Examination of the effect of curcumin supplementation on liver enzymes and some physiological parameters in volleyball players

Exame do efeito da suplementação de curcumina nas enzimas hepáticas e alguns parâmetros fisiológicos em jogadores de vôlei

Savaş Ayhan¹
Ramazan Erdoğan²
Ercan Tizar³
Gönül Rezzan Tizar⁴
Korhan Kavuran⁵

Abstract

Purpose: The aim of this study is to examine the effect of curcumin supplementation applied in addition to volleyball training on the lipid metabolism and some physiological parameters of the athletes. Material Method: The research group consisted of 20 volunteer male volleyball athletes who consistently participated in training and national level volleyball events. In addition to volleyball exercise, the participants in the research received 200 mg of curcumin pill. During the volleyball competition time, the research group received an 85-minute daily training regimen three days a week for six weeks. Findings: When the biochemical parameters

¹ Doctor in Sport Sciences, Dicle University School of Physical Education and Sports, Kütülbil, Dicle Ünv., 21280 Sur/Diyarbakır, Turquia. E-mail: savasayhan2011@gmail.com
Orcid: https://orcid.org/0000-0003-4238-1844

² Doctor in Sport Sciences, Bitlis Eren University School of Physical Education and Sports Beş Minare Mah., Rahva Yerleşkesi, 13000 Bitlis, Turquia. E-mail: ramaznerdogan@hotmail.com
Orcid: https://orcid.org/0000-0001-5337-942X

³ PhD in Sport Sciences, Dicle University School of Physical Education and Sports, Kütülbil, Dicle Ünv., 21280 Sur/Diyarbakır, Turquia. E-mail: ercantizar@gmail.com Orcid: https://orcid.org/0000-0002-3961-7417

⁴ PhD Students in Sport Sciences, İnönü University Institute of Health Sciences, Üzümlü, Yolu, 44000 Malatya Merkez/Malatya, Turquia. E-mail: gonultizar@gmail.com Orcid: https://orcid.org/0000-0001-8330-1703

⁵ PhD in Sport Sciences, Bitlis Eren University School of Physical Education and Sports, Beş Minare Mah., Rahva Yerleşkesi, 13000 Bitlis, Turquia. E-mail: kkavuran@beu.edu.tr
Orcid: https://orcid.org/0000-0002-8924-2182
of the athletes of the research group were analyzed as a result of the training, it was determined that there was a statistically significant difference in the glucose, creatine, pre-test and post-test levels (p<0.05), while there was no statistically significant difference in the sub-pretest-posttest level (p>0.05). It was determined that there was a statistically significant difference between lipid metabolism, triglyceride pre-test and post-test levels (p<0.05), while there was not statistically significant difference found between pre-post-test values for total cholesterol levels (p>0.05). Result: It has been observed that curcumin supplementation applied in addition to volleyball training affects the lipid metabolism and physiological parameters of the athletes. In line with this information, we believe that the supplements to be applied in addition to their routine training will positively affect the athletic performance of the athletes.

**Keywords:** Lipid Profile. Volleyball. Curcumin.

---

**Resumo**

Objetivo: O objetivo deste estudo é examinar o efeito da suplementação de curcumina aplicada além do treinamento de voleibol sobre o metabolismo lipídico e alguns parâmetros fisiológicos dos atletas. Método Material: O grupo de pesquisa consistiu em 20 atletas voluntários do voleibol masculino que participaram consistentemente em treinamentos e eventos de vôlei de nível nacional. Além do exercício de vôlei, os participantes da pesquisa receberam 200 mg de curcumina. Durante o período da competição de vôlei, o grupo de pesquisa recebeu um regime de treinamento diário de 85 minutos, três dias por semana, durante seis semanas. Constatações: Quando os parâmetros bioquímicos dos atletas do grupo de pesquisa foram analisados como resultado do treinamento, determinou-se que houve diferença estatisticamente significativa nos níveis de glicose, creatina, pré-teste e pós-teste (p<0,05), enquanto não houve diferença estatisticamente significativa no nível sub-pré-teste-pós-teste (p>0,05). Verificou-se que houve diferença estatisticamente significativa entre o metabolismo lipídico, os níveis pré-teste e pós-teste de triglicérides (p<0,05), enquanto não houve diferença estatisticamente significativa entre os valores pré-teste para os níveis de colesterol total (p>0,05). Resultado: Observou-se que a suplementação de curcumina aplicada além do treinamento de vôlei afeta o metabolismo lipídico e os parâmetros fisiológicos dos atletas. De acordo com essas informações, acreditamos que os suplementos a serem aplicados, além de seu treinamento de rotina, afetarão positivamente o desempenho atlético dos atletas.

