenated Lactate & Creatine Kinase. Beta-Alanine supplementation with 2.3 g daily dose compared with sodium bicarbonate supplementation at a dose of 3 g may equally be effective in preventing fatigue & reduced muscle damage in athletes & may Beta-Alanine supplementation at a dose of more than 3.2 g daily dose ratio 3 grams of sodium bicarbonate can be more effective in preventing fatigue & muscle damage is reduced.

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