JPJO 5 (1) (2020) 6-9

Jurnal Pendidikan Jasmani dan Olahraga

Available online at:
https://ejournal.upi.edu/index.php/penjas/article/view/23181
DOI: https://doi.org/10.17509/jpjo.v5i1.23181

The Effect of Creatine Supplement on The Kidney Function of Dragon Boat Athletes

Pipit Pitriani*, Hamidie Ronald Ray Daniel Ray, Jajat Darajat
Fakultas Pendidikan Olahraga dan Kesehatan, Universitas Pendidikan Indonesia

Article Info

Article History :
Received December 2019
Revised December 2019
Accepted February 2019
Available online April 2020

Keywords :
Creatine, Creatinine level, Urea level

Abstract

Konsumsi kreatin suplemen di kalangan atlet amatir dan profesional semakin meningkat. Tujuan dari penelitian ini adalah untuk mengetahui pengaruh suplemen kreatin terhadap fungsi ginjal atlet dragon boat. 12 orang atlet dragon boat dibagi menjadi 2 kelompok, satu kelompok yang mengkonsumsi kreatin dan satu kelompok tanpa asupan kreatin (placebo). Suplemen kreatin diberikan dengan dosis loading 20gr/hari, frekuensi pemberian 3-4x sehari. Pada minggu kedua dosis diturunkan menjadi 15 gr/hari. Suplemen kreatin dikonsumsi selama 5 minggu. Kadar ureum dan kreatinin darah diambil dari vena median cubital lengan dengan menggunakan spuit 3cc. Hasil penelitian didapatkan pemberian suplemen kreatin berpengaruh signifikan meningkatkan kadar ureum dan kreatinin dalam darah. Walau terdapat peningkatan kadar ureum dan kreatinin dalam darah namun jumlahnya masih dalam batas normal, sehingga perlu diantisipasi dengan asupan cairan yang memadai.

Abstract

The consumption of creatine supplement among amateur and professional athletes is increasing. The purpose of this study was to determine the effect of creatine supplementation on the kidney function of dragon boat athletes. 12 dragon boat athletes were divided into 2 groups, including one group that consumed creatine supplement and one group without creatine intake (placebo). Creatine supplement was given at a loading dose of 20gr/day. The frequency of creatine supplement intake was 3-4x a day. In the second week, the dose was reduced into 15 gr/day. Creatine supplements were consumed for 5 weeks. Blood urea and creatinine were taken from the median cubital vein of the arm by using a 3cc syringe. The results showed that creatine supplementation had a significant effect in increasing the level of blood urea and creatinine. Although there were increases in urea and creatinine levels in the blood, the amount was still within normal limits. Therefore, it should be anticipated by taking a sufficient water intake.

✉ Correspondence Address : Jln. Dr. Setiabudhi 229. Bandung. Indonesia
E-mail : pipitpitriani@upi.edu,

INTRODUCTION

An athlete's physical fitness is a factor that cannot be separated from the success of an athlete to achieve optimal performance so that maximum performance can be achieved. Cardiorespiratory endurance, body composition, muscle strength, muscular endurance, and flexibility influence physical fitness (Spain and Don Franks, 2001). These components of physical fitness will be maximized if they practice and get enough nutrition.

Every athlete needs various kinds of nutrients to provide energy during training and also to repair damaged muscle mass and increase muscle mass. Carbohydrates, protein, and fat are the main nutrients that play a role in the process. At present, many kinds of nutrients have been made that can improve the performance of athletes called ergogenic aids (Tokish, Kocher and Hawkins, 2004; Maughan, 2005) (Maughan, 2005; Tokish, Kocher, & Hawkins, 2004). One ergogenic aid is often used is a creatine supplement (Bird, 2003; Kraemer and Volek, 2005).

Creatine is one of the most popular substances in athletes and bodybuilders worldwide (Antonio and Ciccone, 2013). More than 4 million kg and $ 200 million in the food supplement industry are allocated to creatine every year. Statistical data in 2014 show that 14% of US college athletes are creatine consumers (Smith, Agharkar and Gonzales, 2014). Creatine is naturally produced by the liver from 2 amino acids, glycine, and arginine (N- [aminoiminomethyl] - N-methyl a Piturglycine). Creatine can also come from meat and fish. Muscles take creatine from the blood circulation and convert it into a compound called phosphocreatine by using the enzyme creatine kinase (Lemon, 2009). Phosphocreatine can produce energy by releasing adenosine triphosphate (ATP). Creatine supplementation causes storage in the muscles and as a result, there is more phosphocreatine and ATP formation. High ATP can increase performance and muscle mass especially in extensive sports (Casey and Greenhaff, 2000; Timmons et al., 2017).

Currently, many studies explain the positive effects of creatine supplements, but not many studies explain the side effects of creatine use in dragon boat athletes. For this reason, the researchers want to investigate the effect of using creatine supplements on the kidney function of dragon boat athletes.