**Keywords:** Perfil lipídico. Voleibol. Curcumina.
Introduction

Curcumin (CCM) is a hydroxycinnamic acid derivative containing two carbonyl groups and two polyphenolic rings that are hydrophobic. It is the primary curcuminoid in turmeric, a plant alkaloid obtained from the ground rhizome of the annual herb Curcuma longa. It has been utilized in the alternative medicine systems of India (Ayurvedic medicine) and Asia (traditional Chinese medicine) to treat gastrointestinal, pulmonary and liver disorders, wounds and sprains (1).

Apart from its therapeutic properties, it imparts a unique flavor to curry when used as a condiment and is also used as a colorant. CCM has been investigated for its anti-obesity, anti-inflammation, anti-cancer, anti-angiogenesis, anti-diabetes, hepatoprotection, radioprotection, and chemopreventive actions (2).

CCM is also said to affect obesity and lipid metabolism via a number of pathways, including energy metabolism regulation, inflammation suppression, and angiogenesis. Few research, however, have specifically investigated the effect of CCM on physiological exhaustion, particularly peripheral fatigue.

It was expected that CCM supplementation might affect exercise-related metabolites, energy distribution, and possibly physical performance based on past research on lipid and energy metabolism (3).

Turmeric (Curcuma longa L.) is a yellowish eastern spice that is related to ginger (Zingiberaceae) (Ammon and Wahl 1991; Hewlings et al. 2017; Priyadarsini 2014). This spice is extensively farmed in tropical countries, with India being the primary producer (4).

Because of its attractive scent, somewhat spicy and bitter taste, turmeric is commonly utilized as a medicinal plant in Asian nations in addition to cooking. It is made up of essential oils (turmeron, atlantone, and zingiberen), proteins, carbohydrates, and resins (5).

The major phenolic molecule generated from turmeric is curcumin (1.7-bis (4-hydroxy-3 methoxyphenol)-1,6 heptadiene-3,5-dione), also known as diferuloylmethane. Vogel and Pelletier (1815) isolated this chemical from turmeric rhizomes in 1865, and MiobeRdzka, Kostanecki, and Lampe (1910) described its structure (6).

Turmeric has lately gained widespread interest from researchers who have done studies demonstrating that its therapeutic characteristics are linked to pain relief, as well as the prevention and treatment of cardiovascular, cancer, and other chronic diseases (7).

Curcumin administration has also been shown to improve physical activity and sports performance in animal studies. Curcumin supplementation is said to aid in muscle repair and
inflammation reduction, improve mitochondrial biogenesis, reduce oxidative stress, and prevent fatigue and muscle damage (8).

**Material Method**

**2.1 Research Group**

The research group consisted of 20 volunteer male volleyball athletes who consistently participated in training and national level volleyball events. In addition to volleyball exercise, the participants in the research received 200 mg of curcumin pill.

**2.2 Training Program**

Throughout the volleyball competition time, the research group received an 85-minute daily training regimen three days a week for six weeks. A training program was conducted in a training unit that included 10-15 minutes of warm-up time, 50-60 minutes of volleyball training and studies to build fundamental motor characteristics, and 5-10 minutes of cooling down activities at the end of the training. The trainings were adjusted according to the fitness level of the research group and were applied throughout the training program.

