Changes in Body Composition for Predicting Exertional Rhabdomyolysis Induced Acute Kidney Injury During Intensive Physical Training Program for Conscripts

Chaken Maniyan1
Bancha Satirapoj
Ouppatham Supasyndh1

1Division of Nephrology, Department of Medicine, Phramongkutklao Hospital and College of Medicine, Bangkok 10400, Thailand

Background: Exertional rhabdomyolysis induced acute kidney injury (AKI) is a life-threatening condition. The risk factors for developing this condition were partial documented and changing in body composition of these populations is poorly understood.

Objective: We aimed to exhibit the alteration of body composition during intensive physical training program for conscripts and identify additional risk factors for developing AKI.

Methods: A prospective cohort study in military recruits between May and July 2017 were conducted. Clinical and laboratory data including body mass index (BMI), serum creatinine, electrolyte, creatine phosphokinase (CPK), and body composition using body impedance analysis (BIA) and corneometer (cutaneous BIA) were measured before training and every 2 weeks until program was completed.

Results: All 302 subjects with mean age 22.1 ± 1.3 years were included. Incidence of exertional rhabdomyolysis induced AKI was 19.2%. Most of AKI (54.2%) was occurred in week 4. The subjects who developed AKI had a lower total body water at baseline (45.08 ± 2.95% vs 54.31 ± 5.21% p = 0.02) and higher CPK level at week 2 of training (1372 ± 78 U/l vs 293 ± 71 U/l p = 0.03). They also had a rapid loss in muscle mass (-16 ±7.52% vs -11.9±5.08% P < 0.001) and fat mass (-16.72 ±5% vs -11.98 ±5.08% p < 0.001) in first 2 week. Moreover, at the end of training program, there was a significantly greater decline of percentage of body weight (-7.0±3.5 vs -1.5±6.5%, P<0.001) and muscle mass (-31.72±7.52 vs -26.98±5.08 %, p < 0.001) in the AKI group compared with the non-AKI group. In contrast, there was a statistically significantly greater increase on percentage of total body water (TBW) (24.8±16.5 vs 3.5±7.7%, P<0.001) at the end of program in the AKI group compared with the non-AKI group. Multivariate analysis revealed that low baseline of total body water (OR 1.78 (1.49-2.17) p < 0.01), rapid muscle mass loss in 0-2-week (OR 1.75 (1.35-2.29) p < 0.01) and fat mass loss in 0-2-week (OR 1.66 (1.16-2.27) P<0.01) were strong independent predictors for exertional rhabdomyolysis induced AKI.

Conclusion: Low baseline total body water, rapid loss of muscle, and fat in early training period are additional risk factors for exertional rhabdomyolysis induced AKI. To our best knowledge, this is the first study to explore the body composition change for the prediction of AKI. Early detection of these changes should be implemented for AKI prevention program.

Keywords: Exertional heat injury, Acute kidney injury, Hydration status, Rhabdomyolysis