

INTISARI

Latar belakang: *In-vitro oocyte maturation* (IVM) adalah solusi manajemen infertilitas pada wanita dengan *polyendocrine metabolic ovarian syndrome* (PMOS). Media kultur adalah salah satu faktor yang berperan penting untuk IVM. Media kultur yang baik harus mengandung faktor pertumbuhan yang optimal. *Platelet rich plasma* (PRP) telah diketahui sebagai sumber faktor pertumbuhan yang potensial karena mengandung berbagai faktor pertumbuhan. Penambahan PRP ke dalam media kultur IVM diharapkan dapat meningkatkan maturasi oosit. Efektivitas suplementasi PRP alogenik pada media IVM pasien PMOS belum pernah diteliti.

Tujuan: Menguji efektivitas penambahan PRP 5% pada media kultur IVM terhadap luaran keberhasilan maturasi oosit pada media maturasi oosit secara mikroskopis (maturasi nuklear dan maturasi sitoplasma) dan secara biomolekuler (GDF-9, BMP-15, IL-7, dan GSH).

Metode: Penelitian melalui dua tahap. Tahap pertama menentukan dosis PRP, yang selanjutnya digunakan untuk suplementasi media IVM pada penelitian utama. Desain penelitian yang digunakan kuasi eksperimental. Sampel penelitian yaitu 24 oosit dari wanita PMOS. Oosit dibagi menjadi kelompok intervensi (suplementasi 5% PRP alogenik) dan kontrol (tanpa suplementasi PRP). Maturasi nuklear dinilai dari tercapainya tahap MII, yang ditandai dengan munculnya *polar body* I. Maturasi sitoplasma dilihat melalui sitoplasma halus, zona pellucida <15 μm reguler, serta aktivitas mitokondria dengan pewarnaan merata. Analisis biomolekuler GDF-9, BMP-15, IL-7, dan GSH dilakukan menggunakan ELISA. Analisis bivariat terhadap maturasi oosit dengan uji *Chi square*, sedangkan terhadap parameter biomolekuler dengan *independent t-test*. Analisis multivariat dengan regresi logistik untuk data kategorikal dan uji regresi linier untuk data numerik. Data dianalisis dengan SPSS signifikansi $p < 0,05$.

Hasil: Suplementasi 5% PRP alogenik pada media IVM meningkatkan maturasi nuklear oosit pada PMOS ($p = 0,001$, $RR = 5,5$ (95% CI: 1,5-9,7)), maturasi sitoplasma melalui pembentukan sitoplasma halus ($p = 0,001$, $RR = 3,67$ (95% CI: 1,4-9,9)), zona pellucida ($p = 0,025$, $RR = 1,83$ (95% CI: 1,02-3,3)) dan *fine polar body* ($p = 0,001$, $RR = 5$ (95% CI: 1,4-18,2)). Hasil yang sama juga terhadap parameter biomolekuler yaitu GDF-9 ($p = 0,020$, $1,036 \pm 0,004$ vs $1,032 \pm 0,003$ pg/mL), BMP-15 ($p = 0,001$, $0,888 \pm 0,008$ vs $0,878 \pm 0,004$ pg/mL), namun tidak signifikan pada IL-7 dan GSH ($p > 0,05$).

Kesimpulan: Suplementasi 5% PRP alogenik pada media kultur IVM memperbaiki luaran maturasi mikroskopis oosit dan memperbaiki kadar GDF-9 dan BMP-15.

Kata kunci: *Polyendocrine Metabolic Ovarian Syndrome*; PMOS; Maturasi Oosit *In-vitro*; *Platelet Rich Plasma*; PRP; PRP alogenik; GDF-9; BMP-15; IL-7; GSH

ABSTRACT

Background: In-vitro oocyte maturation (IVM) is a promising infertility management strategy for women with polyendocrine metabolic ovarian syndrome (PMOS). Culture media play a crucial role in the success of IVM. An optimal culture medium should contain adequate growth factors to support oocyte maturation. Platelet-Rich Plasma (PRP) has emerged as a potential source of growth factors due to its rich content of bioactive molecules. The addition of PRP to IVM culture media is expected to enhance oocyte maturation outcomes. However, the effectiveness of allogeneic PRP supplementation in IVM media for PMOS patients has not yet been investigated.

Objective: To evaluate the effectiveness of 5% allogeneic PRP supplementation in IVM culture media on oocyte maturation outcomes, assessed microscopically through nuclear and cytoplasmic maturation, and biomolecularly through the expression levels of GDF-9, BMP-15, IL-7, and GSH.

Methods: This study was conducted in two stages. The first stage aimed to determine the optimal PRP concentration, which was subsequently used for supplementation of the IVM culture medium in the main study. A quasi-experimental design was employed. The study included 24 oocytes obtained from women with PMOS. Oocytes were allocated into an intervention group (supplemented with 5% allogeneic PRP) and a control group. Nuclear maturation was assessed by the achievement of the metaphase II (MII) stage, indicated by the extrusion of the first polar body. Cytoplasmic maturation was evaluated based on the presence of a smooth cytoplasm, a regular zona pellucida thickness of $<15\ \mu\text{m}$, and homogeneous mitochondrial activity staining. Biomolecular analyses of GDF-9, BMP-15, IL-7, and GSH were performed using ELISA. Bivariate analysis of oocyte maturation outcomes was conducted using the Chi-square test, while biomolecular parameters were analyzed using the independent t-test. Multivariate analysis was performed using logistic regression for categorical variables and linear regression for continuous variables. Statistical analyses were conducted using SPSS, with a significance threshold of $p < 0.05$.

Results: Supplementation of the IVM culture medium with 5% allogeneic PRP significantly improved nuclear maturation of PMOS oocytes ($p = 0.001$, RR = 5.5, 95% CI: 1.5–9.7). It also enhanced cytoplasmic maturation, as evidenced by increased formation of smooth cytoplasm ($p = 0.001$, RR = 3.67, 95% CI: 1.4–9.9), regular zona pellucida morphology ($p = 0.025$, RR = 1.83, 95% CI: 1.02–3.3), and fine polar body formation ($p = 0.001$, RR = 5.0, 95% CI: 1.4–18.2). Similar improvements were observed in biomolecular parameters, including GDF-9 ($p = 0.020$; 1.036 ± 0.004 vs. 1.032 ± 0.003 pg/mL) and BMP-15 ($p = 0.001$; 0.888 ± 0.008 vs. 0.878 ± 0.004 pg/mL). However, no significant differences were found in IL-7 and GSH levels ($p > 0.05$).

Conclusion: Supplementation of IVM culture media with 5% allogeneic PRP improves microscopic oocyte maturation outcomes and enhances GDF-9 and BMP-15 levels.

Keywords: Polyendocrine Metabolic Ovarian Syndrome; PMOS; In-Vitro Oocyte Maturation; Platelet-Rich Plasma; PRP; Allogeneic PRP; GDF-9; BMP-15; IL-7; GSH.