**2.3 Collection and Analysis of Samples**

Blood samples were collected from the research group twice: once before the commencement of the training program and once at the end. Athletes taking part in the study were watched during training, and those who had metabolic abnormalities or were using medicines were eliminated. The athletes' AST, ALT, urea, Creatine, Glucose, Cholesterol, and Triglyceride levels were measured in blood samples collected as a consequence of training. The athletes' blood samples were collected by professionals in a private medical laboratory using a completely automated hemogram called "Coulter Stks" while they were seated and resting, and their analyses were performed in a private hospital.
2.4 Statistical Analysis

The SPSS package program was used to examine the data. Following the normality study, parametric tests were applied on the data that was judged to have a normal distribution. As descriptive statistics for the research group's demographic information, percentage frequency and arithmetic mean tests were used. The Paired Samples test was used to compare the study group's pre-post test results. Significance was calculated as p<0.05.

Findings

<table>
<thead>
<tr>
<th>Parameters</th>
<th>X</th>
<th>ss</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age</td>
<td>21.05</td>
<td>1.93</td>
</tr>
<tr>
<td>Height</td>
<td>177.70</td>
<td>5.35</td>
</tr>
<tr>
<td>Body Weight</td>
<td>69.05</td>
<td>4.61</td>
</tr>
<tr>
<td>Sports Age</td>
<td>12.95</td>
<td>1.70</td>
</tr>
<tr>
<td>BMI</td>
<td>21.89</td>
<td>0.99</td>
</tr>
</tbody>
</table>

Table 1. Percentage Frequency Values Regarding Demographic Information of Athletes
*; p<0.05
Source: Author

When Table 1 is examined, it is monitored that the research group has an average age of 21.05±1.93 years, a height of 177.70±5.35 cm, a body weight of 69.05±4.61 kg, and a BMI of 21.89±0.99 and 12.95±1.70 sports years.

<table>
<thead>
<tr>
<th>Parameters</th>
<th>Pre test</th>
<th>Post test</th>
<th>T</th>
<th>p</th>
</tr>
</thead>
<tbody>
<tr>
<td>Glucose</td>
<td>88.75±5.10</td>
<td>92.25±3.62</td>
<td>-2.891</td>
<td>0.00*</td>
</tr>
<tr>
<td>Creatine</td>
<td>0.95±0.10</td>
<td>1.10±0.08</td>
<td>-9.509</td>
<td>0.00*</td>
</tr>
<tr>
<td>Urea</td>
<td>32.30±5.43</td>
<td>29.15±4.63</td>
<td>4.080</td>
<td>0.00*</td>
</tr>
<tr>
<td>AST</td>
<td>23.45±4.12</td>
<td>27.15±4.33</td>
<td>-6.180</td>
<td>0.00*</td>
</tr>
<tr>
<td>ALT</td>
<td>24.30±7.26</td>
<td>25.65±9.00</td>
<td>-1.342</td>
<td>0.19</td>
</tr>
</tbody>
</table>

Table 2. Biochemical Changes of Athletes Before and After Training
*p<0.05
Source: Author

When the biochemical parameters of the athletes as a result of the training were evaluated in Table 2, it was determined that there was a statistically significant difference in the pre-post test levels of glucose, creatine, urea and AST (p<0.05), while there was no statistically significant difference in the ALT pre-post test level (p>0.05).
Examination of the effect of curcumin supplementation on liver enzymes and some physiological parameters in volleyball players

### Table 3. Athletes' Pre- and Post-Training Lipid Metabolism Changes

<table>
<thead>
<tr>
<th>Parameters</th>
<th>Pretest</th>
<th>Post test</th>
<th>t</th>
<th>P</th>
</tr>
</thead>
<tbody>
<tr>
<td>Triglyceride</td>
<td>90.35±15.20</td>
<td>82.95±16.19</td>
<td>2.771</td>
<td>0.01*</td>
</tr>
<tr>
<td>Total Cholesterol</td>
<td>133.00±15.88</td>
<td>127.70±13.30</td>
<td>1.595</td>
<td>0.13</td>
</tr>
</tbody>
</table>

*: p<0.05
Source: Author

When Table 3 was analyzed, it was determined that there was a statistically significant difference between the lipid metabolism of the research group and the triglyceride pretest-posttest level (p<0.05), while there was no statistically significant difference between the total cholesterol level pre-posttest values (p>0.05).

