



UNIVERSITAS GADJAH MADA
THE EFFECT OF LOW PROTEIN DIET ON THE mRNA EXPRESSIONS OF SUPEROXIDE DISMUTASE-1 (SOD-1) AND CATALASE IN MICE KIDNEY WITH UNILATERAL URETERAL OBSTRUCTION

ABSTRACT

Background. Undernutrition is one of the public health problems that still occur in Indonesia. Effect of chronic protein energy malnutrition (PEM) causing stunting and wasting in children could also associated with both structural and functional pathology of organs including kidney. *Unilateral ureteral obstruction* (UUO) is a representative method of chronic kidney failure. Protein deficiency is reported to worsen the condition of injury, but its effects on the kidneys have not been well understood.

Objectives. To explore the effect of low-protein diet on renal resistance in chronic renal failure through mRNA expression of Superoxide Dismutase-1 (SOD-1) and Catalase in mice kidney with UUO.

Methods. This research was a quasi-experimental research and the research design is post-test with control group design. Condition of chronic kidney failure is represented by unilateral ureteral obstruction (UUO) model on subjects consisting of 20 male *Swiss-Webster* strain mice aged 2-3 months divided into 4 groups, namely the SO group (sham operation), UUO (UUO with normal diet as control group, 20% protein content), UUO + 10% (UUO with casein diet, 10% protein content for 1 month before UUO), and UUO + 12% (UUO with casein diet, 12% protein content for 1 month before UUO). Mice were sacrificed after 7 days of UUO. SOD-1 and Catalase mRNA expression was examined by RT-PCR then densitometry analysis was carried out from the electrophoresis band photo result. Data obtained from the study were tested statistically to see the difference significances between groups. SOD-1 and Catalase mRNA expression were tested using parametric test.

Results. Comparative parametric analysis showed different tubular injury scores between groups significantly. Group with UUO treatment but with normal diet showed lower mRNA expression of *SOD-1* (1.05 ± 0.13 vs. 0.944 ± 0.13 ; $p > 0.05$) and *Catalase* (1.05 ± 0.13 vs. 1.01 ± 0.05 ; $p > 0.05$) compared to the sham operation group, while those on the low protein diet of 10% and 12% showed lower mRNA expression of *SOD-1* (0.902 ± 0.17 vs. 0.944 ± 0.13 ; 0.926 ± 0.13 vs. 0.944 ± 0.13 ; $p > 0.05$) and *Catalase* (0.946 ± 0.11 vs. 1.01 ± 0.05 ; 0.971 ± 0.06 vs. 1.01 ± 0.05 ; $p > 0.05$) than the UUO with normal diet group.

Conclusion. Low protein diet produces lower SOD-1 and Catalase mRNA expression insignificantly in mice with unilateral ureteral obstruction.

Keywords: low protein diet, SOD-1, Catalase, unilateral ureteral obstruction

**PENGARUH DIET RENDAH PROTEIN TERHADAP EKSPRESI mRNA
SUPEROXIDE DISMUTASE -1 (SOD-1) DAN CATALASE PADA MENCIT DENGAN
UNILATERAL URETERAL OBSTRUCTION**

INTISARI

Latar Belakang. Malnutrisi energi protein kronis dapat menyebabkan *stunting* pada anak-anak juga dapat dikaitkan dengan cedera struktural dan fungsional pada organ termasuk ginjal. *Unilateral Ureteral Obstruction* (UUO) merupakan metode representatif dari kondisi gagal ginjal kronis. Kekurangan protein dilaporkan memperburuk kondisi cedera, namun efeknya pada ginjal belum diketahui secara mendalam.

Tujuan Penelitian. Untuk mengkaji pengaruh diet rendah protein terhadap ketahanan ginjal dalam kondisi gagal ginjal kronis pada ekspresi mRNA *Superoxide Dismutase-1* (SOD-1) dan *Catalase* pada mencit dengan UUO.

Metode Penelitian. Penelitian ini merupakan jenis penelitian quasi eksperimental dengan rancangan penelitian *post-test with control group design*. Kondisi gagal ginjal kronis direpresentasikan dengan model *Unilateral Ureteral Obstruction* (UUO) pada subjek sejumlah 20 ekor mencit jantan galur *Swiss Webster* berusia 2-3 bulan yang dibagi dalam 4 kelompok, yaitu kelompok SO (*Sham Operation*, n=5), UUO (UUO dengan diet normal sebagai kontrol, kadar protein 20%, n=5), UUO+10% (UUO dengan diet kasein, kadar protein 10% selama 1 bulan sebelum UUO, n=5), dan UUO+12% (UUO dengan diet kasein, kadar protein 12% selama 1 bulan sebelum UUO, n=5). Mencit diterminasi pada hari ke-7 setelah UUO. Ekspresi mRNA *SOD-1* dan *Catalase* diperiksa dengan RT-PCR kemudian dilakukan analisis densitometri dari foto pita hasil elektroforesis. Data dari penelitian diuji secara statistik untuk melihat signifikansi perbedaan antar kelompok. Ekspresi mRNA *SOD-1* dan *Catalase* diuji menggunakan uji parametrik.

Hasil. Analisis komparatif parametrik menunjukkan perbedaan skor cedera tubulus yang signifikan antarkelompok. Kelompok dengan perlakuan UUO menunjukkan ekspresi mRNA *SOD-1* (1.05 ± 0.13 vs. 0.944 ± 0.13 ; $p > 0.05$) dan *Catalase* (1.05 ± 0.13 vs. 1.01 ± 0.05 ; $p > 0.05$) yang lebih rendah dibandingkan kelompok *sham operation*, sedangkan kelompok dengan diet rendah protein 10% dan 12% menunjukkan ekspresi mRNA *SOD-1* (0.902 ± 0.17 vs. 0.944 ± 0.13 ; 0.926 ± 0.13 vs. 0.944 ± 0.13 ; $p > 0.05$) dan *Catalase* (0.946 ± 0.11 vs. 1.01 ± 0.05 ; 0.971 ± 0.06 vs. 1.01 ± 0.05 ; $p > 0.05$) yang lebih rendah dibandingkan kelompok UUO dengan diet normal.

Kesimpulan. Pemberian diet rendah protein menghasilkan ekspresi *SOD-1* dan *Catalase* yang lebih rendah namun tidak signifikan pada mencit dengan *unilateral ureteral obstruction*.

Kata Kunci: diet rendah protein, SOD-1, *catalase*, *unilateral ureteral obstruction*