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THE EFFECT OF A SINGLE BOUT OF FUTSAL ON URIC ACID CONCENTRATION IN FEMALE COLLEGIATE ATHLETES: A PILOT STUDY

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ABSTRACT

Introduction and objective: Futsal is the most growing sport in the world. Many studies have documented that exercise or sports improve antioxidant activity. However, the effect of futsal on antioxidant is not known. The purpose of the study is to examine the effect of playing futsal on uric acid concentration (UA). Materials and methods: This cross-sectional study involved twenty females collegiate futsal players. Ten of them were assigned to play futsal (futsal group) while ten other players assign not to play futsal group (controls group). The UA concentration was measured from capillary blood using strip test methods. Uric acid was checked before (baseline UA) and after playing futsal (posts UA). Futsal was played according to the game rules. Independent and paired-samples t test was applied. Significance was set at $p<0.05$. Results: Baseline and post-UA were not different between groups ($p=0.52$ and $p=0.13$, respectively). Post UA was significantly elevated in futsal group (0.73 mg/dL, $p<0.01$). The elevated UA was significantly different with control (0.73 vs -0.19 mg/dL, $p<0.01$). Discussion: Sport and exercise have been known to play role as an antioxidant. This benefit effect could prevent several diseases. However the study on the effect of futsal on antioxidant are very lacking. Our study indicated a single bout of futsal improved an antioxidant activity in female futsal player. The results should be interpreted with cautions due to several limitations including sample size, design of the study, and antioxidant marker. Conclusion: A single bout of futsal increases the uric acid concentration in female collegiate futsal players.

Key words: Uric acid. Antioxidant. Futsal. Female college students.

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RESUMO

O efeito de um único ataque de futsal na concentração de ácido úrico em atletas universitárias: um estudo piloto

Introdução e objetivo: O futsal é a modalidade que mais cresce no mundo. Muitos estudos documentaram que exercícios ou esportes melhoram a atividade antioxidante. No entanto, o efeito do futsal no antioxidante não é conhecido. O objetivo do estudo é examinar o efeito do futsal na concentração de ácido úrico (UA). Materiais e métodos: Este estudo transversal envolveu vinte jogadores colegiais de futsal do sexo feminino. Dez deles foram designados para jogar futsal (grupo de futsal), enquanto outros dez jogadores designaram para não jogar grupo de futsal (grupo de controle). A concentração de UA foi medida a partir do sangue capilar usando métodos de teste em tira. O ácido úrico foi verificado antes (UA de linha de base) e depois de jogar futsal (pós UA). O futsal foi jogado de acordo com as regras do jogo. Foi aplicado o teste t de amostras independentes e emparelhadas. A significância foi estabelecida em $p<0,05$. Resultados: Linha de base e pós-UA não foram diferentes entre os grupos ($p=0,52$ ep=0,13, respectivamente). Pós UA foi significativamente elevado no grupo de futsal (0,73 mg / dL, $p<0,01$). A UA elevada foi significativamente diferente com o controle (0,73 vs - 0,19 mg / dL, $p<0,01$). Discussão: Sabe-se que o esporte e o exercício exercem um papel como antioxidante. Este efeito benefício pode prevenir várias doenças. No entanto, o estudo sobre o efeito do futsal no antioxidante é muito escasso. Nosso estudo indicou que uma única sessão de futsal melhorou uma atividade antioxidante em jogador de futsal feminino. Os resultados devem ser interpretados com cautela devido a várias limitações, incluindo tamanho da amostra, desenho do estudo e marcador antioxidante.Conclusão: Uma única sessão de futsal aumenta a concentração de ácido úrico em jogadoras de futsal universitárias.

Palavras-chave: Ácido úrico. Antioxidante. Futsal. Universitárias.

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INTRODUCTION

Futsal is one of the most popular sports and its number of players has been growing very fast around the world.

Increased participation in futsal may be due to fewer players involved and smaller fields. Increased participation in futsal also involves females. The number of females engages in futsal is possibly even similar to other sports. However, with its in

creasing popularity and people involved, the study on futsal, especially its effect on health and antioxidant, is still lacking.

Uric acid (UA) is the result of purine metabolism, which is synthesized from food or endogenously and excreted mainly through the proximal tubules (Fathallah-Shaykh, Cramer, 2014).

The increased serum concentration of UA or hyperuricemia is due to increased production or decreased excretion.

Several factors are associated with hyperuricemia, including genetics, obesity, diet, alcoholism, dehydration, and lactic acidosis (Sun et al., 2010; Harris et al., 1999). Females are at lower risk of hyperuricemia than males.

However, the literature is still unclear about the role of UA. Acute elevation of UA is considered a protective factor because of its role as an antioxidant whereas chronic elevation is associated with risks of some diseases such as acute kidney injury, chronic kidney disease, and hypertension (Fathallah-Shaykh, Cramer, 2014; Oliveira, Burini, 2012; Xu et al., 2017).

