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Effects of GLP-1 Receptor Agonists on Oocytes and Female Fertility

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The global rise in obesity among reproductive-age women has increased the need to understand how excess adiposity influences fertility and oocyte quality. Recent studies suggest that glucagon-like peptide-1 receptor agonists (GLP-1 RAs), which have been broadly utilized for metabolic control and weight reduction, may have direct favorable effects on the female reproductive system. This editorial aims to draw attention to the current evidence on the molecular and clinical mechanisms by which GLP-1 RAs may improve oocyte quality, follicular function, and fertility outcomes.

The increasing number of obese or overweight women looking for reproductive assistance has intensified research into the effects of excess weight on oocyte competence and fertility. A recent meta-analysis and systematic review reported that obesity exerts a weak but statistically significant negative impact on assisted reproductive technology (ART) outcomes, including ovarian stimulation duration, the required total gonadotropin dose, and the number of mature oocytes retrieved (1).

Preclinical studies have demonstrated that diet-induced obesity leads to profound ovarian alterations, including depletion of primordial follicles, follicular apoptosis, increased meiotic aneuploidy, reduced follicle number and size, and increased mitochondrial dysfunction within oocytes (2-6). Although dietary interventions can restore systemic metabolic parameters, persistent meiotic and mitochondrial defects suggest that obesity may cause irreversible ovarian injury (7).

Recent evidence suggests that the receptors of GLP-1 are expressed in several components of the human reproductive system (8). Beyond their established metabolic roles, GLP-1 and its analogs may exert anti-fibrotic and anti-inflammatory effects on gonadal and endometrial tissues affected by polycystic ovary syndrome (PCOS), obesity, and diabetes. In PCOS women, GLP-1 RAs have been shown to reverse polycystic ovarian morphology and reduce serum androgen concentrations and bioavailability (8).

Canan Tapkan studied medicine at Eskişehir Osmangazi University from 2004 to 2010 and completed her specialization in obstetrics and gynecology at Dr. Zekai Tahir Burak Obstetrics and Gynecology Hospital in 2015. Between 2016 to 2022, she worked at Ankara Keçiören Training and Research Hospital, where she also served as an administrative assistant for two years. In 2020, she actively participated in the pandemic response. Since 2022, she has been working at Ankara Atatürk Sanatorium Training and Research Hospital, where she has been actively training pregnant women at the Pregnancy School, which she established. In 2025, she received training at Ankara Bilkent City Hospital in assisted reproductive therapies.

In a clinical study among obese and PCOS women, combination therapy with metformin and low-dose liraglutide significantly ameliorated both in vitro fertilization (IVF) and spontaneous pregnancy rates compared with metformin monotherapy (9, 10). In the combination group, the higher pregnancy rate per embryo transfer implies that GLP-1 RAs may enhance fertility not only through weight reduction but also via direct reproductive benefits.

At the cellular level, liraglutide has been shown to ameliorate dehydroepiandrosterone (DHEA) -induced follicular dysfunction by decreasing CXCL10 secretion from granulosa cells and suppressing the JAK signaling pathway in PCOS patients (11). CXCL10 (IP-10, interferon-γ–inducible protein 10) is a pro-inflammatory chemokine implicated in follicular dysfunction, oxidative stress, and impaired oocyte maturation. By reducing CXCL10 levels, liraglutide may restore granulosa cell homeostasis and improve oocyte quality. Furthermore, semaglutide has been shown to attenuate autophagy and oxidative stress in oocytes by modulating the pathway of PI3K/AKT/mTOR signaling (12).

Collectively, current evidence suggests that GLP-1 receptor agonists exert positive effects on oocyte competence, follicular function, and fertility outcomes.

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These benefits likely arise from both systemic metabolic improvements and direct anti-inflammatory actions within the ovary. Nonetheless, additional clinical and mechanistic study is needed to elucidate the safety and long-term effects of GLP-1 RAs on female reproductive health.

Competing Interests
None declared.

Ethical Issues
Not applicable.

Authors' Contribution
Conceptualization: Zehra Kurdoğlu.
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