ABSTRAK

Pengaruh Diet Rendah Protein dan Rendah Kalori terhadap Perkembangan Folikel Ovarium Mencit dan Ekspresi PTEN pada Folikel Primordial dan Folikel Primer

Regina Arumsari
Program Pendidikan Dokter Spesialis Obstetri dan Ginekologi, Departemen Obstetri dan Ginekologi, Fakultas Kedokteran, Kesehatan Masyarakat, dan Keperawatan, Universitas Gadjah Mada, Indonesia

Latar belakang: Gagasan *developmental programming* menguraikan konsekuensi gangguan nutrisi maternal terhadap sistem reproduksi keturunannya, salah satunya penurunan cadangan folikel ovarium. Stress oksidatif dari faktor endogen akibat restriksi nutrisi maternal diduga mengaktivasi jalur PI3K/PTEN/Akt dan menyebabkan rekruitmen folikel primordial.
Tujuan: Mengetahui pengaruh diet rendah protein dan rendah kalori terhadap jumlah folikel ovarium dan ekspresi PTEN.
Metode: Pada penelitian tahap I, 10 ekor mencit betina (*Mus musculus*) galur Swiss-Webster umur 1 bulan diberikan diet rendah protein (10% kasein), 10 ekor mencit betina diberikan diet rendah kalori (70% kebutuhan kalori, 14% kasein), dan 10 ekor mencit betina diberikan diet protein normal (14% kasein) sebagai kontrol selama 2 bulan. Lima ekor mencit per kelompok dikorbankan untuk dilakukan analisis. Pada penelitian tahap II, 5 ekor mencit setiap kelompok dikawinkan kemudian perlakuan dilanjutkan hingga kebuntingan, persalinan dan menyusui anakannya. Pada saat anakan mencit berusia tiga bulan, sebanyak 5 ekor per kelompok anakan betina dan induk betina dewasanya dikorbankan dan dilakukan analisis hitung jumlah folikel primordial dan primer serta ekspresi protein PTEN pada sitoplasma oosit dan sel granulosa folikel primordial dan primer.
Hasil: Jumlah folikel primordial pada kelompok induk mencit rendah protein (RPTK) dan induk mencit rendah kalori (RKTK) lebih rendah apabila dibandingkan dengan kelompok induk mencit kontrol (KTK) (26±3,42 vs 29±2,63; p=0,886 dan 18±2,41 vs 29±2,63; p=0,111). Jumlah folikel primordial anakan mencit rendah protein (RP) lebih rendah dibandingkan anakan mencit kontrol (K) (36±2,12 vs 68±7,02; p=0,073). Pada sampel indukan mencit, skor PTEN pada RPTK dan RKTK lebih rendah apabila dibandingkan dengan kelompok KTK (6,76±0,40 vs 8,18±0,20; p=0,200 dan 8,16±0,41 vs 8,18±0,20; p=0,190). Skor PTEN pada anakan mencit, kelompok RP lebih rendah dibandingkan dengan anakan K (13,11±0,58 vs 16,56±0,43; p=0,026).
Kesimpulan: Jumlah folikel primordial dan ekspresi PTEN pada kelompok diet rendah kalori maupun kelompok diet rendah protein lebih rendah dibandingkan kelompok kontrol, baik pada sampel induk mencit maupun anakan mencit. Ekspresi PTEN lebih rendah secara bermakna pada anakan mencit dengan diet rendah protein dibandingkan dengan anakan mencit kontrol.
Kata kunci: Stress oksidatif, folikel primordial, diet rendah protein, diet rendah kalori, PTEN.

ABSTRACT

The Effect of Low-Protein and Low-Calorie Diet on Mice Ovarian Follicle Development and PTEN Expression on Primordial and Primary Follicle

Regina Arumsari
OBGYN Residency Program, Departement of Obstetrics and Gynecology, Faculty of Medicine, Public Health and Nursing, Universitas Gadjah Mada, Indonesia

Backgrounds: The idea of developmental programming outlines the consequences of maternal nutritional disorders on the offspring's reproductive system, one of which is a decrease in ovarian follicle reserves. Oxidative stress from endogenous factors due to maternal nutritional restriction is thought to activate the PI3K/PTEN/Akt pathway and cause the recruitment of primordial follicles.
Objectives: This study aims to evaluate the effect of a low-protein and low-calorie diet on the number of ovarian follicles and PTEN expression.
Methods: In the phase I study, a total of 10 female mice (*Mus musculus)* of the Swiss-Webster strain aged 1 month were given a low-protein diet (10% casein), 10 female mice were given a low-calorie diet (70% of calorie, 14% casein) and 10 female mice were given a normal protein diet (14% casein) as a control. After treatment for two months, 5 mice per group were sacrificed and both ovaries were taken and then analyzed. In the phase 2 study, three-month-old mice offspring, 5 mice per group were sacrificed and both ovaries were taken and then analyzed. The outcome parameters were the total number of primordial and primary follicles and PTEN protein expression in the oocyte cytoplasm and granulosa cells of primordial and primary follicles.
Results: The number of primordial follicles in the low-protein diet mice (RPTK) and low-calorie diet mice (RKTK) was lower when compared with the control mice group (KTK) (26±3.42 vs 29±2.63*;* p=0.886 and 18±2.41 vs 29±2.63; p=0.111). Similar results were also seen in the offspring mice, where the number of primordial follicles in the offspring of low-protein diet group (RP) was lower compared to the offspring control group (K) (36±2.12 vs 68±7.02, p=0.073). PTEN score in the low-protein diet group (RPTK) and low-calorie diet group (RKTK) was lower when compared to the control group (KTK) (6.76±0.40 vs 8.18±0.20; p=0.200 and 8.16±0.41 vs 8.18±0.20; p=0.190). PTEN score in low-protein diet mice offspring group (RP) was significantly lower when compared to control offspring mice group (K) (13.11±0.58 vs 16.56±0.43; p=0.026).
Conclusion: The number of primordial follicles and PTEN protein expression in the low-calorie diet mice group and low-protein diet mice group were lower than those in the control mice group. PTEN protein expression were significantly lower in mice offspring of low-protein diet group compared to control group.
Keywords: Oxidative stress, primordial follicle, low-protein diet, low-calorie diet, PTEN