METHODS

The research design used in this study is an experimental pre-post control group design. The population in this study are female dragon boat athletes in West Java. Twelve female athletes are sampled with aged over 16 years and they are divided into two groups. One group is given a creatine supplement, the other group is given a placebo (control group). Creatine supplement is consumed for 5 weeks with a loading dose of 20gr/day for 7 days, the frequency of administration is 3-4 times per day of each 5gr creatine is dissolved in the water approximately 1 liter. In the second week, the dose is reduced to 15 gr/day. The study is conducted in Jatiluhur Purwakarta Reservoir, in August-November 2019.

Blood urea and creatine levels are examined before and after the intervention. The blood samples are taken from the median cubital arm by using a 3cc syringe. It is then stored in an EDTA blood sample tube. Urea levels are examined by using the kinetic test method with Urease and Glutamate Dehydrogenase. Creatine levels are examined for enzymatic colorimetric methods by using the Indiko Plus tool. The data analysis uses independent sample T test.

RESULT

Table 1. Characteristics of subjects

Characteristicts	Creatine (X±SD)	Control (X±SD)
age (year)	20.33±4.61	18.3±1.88
weight (kg)	55±2.88	57.86±6.59
height (cm)	159.83±4.29	162.8±8.23
BMI (kg/m^2)	21.54±1.07	21.79±1.62
TD systole (mmHg)	101.67±6.87	110±10
TD diastole (mmHg)	61.67±3.73	68.33±3.72

The data from the characteristics of the subjects obtain the average age in the Creatine group is 20.33 ± 4.61 years, while in the control group is 18.3 ± 1.88 years. The average has a normal body mass index

(BMI) of 21.54 ± 1.07 kg / m2 in the Creatine group and 21.79 ± 1.62 kg / m2 in the control group. Systolic/ diastolic blood pressure in the creatine and control groups is still within normal limits (101.67 ± 6.87 / 61.67 ± 3.73 mmHg vs 110 ± 10 / 68.33 ± 3.72 mmHg).

The results of the study reveals that creatine supplementation significantly increase blood urea levels ($p < 0.05$) from 16.06mg / dL to 24.91mg / dL (Figure 1). For the control group, there are no significant changes in urea levels.

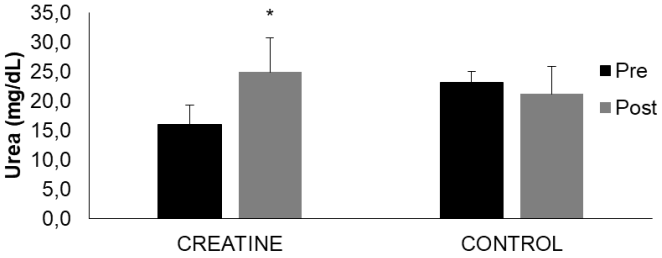

Figure 1. Comparison of blood urea levels.

Blood creatinine levels also experience a significant increase ($p < 0.05$) in the creatine supplementation given group from 0.76 mg / dL to 0.88 mg / dL.

Figure 2. Comparison of blood creatinine levels.

DISCUSSION

This study aims to determine the effect of creatine supplementation on kidney function in West Java dragon boat athletes. Creatine is an ergogenic aid that is popularly used by athletes from various sports (Cooper et al., 2012). This creatine can be found in natural food such as beef and fish (Timmons et al., 2017). Creatine can be converted to creatinine in skeletal and hepatic muscle by nonenzymatic hydrolysis. Creatinine serum is a classic marker of kidney function. Creatinine serum concentrations can increase by as much as 50% within 2 hours after consuming meat and still increase for up to 24 hours in normal people or those with kidney disorders. (Preiss et al., 2007; Nair et al., 2014).

The results of the study find a significant effect of the intake of creatine supplements on the increase in urea and blood creatinine. Creatine supplementation is carried out for 5 weeks with a loading dose of 20 grams per day with a frequency of giving 3-4 times a day.

The results of the research on the influence of creatine on kidney function vary greatly. Creatine supplementation causes an increase in creatinine urea levels in mice that have cysts in their kidneys (Edmunds et al., 2001). Meanwhile, other studies state that there is no significant effect on kidney function in mice that have previously experienced kidney failure (Taes et al., 2003). Likewise, Mayhew (2002) shows that creatine consumption of 5gr / day to 20gr / day for 0.25 to 5.6 years do not have a long-term adverse effect on the renal function index under study including urea serum and clearance of creatinine and creatinine in football players in America (Mayhew, Mayhew and Ware, 2002). Schilling (2001) shows that long-term creatine consumption (0.8 to 4 years) with an average loading of 13.7 ± 10.0gr / day and a maintenance dose of 9.7 ± 5.7gr / day can only increase creatinine serum concentration within the normal range (Schilling et al., 2001).

With the many different results obtained in other studies, it is recommended that the athlete with preexisting kidney disease or those who have potential risk for kidney dysfunction such as diabetes mellitus, hypertension, and proteinuria should not consume Creatine (Davani-Davari et al., 2018).

