Impact of Human Growth Hormone on IVF Outcomes in Patients with Diminished Ovarian Reserve

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Introduction

- Patients with diminished ovarian reserve (DOR) have lower success rates with in vitro fertilization (IVF).[1]
- Human growth hormone (hGH) has been used as an adjunct treatment to improve ovarian response and IVF outcomes, but published evidence remains inconclusive.[2]
- Objective: This study evaluated how adjuvant hGH therapy impacts live birth rate and blastocyst yield per cycle in DOR patients undergoing IVF.

Materials and Methods

- Retrospective chart review of IVF cycles using a GnRH antagonist protocol at SpringCreek Fertility from 2015 to 2024.
- Patients ≥ 18 with one or more DOR criteria[1]: AMH <1.2 ng/mL, Day-3 FSH > 10 IU/L, AFC < 5-7 or previous POR (≤ 3 oocytes with conventional stimulation criteria) were included.
- (N = 816) and categorized into hGH (n = 614) and no hGH (n = 202) groups.
- Primary outcomes were live birth rate and blastocysts per cycle by hGH exposure. Live birth rate was adjusted for age, AMH and BMI and further analyzed by POSEIDON group and FSH status.
- Continuous variables were compared using independent or Welch's t-tests, and categorical variables using chi-square tests

Results

Table 1. Characteristics of the study cohort.

Characteristic	N	Overall N = 816[1]	No hGH N = 202[1]	hGH N = 614[1]	p-value[2]
Age, years	816	36.5 ± 4.1	35.2 ± 4.5	36.9 ± 3.9	<0.001
BMI, kg/m²	814	28.4 ± 6.0	28.1 ± 5.8	28.5 ± 6.0	0.477
AMH, ng/mL	816	1.8 ± 2.0	2.2 ± 2.2	1.7 ± 1.9	0.014
FSH, IU/L	795	7.3 ± 4.9	7.6 ± 6.4	7.2 ± 4.3	0.341
POSEIDON classification	816				0.008
Group 3 (Age <35)		222 (27.2%)	70 (34.7%)	152 (24.8%)	
Group 4 (Age ≥35)		594 (72.8%)	132 (65.3%)	462 (75.2%)	
AMH <1.2 ng/mL	816	398 (48.8%)	79 (39.1%)	319 (52.0%)	0.002
FSH >10 IU/L	795	136 (17.1%)	31 (15.4%)	105 (17.7%)	0.532

[1]Mean ± SD for continuous variables; n (%) for categorical variables

[2]Welch Two Sample t-test; Pearson's Chi-squared test

Table 2. Primary outcomes by hGH exposure. Live birth rate and blastocysts per cycle in overall and POSEIDON group, with unadjusted and adjusted effect estimates

Outcome	No hGH	hGH	P Value	Effect Estimate (95% CI)
PRIMARY OUTCOMES				
Live birth rate, N (%)	56/202 (27.7)	171/614 (27.9)		
Unadjusted			1.000	OR: 1.01 (0.71-1.44)
Adjusted*			0.111	OR: 1.37 (0.94-2.04)
POSEIDON Group 3	20/70 (28.6)	58/152 (38.2)		OR: 1.54 (0.84 - 2.89)
POSEIDON Group 4	36/132 (27.3)	113/462 (24.5)		OR: 0.86 (0.56 - 1.35)
Blastocysts per cycle, mean	2.0 ±1.9	1.9 ±1.9	0.598	MD: -0.08 (-0.22 to 0.38)

OR = odds ratio; MD = mean difference

*Adjusted for Age, AMH, FSH, and BMI

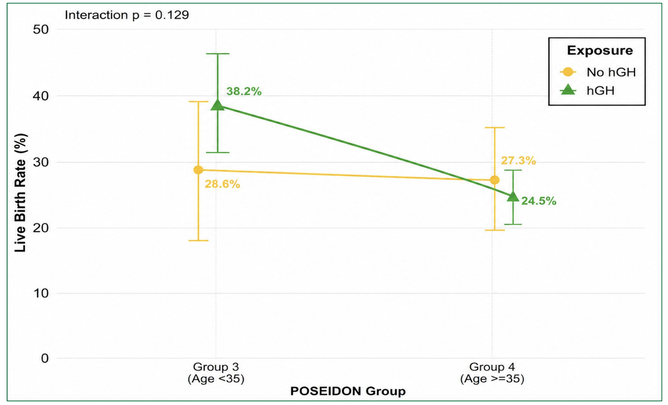

Figure 1. Live birth rate by POSEIDON group and hGH exposure.
Points show live birth rate (%) with 95% CI for Group 3 and Group 4, with vs. without hGH. The interaction between POSEIDON group and hGH exposure was not statistically significant (Interaction *p* = 0.129).

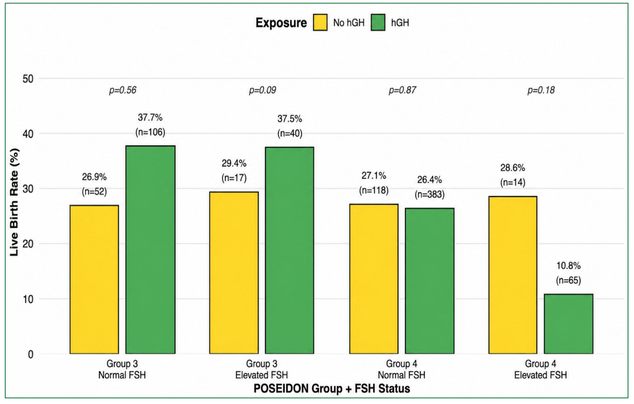

Figure 2. Live birth rate in POSEIDON groups by hGH exposure and FSH status.
Numbers above bars show live birth rate (%) and sample size (n); p-values compare hGH vs. no hCH within each subgroup. Exploratory analysis; no comparisons reached statistical significance.

Conclusion

- Overall, hGH was not associated with a significant improvement in live birth rate (adjusted OR 1.37, 95% CI 0.94-2.04, p=0.111).
- The effect of hGH appeared to differ by POSEIDON group: a potential benefit in younger poor responders (Group 3: 38.2% vs. 28.6%, OR 1.54) versus no benefit in older poor responders (Group 4: 24.5% vs. 27.3%, OR 0.86), though the interaction was not statistically significant (p=0.129).
- Within Group 3, the numerical benefit of hGH was consistent regardless of FSH status, with the largest effect size seen in those with elevated FSH (37.5% vs. 29.4%, p=0.09).
- hGH exposure was not associated with a difference in blastocyst yield per cycle (2.0 vs. 1.9, p=0.598), suggesting any potential benefit may act on endometrial receptivity or embryo quality rather than embryo quantity.

Limitations

- hGH allocation was not randomized and likely reflects clinician selection based on unmeasured prognostic factors.
- Subgroup analyses were exploratory and underpowered, with some strata containing as few as 14–17 patients, limiting the reliability and precision of these estimates.
- Single-center design may limit generalizability to other populations or clinical practice settings.

Literature Cited

[1]Alviggi C, et al. Fertil Steril. 2016;105(6):1452-1453.
[2]Zakerinasab F, et al. Turk J Obstet Gynecol. 2024;21(3):208-218.