The literature has evidenced that various sports and exercise that raise the concentration of UA. A previous study found a patient experienced an increase in UA concentration after exercise on a bicycle ergometer (1986).

A study in soccer involving players from four age groups for 12 weeks in different phase had been conducted.

The results confirmed that UA concentration increased compared to the baseline in all age groups and the increase in the competitive phase was higher than in the preparatory phase (Manna et al., 2010). The effect of off-road motocross on UA concentration had been already studied.

The study demonstrated that UA concentration was also elevated in off-road motocross racers (Ascensão et al., 2007).

To our knowledge, no other study investigated the effect of futsal on the UA concentration. Thus, this study aimed to investigate the effect of single bout futsal on UA concentration in female collegiate players.

MATERIALS AND METHODS

Participants

This cross-sectional study involved twenty females collegiate futsal players of Faculty of Medicine, Universitas Katolik Indonesia Atma Jaya.

Ten of them were assigned to play futsal as futsal group, whereas ten other players not to play futsal as a control group. Subjects were excluded if they were overweight (BMI>25 kg/m^2), taking alcohol or food containing alcohol, and had a family history of hyperuricemia or gout.

All subjects signed an informed consent form before participation. Ethical clearance was approved by the Ethics Committee of Faculty of Medicine and Health Science, Universitas Katolik Indonesia Atma Jaya (protocol number: 11/05/KEP-FKUAJ/2018).

Measures

Height was measured at Frankfort position using a calibrated stadiometer while subjects stood barefoot. Weight was measured using a digital scale (Seca Robusta 813, Germany) while subjects used minimal clothing.

The results were expressed in meters with an accuracy to the nearest 0.01 meters in height, and as kilogram with an accuracy to the nearest 0.1 kilograms in weight.

Body mass index was obtained from the established formula and reported as kg/m^2. Weight was measured twice before and after futsal game to observe possible weight change due to water loss.

Uric acid examination

Screen kidney function and chemical compounds affecting UA concentration were examined by using urinalysis reagent strips for ten parameters (Verify). The UA concentration was checked using uric acid test strips (EasyTouch®, Taiwan), which have good accuracy (Dai et al., 2005).

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The instrument is activated by inserting a disposable electrode strip into the lower part of the meter. Capillary blood is obtained from a hand finger using a sharp needle or a lancet. Measurement is conducted by placing one drop of capillary blood on the reaction zone of the test strip. The results will appear in 20 seconds. The measuring range of the UA meter is 3-20 mg/dl with the operating temperature and humidity are 14-40°C and ≤ 95%. The normal range of UA concentration for women is 2.4 - 6 mg/dL.

Uric acid measurement was performed before and after playing futsal, both for control and intervention groups. The UA examinations for control and futsal group were conducted at the same time, 10 minutes before (baseline UA) and soon after playing futsal (post-UA).

Futsal game

Ten subjects played a futsal game according to the game rules. They were divided into two teams, five players for each team.

A futsal game was played in two sessions, 20 minutes per session with a 15 minutes break between sessions. All subjects were not allowed to eat or drink during and after a futsal game.

Statistical analysis

Descriptive statistics are presented as mean±SD. The normality of the data is analysed using the Shapiro-Wilk test. An independent sample of the t test or Mann-Whitney was applied to compare numerical data between groups.

Paired sample t est or Wilcoxon was used to examine changes in weight and UA concentration within the group.

Pearson or Spearman was used to analysing the correlation between ΔUA concentration and certain variables. The significance of statistics in this study was set at $p<0.05$. The statistic analysis was computed using SPSS version 17.

RESULTS

Shapiro-Wilk test exhibited that baseline AU and changes in body weight (Δweight) were not distributed normally ($p= 0.014$ and 0.018, respectively). Subjects' characteristics are presented in table 1. Independent samples of t test showed height was significantly different between groups.

No significant differences were found in weight, BMI, and baseline UA. Urinalysis reagent test results are not presented. Ten parameters (leukocytes, nitrite, urobilinogen, protein, pH, blood, specific gravity, ketone, bilirubin, glucose) were all normal.

Table 1 - Subjects' characteristics.

Variables	Control	Futsal	p
Height (m)	158.00 ±4.83	163.60 ±5.70	0.03
Weight (kg)	53.10 ±4.14	57.60 ±6.45	0.07
BMI (kg/m^2)	21.22 ±1.21	21.47 ±1.46	0.69
Baseline UA (g/dL)	5.77 ±0.46	5.53 ±1.07	0.70*

Legend: BMI = body mas index; UA = uric acid. *Mann-Whitney

Table 2 demonstrates changes in weight and UA concentration in two groups. Within the group, paired samples of t test showed weight was reduced significantly in both groups ($p=0.04$ in control, $p=0.01$ in futsal group).