### Discussion and Result

During aerobic exercise (1 hour treadmill jog), there was a substantial reduction in physical exercise-derived inflammation compared to the pre-exercise moment in studies when turmeric supplementation was used. Despite some inconsistent results, curcumin administration appears to be useful for pain relief as well as muscle damage mitigation by lowering serum CK. On day 3 after resistance exercise, post-exercise CG (180 mg/day - 4 days), placebo group, and when compared to the supplemented group 7 days before activity, there was a reduction in muscular discomfort. Nevertheless, there was no change in creatine kinase (CK) serum levels across the groups (9).

Another study found that CG (180 mg/day - 7 days after exercise) had a lower muscular pain level 3-6 days after exercise than the placebo group. Also, CK serum CG concentrations were lower 5-7 days after exercise compared to the placebo group (10).

Öztürk et al. (2022) stated that long-term volleyball training caused changes in the mineral and some physiological parameters of the athletes (11).

Nicol et al. (2015) found that those treated with curcumin (5 g/day - 5 days) had less muscular pain and lower CK serum values (22-9%; ± 21-22%) at 24- and 48 hours. Another clinical trial in France with 10 rugby players treated with curcumin+piperine (6 g/day + 60 mg/day - 4 days) found no impact on pain or muscle injury (12).

In a different study, Erdoğan (2021) determined that the conditioning training he applied in addition to volleyball training caused changes in the liver enzymes and muscle damage markers of the athletes (13).

Curcumin supplementation for 8 weeks resulted in substantial improvements in CRP, LDH, MDA, and VO2 max values in healthy young adult women in trials. In contrast, no
effect of curcumin intake on weight, body fat, or lean body mass was identified in this research (14).

In another study, Erdoğan (2021) stated that the training of the athletes participating in school sports during the competitions had a positive effect on liver enzymes and lipid metabolism in the athletes (15).

There are several supplements available that boost exercise performance, minimize tiredness, and promote rapid recovery after exercise. High-intensity or rigorous physical activity disrupts the body's homeostasis, such as the redox state, and lowers physiological processes. Muscle damage or injury is caused by physical or chemical causes. It has been proposed that reactive oxygen species (ROS) are implicated in oxidative skeletal muscle fatigue via lipid peroxidation damage to cell membrane integrity. Infiltration of cells causes the release of certain cytosol enzymes or proteins into the blood, such as creatine kinase, myoglobin, aspartataminotransferase, and alanineaminotransferase, as markers of muscle injury (16).

Additional indicators used to detect exhaustion include lactate, ammonia, blood urea nitrogen (BUN), and glucose (17).

Delecroix et al. (2017) stated that curcumin and piperine supplementation applied before and after exercise positively affects the muscle damage of athletes after exercise (18).

Huang et al. (2022) determined that long-term and regular exercises positively affect the lipid profile (19).

In another study, Doewes et al. (2022) stated that aerobic exercises have a positive effect on the lipid profile of individuals (20).

In conclusion; It has been observed that curcumin supplementation applied in addition to volleyball training affects the lipid metabolism and physiological parameters of the athletes. In line with this information, the diversity of nutrients or compounds derived from food factors or medicinal plants can be explored to understand their possible effects on exercise physiology and the different bioactivities that can be used for health promotion.

References


Examination of the effect of curcumin supplementation on liver enzymes and some physiological parameters in volleyball players


Submetido em: 01.11.2023
Aceito em: 01.12.2023