CONCLUSION

Creatine supplementation affects kidney function. However, blood urea and creatinine levels are still within normal limits. Further research needs to see how the effect of creatine supplementation with different doses on kidney function, liver and body metabolic processes in athletes who do active exercise. Creatine supplements are consumed to improve sports performance but they need to be used at appropriate doses and athletes who consume these supplements do not have impaired

kidney function. In addition to consuming creatine, adequate fluid intake is needed so that it does not overload the kidneys.

ACKNOWLEDGEMENT

We would like to deliver our gratitude to Lembaga Penelitian dan Pengabdian kepada Masyarakat (LPPM) UPI as the funding source of the study. We would also deliver our sincere gratitude to all participants who had involved in the study.

REFERENCES

Antonio, J. and Ciccone, V. (2013) 'The effects of pre versus post workout supplementation of creatine monohydrate on body composition and strength', Journal of the International Society of Sports Nutrition. Journal of the International Society of Sports Nutrition, 10(1), p. 1. doi: 10.1186/1550-2783-10-36.

Bird, S. P. (2003) 'Creatine supplementation and exercise performance: a brief review.', Journal of sports science & medicine, 2(4), pp. 123–32. Available at: http://www.ncbi.nlm.nih.gov/pubmed/24688272%0Ahttp://www.pubmedcentral.nih.gov/articlerender.fcgi?artid=PMC3963244.

Casey, A. and Greenhaff, P. L. (2000) 'Does dietary creatine supplementation play a role in skeletal muscle metabolism and performance?', American Journal of Clinical Nutrition, 72, pp. 607S-617S.

Cooper, R. et al. (2012) 'Creatine supplementation with specific view to exercise/sports performance: An update', Journal of the International Society of Sports Nutrition. ???, 9(1), p. 1. doi: 10.1186/1550-2783-9-33.

Davani-Davari, D. et al. (2018) 'Potential adverse effects of creatine supplement on the kidney in athletes and bodybuilders', Iranian Journal of Kidney Diseases, 12(5), pp. 253–260.

Edmunds, J. W. et al. (2001) 'Creatine supplementation increases renal disease progression in Han:SPRD-cy rats', American Journal of Kidney Diseases, 37(1), pp. 73–78. doi: 10.1053/ajkd.2001.20590.

Kraemer, W. J. and Volek, J. S. (2005) 'CREATINE SUPPLEMENTATION', Clinics in Sports Medicine, 18(3), pp. 651–666. doi: 10.1016/s0278-5919(05)70174-5.

Lemon, P. W. R. (2009) 'Dietary Creatine Supplementation and Exercise Performance: Why Inconsistent Results?', Canadian Journal of Applied Physiology, 27(6), pp. 663–680. doi: 10.1139/h02-039.

Maughan, R. J. (2005) 'Nutritional ergogenic aids and exercise performance', Nutrition Research Reviews, 12(02), p. 255. doi: 10.1079/095442299108728956.

Mayhew, D. L., Mayhew, J. L. and Ware, J. S. (2002) 'Effects of long-term creatine supplementation on liver and kidney functions in American College football players', International Journal of Sport Nutrition and Exercise Metabolism, 12(4), pp. 453–460. doi: 10.1123/ijsnem.12.4.453.

Nair, S. et al. (2014) 'Effect of a cooked meat meal on serum creatinine and estimated glomerular filtration rate in diabetes-related kidney disease objective', Diabetes Care, 37(2), pp. 483–487. doi: 10.2337/dc13-1770.

Preiss, D. J. et al. (2007) 'The influence of a cooked-meat meal on estimated glomerular filtration rate', Annals of Clinical Biochemistry, 44(1), pp. 35–42. doi: 10.1258/000456307779595995.

Schilling, B. K. et al. (2001) 'Creatine supplementation and health variables: A retrospective study', Medicine and Science in Sports and Exercise, 33(2), pp. 183–188. doi: 10.1097/00005768-200102000-00002.

Smith, R. N., Agharkar, A. S. and Gonzales, E. B. (2014) 'A review of creatine supplementation in age-related diseases: more than a supplement for athletes', F1000Research, 3, p. 222. doi: 10.12688/f1000research.5218.1.

Spain, C. G. and Don Franks, B. (2001) 'Healthy People 2010: Physical acitivity and fitness', President's Council on Physical Fitness and Sports, 3(13), pp. 1–16.

Taes, Y. E. C. et al. (2003) 'Creatine supplementation does not affect kidney function in an animal model with pre-existing renal failure', Nephrology Dialysis Transplantation, 18(2), pp. 258–264. doi: 10.1093/ndt/18.2.258.

Timmons, J. A. et al. (2017) 'Muscle creatine loading in men', Journal of Applied Physiology, 81(1), pp. 232–237. doi: 10.1152/jappl.1996.81.1.232.

Tokish, J. M., Kocher, M. S. and Hawkins, R. J. (2004) 'Ergogenic aids: A review of basic science, performance, side effects, and status in sports', American Journal of Sports Medicine, 32(6), pp. 1543–1553. doi: 10.1177/0363546504268041.