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Akurasi Berat Jenis Urin sebagai Prediktor Gangguan Ginjal Dini pada Pekerja Terpajan Panas: Kajian terhadap Vasopresin, Laju Filtrasi Glomerulus, Albuminuria, Nefrin Urin, dan KIM-1 Urin = Accuracy of Urine Specific Gravity as Predictor of Early Kidney Impairment in Heat-Exposed Workers: Study on Vasopressin, Glomerular Filtration Rate, Albuminuria, Urinary Nephrin and Urinary KIM-1

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Abstrak

Studi eksperimental hewan memperlihatkan bahwa kadar vasopresin serum yang tinggi berhubungan dengan hiperfiltrasi, albuminuria dan hipertrofi glomerulus, dan dikhawatirkan berlanjut menjadi penurunan laju filtrasi glomerulus (LFG) dalam jangka panjang. Namun, belum terdapat laporan yang membuktikan hubungan sebab-akibat antara peningkatan vasopresin serum dengan gangguan ginjal. Studi ini bertujuan untuk mengetahui hubungan peningkatan vasopresin serum dengan gangguan ginjal, beserta lokasi gangguan ginjal tersebut. Studi ini juga ditujukan untuk melihat kemampuan berat jenis (BJ) urin untuk mendeteksi gangguan ginjal.

Penelitian ini adalah studi potong lintang dengan consecutive sampling di sebuah pabrik sepatu pada bulan Januari–Maret 2020. Subjek adalah pekerja terpajan panas yang dinyatakan sehat berdasarkan medical checkup tahun 2019. Sampel darah dan urin diambil lima jam setelah subjek bekerja. Subjek diperiksakan kreatinin plasma, estimasi LFG berdasarkan CKD-EPI, BJ urin, albuminuria carik-celup, albumincreatinine ratio (ACR) urin, vasopresin serum, kidney injury molecule-1 (KIM-1) urin, dan nefrin urin. Data masa kerja, dan jenis kelamin diperoleh melalui wawancara.

Pada studi ini, diperoleh 119 subjek wanita dengan median usia 38 (31–51) tahun dan median masa kerja 10 (3–14) tahun. Hiperfiltrasi didapatkan pada 18 subjek, LFG tidak menurun pada 104 subjek (87,4%), dan peningkatan nefrin urin pada 104 pekerja (87,4%). Tidak terdapat hubungan antara vasopresin meningkat dengan hiperfiltrasi, penurunan LFG, albuminuria, nefrin urin, dan KIM-1 urin. Terdapat hubungan bermakna antara peningkatan nefrin urin dengan masa kerja 10 tahun (p = 0,03). Terdapat hubungan peningkatan KIM-1 urin dengan albuminuria (p = 0,008). Terdapat area under the curve (AUC) antara BJ urin dan nefrin urin sebesar 81,7% (95% CI 68,8–94,6%), dengan titik potong BJ urin 1,018 yang memiliki sensitivitas 71,2% dan spesifisitas 80% untuk kenaikan nefrin.

Sebagai simpulan, peningkatan vasopresin serum tidak berhubungan dengan hiperfiltrasi, penurunan LFG, albuminuria, dan peningkatan KIM-urin. Masa kerja > 10 tahun dihubungkan dengan peningkatan nefrin urin. BJ urin 1,018 dapat dijadikan acuan untuk mendeteksi kenaikan nefrin urin pada pekerja terpajan panas.
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Animal experimental studies have shown that high serum vasopressin levels are associated with hyperfiltration, albuminuria, and glomerular hypertrophy, which may lead to decreased glomerular filtration

rate (GFR) in long-term. However, there was no earlier report that has established the causal relationship between elevated serum vasopressin and renal impairment. This study aims to determine the association between increased serum vasopressin and kidney impairments, along with the location of these impairments. This study is also aimed to look at the ability of urine specific gravity to detect elevated serum vasopressin and kidney impairments.

This study was a cross-sectional study with consecutive sampling in a shoe factory from January–March 2020. Subjects were heat-exposed workers who were declared healthy based on the medical checkup in 2019. Blood and urine samples were taken five hours after the subject worked. Subjects were examined for plasma creatinine, estimated GFR (eGFR) based on CKD-EPI, urine specific gravity, dipstick albuminuria, urine albumin-creatinine ratio (ACR), serum vasopressin, urine kidney injury molecule-1 (KIM-1), and urinary nephrin. Data on age, length of service, and gender were obtained through interviews.

There were 119 female subjects with a median age of 38 (31–51) years and a median length of service 10 (3–14) years. eGFR was not decreased in 104 subjects (87.4%) and urinary nephrin increased in 104 workers (87.4%). There were no increase in urinary albumin excretion and urinary KIM-1. There were significant association between increased urinary nephrin with length of service 10 years ($p = 0.03$), normal-increased eGFR with age 30–39 years ($p = 0.001$), and increased urinary KIM-1 with albuminuria ($p = 0.008$). There was an area under the curve (AUC) of 81.7% (95% CI 68.8–94.6%) between urine specific gravity and urinary nephrin, with a cut-off point of urine specific gravity > 1.018 having a sensitivity of 71.2% and a specificity of 80% for the increase in urinary nephrin.

In conclusion, increased serum vasopressin does not cause a decrease in GFR, albuminuria, and increase in urinary KIM, but does cause an increase in urinary nephrin. urine specific gravity 1.018 can be used as a cut-off for detecting increased urinary nephrin in heat-exposed workers.