

Hubungan antara Kadar Asupan Protein dengan Cedera Glomerulotubular pada Bayi Baru Lahir Sangat Prematur = Correlation of Protein Intake and Glomerulotubular Injury in Very Preterm Neonates

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Abstrak

Latar belakang : Jumlah kelahiran hidup bayi prematur di RSCM adalah 507 dan 112 diantaranya lahir pada usia gestasi 28-32 minggu atau disebut bayi baru lahir sangat prematur (BBLSP). Data RSCM menunjukkan bahwa BBLSP memiliki angka kesintasan 58,9%. Pemberian nutrisi yang agresif dengan diet tinggi protein pada BBLSP diperlukan untuk mempercepat kejar tumbuh. Diet tinggi protein memberikan beban metabolisme pada ginjal BBLSP yang sedang berkembang. Ginjal BBLSP memiliki jumlah nefron fungsional yang lebih sedikit dan imaturitas yang ditandai dengan rendahnya laju filtrasi glomerulus serta kemampuan pemekatan urin yang rendah. Diet tinggi protein menginduksi hipertrofi ginjal, proteinuria, dan sklerosis glomerular melalui single nephron glomerular hyperfiltration (SNGHF) sehingga menyebabkan cedera glomerulotubular yang dapat dideteksi dengan biomarka Neutrophil gelatinase-associated lipocalin urin (uNGAL).

Tujuan : Mengetahui pengaruh asupan protein terhadap cedera glomerulotubular pada BBLSP.

Metode : Penelitian ini adalah penelitian pada BBLSP yang dilakukan dengan desain kohort prospektif yang dilakukan di ruang rawat perinatologi Departemen Ilmu Kesehatan Anak RS Cipto Mangunkusumo dan RS Bunda Menteng pada periode 1 Juni 2019 hingga Mei 2020. Pengambilan sampel urin dilakukan sebanyak 3 kali yaitu usia 0-48 jam (T1), 72 jam (T2), dan usia 21 hari (T3). Dilakukan pemeriksaan rasio NGAL dan kreatinin urin (uNGAL/Cr). Cedera glomerulotubular didefinisikan sebagai uNGAL/Cr ≥ 1 SB. Data karakteristik subyek dan asupan protein diambil dari rekam medik. Rerata asupan protein enteral dicatat sejak usia 14-21 hari sesuai asupan di rekam medik. Kadar protein di ASI diukur dengan human milk analyzer. Asupan tinggi protein adalah kadar asupan protein 3 g/kg/hari.

Hasil : Total subyek penelitian adalah 59 BBLSP pada saat rekrutmen dan terdapat 39 subyek menyelesaikan penelitian hingga usia 21 hari. Proporsi BBLSP yang mengalami cedera glomerulotubular pada pemberian kadar asupan tinggi protein 5/29 subyek, sedangkan pada pemberian kadar asupan rendah protein adalah 4/10 subyek. Kadar uNGAL/Cr pada BBLSP yang mendapatkan kadar asupan tinggi protein dibandingkan rendah protein adalah 3,54 (0,69-89,16) ng/mg dan 6,88 (0,32-66,64) ng/mg. Kadar uNGAL/Cr pada usia 48 jam, 72 jam, dan 21 hari tidak menunjukkan korelasi yang bermakna dengan kadar asupan protein ($p=0,80$; $0,58$; $0,07$).

Simpulan : Sebanyak 5/29 subyek yang mendapatkan kadar asupan tinggi protein mengalami cedera glomerulotubular. Kadar uNGAL/Cr pada BBLSP yang mendapat asupan tinggi protein maupun rendah protein cenderung meningkat pada usia 72 jam dan menurun pada usia 21 hari. Pemberian asupan tinggi protein pada BBLSP tidak menyebabkan cedera glomerulotubular pada bayi sangat prematur.

.....Background: Absolute preterm birth rate in Cipto Mangunkusumo Hospital (CMH) was 507 in 2018, 112 amongst were born very preterm (28-32 weeks of gestational age). The survival rate was approximately 58.9%. Early aggressive nutrition by administration of high protein intake is needed for catch up growth.

High protein produces high metabolic load to the kidney. Kidney in the very preterm neonates have fewer amount of functional nephron. Furthermore, the immaturity of the kidney was shown in lower glomerular filtration rate and ability to dilute urine. High protein intake induces nephron hypertrophy, proteinuria, and glomerular sclerosis through single nephron glomerular hyperfiltration (SNGHF) which lead to glomerulotubular injury. Urine neutrophil gelatinase-associated lipocalin to creatinine ratio (uNGAL/Cr) is a biomarker used to detect glomerulotubular injury.

Aim : To analyze the correlation of high protein intake and glomerulotubular injury in very preterm neonates.

Method: A prospective cohort study was conducted in very preterm infants admitted to neonatology ward of CMH and Bunda Hospital Menteng during 1 June 2019 to May 2020. Urine sample were taken in 3 points of time: age 0-48 hours, 72 hours, and 21 days postnatal. Urine NGAL and creatinine (uNGAL/Cr) were examined. Glomerulotubular injury was defined as uNGAL/Cr level 1 SD. Subject characteristic data and protein intake were obtained from medical record. Enteral protein intake was recorded daily from medical record since age 14-21 days postnatal. Protein level in the breastmilk was measured by using human milk analyzer. High protein intake is recorded if the average intake was ≥ 3 /kg/day.

Results: This study recruited 59 very preterm neonates and 39 of them survived until the end of the study. Proportion of very preterm neonates who had glomerulotubular injury after high protein intake vs low protein intake was 5/29 vs 4/10 subjects. Median of uNGAL/Cr level in high protein intake group compare to low protein intake group were 3,54 (0,69-89,16) ng/mg and 6,88 (0,32-66,64) ng/mg. Protein intake is not correlated to uNGAL/Cr level at 0-48 hours, 72 hours, and 21 days postnatal age ($p=0,80$; $0,58$; $0,07$).

Conclusion: There were 5/29 subjects experienced glomerulotubular injury in high protein intake administration. In very preterm neonates, uNGAL/Cr level was increased at the age of 72 hours and decreased in 21 days on both high and low protein intake group. High protein intake had no correlation to glomerulotubular injury in the very preterm neonates.