The UA concentration was significantly elevated in the intervention group ($p=0.01$) but remain unchanged in the control group (Wilcoxon test, $p=0.18$). Between groups, independent samples of t-test indicated there was no difference in post-UA ($p=0.13$) and weight after futsal game ($p=0.08$) between control and futsal group.

The changes in weight (Δweight) and UA concentration (ΔUA) in the intervention group were significantly higher than the control

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group (-0.53 vs -0.07 kg, p= 0.01 for ∆weight, and 0.73 vs -0.19 g/dL, p= 0.01 for ∆UA).

Table 2 - Uric acid concentration change within and between-group.

Variables	Control			Intervention		
	Baseline	Post	p	Baseline	Post	p
Weight (kg)	53.10 ±4.14	52.96 ±4.11	0.04	57.60 ±6.45	57.38 ±6.35	0.01
UA (g/dL)	5.77 ±0.46	5.58 ±0.71	0.18*	5.53 ±1.07	6.26 ±1.13	0.01*

Legend: UA = uric acid. *Wilcoxon test.

The correlation between ∆UA and some variables were evaluated (Table 3). Change in UA concentration are correlated with height (p= 0.03) and ∆weight (p=0.01). The degree of correlations (r) between ∆UA and height is moderate, and between ∆UA and ∆weight is strong.

Table 3 - The correlation between UA change and variables.

		Height	Weight	BMI	∆Weight	Baseline UA
∆UA concentration	r	0.48	0.27	-0.11	-0.72	0.00
	p	0.03	0.24	0.64	<0.01*	0.99*

Legend: BMI = body mas index; UA = uric acid. *Spearman.

DISCUSSION

Exercise and sports have been known to improve antioxidant capacity. However, the impact of futsal on antioxidant capacity, especially UA, has not been widely studied.

To the best of our knowledge, this was the first study focused on evaluating the effect of futsal on UA concentration in female collegiate futsal players.

The results of this study showed that playing futsal increased UA concentration significantly.

Uric acid has been known to have a function as an antioxidant (Glantzounis et al., 2005). The role of UA as an antioxidant comes from its ability to protect against lipid peroxidation and peroxidative damage, as well as neutralizing the reactive oxygen species (Ames et al., 1981; Mahajan et al., 2009; Fabbrini et al., 2014).

Contribution of UA as an antioxidant reach 50% of the antioxidant capacity of the blood (Oliveira, Burini, 2012).

However, there is some evidence that indicates conversely. A study on mice found that UA impaired glucose tolerance and induced insulin resistance (Zhu et al., 2014).

A study by Liu et al., (2019) examined UA concentration on breast cancer and benign breast tumour patients. The results showed that elevated UA concentration was more associated with a biomarker for cell death rather than an antioxidant (Liu et al., 2019).

Therefore, the interpretation of change in UA concentration should be with caution by considering several factors affecting UA concentration.

The effect of exercise and sports on uric acid concentration has been investigated. Increased uric acid concentration is more closely related to exercise intensity rather than a total workout.

A study by Green and Fraser (1988) showed that doing a cycle with higher intensity increased uric acid concentration higher than with lower intensity.

Manna et al., (2010) found that uric acid concentration was elevated by 0.6 mg/dL after playing soccer. Elevated uric acid by 0.98 mg/dL was also shown by male sprinters (Jówko et al., 2015).

The highest elevated uric acid by 1.46 mg/dL was reported after off-road motocross race in the study by Ascensão et al., (2007). Our study found uric acid concentration elevated by 0.73 mg/dL. The intensity of the futsal game in this study was quite intense to induce increased UA.

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Several mechanisms are associated with increased uric acid during intense exercise. Elevated uric acid caused by increased formations that may arise in several ways, purine nucleotides degradation and fast-twitch fibre utilization (Green, Fraser, 1988).

Moreover, some conditions are occurring during exercise which may also contribute to elevated uric acid, such as lactic acidosis and dehydration (Harris et al., 1999).

Futsal is an anaerobic sport characterized by fast running and kicking the ball. Also, a reduced bodyweight that correlates with UA concentration change may indicate a water loss. Involvement of fast-twitch fibre muscle and water loss perhaps contributed to increased UA due to futsal game in our study.

This study has some limitations. First, several other antioxidants, which may have stronger capacities than uric acid was not evaluated. Because the role of uric acid as an antioxidant remains debatable, evaluating well-known antioxidants will support the benefits effect of futsal.

Second, the sample size might be too small. This was due to the small number of female students involving in futsal and met with the research criteria. However, this is a pilot study that will be followed up.

CONCLUSION

In conclusion, this study indicated that a single bout of futsal could elevate uric acid in female collegiate futsal players.

However, this finding should be concluded with caution due to the limitations of the study.

Further studies should be conducted with a larger sample, using a cohort study to see the chronic effect of futsal, and other antioxidant examination are recommended.

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CONFLICT OF INTEREST

Authors declare there is no conflict of interest.

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