

**EFFECT OF LOW AND HIGH BODY MASS INDEX (BMI) ON EMBRYO DEVELOPMENT, IMPLANTATION AND LIVE BIRTH RATES.** R. Sherbahn. Advanced Fertility Center of Chicago, Gurnee, IL.

**OBJECTIVE:** To study the influence of body mass index (BMI) on day 3 embryo development and implantation and live birth success rates with IVF.

**DESIGN:** Retrospective review of embryo development and implantation and live birth rates according to the body mass index of the female patient.

**MATERIALS AND METHODS:** All 2362 IVF embryo transfer cycles using autologous eggs with a female partner under age 40 that had a BMI recorded between January 2002 and December 2009 were included in the study.

The cases were split into 3 groups for analysis according to BMI. The very thin group had a BMI of 14-18, the normal group BMIs were between 19-28, and the obese group had BMIs of 29-43.

IVF outcome parameters were evaluated including number of eggs retrieved, number of mature eggs, number of day 3 8 cell embryos and implantation and live birth rates. Statistical analysis utilized Student's t-test and chi-square statistics.

**RESULTS:** Implantation and live birth rates were higher in the middle BMI group and lower in the very thin and the obese groups. This was the case even though the number of eggs retrieved and the number of 8 cell embryos on day 3 was similar between the 3 groups.

See Table 1.

IVF Results by BMI Group

BMI Group	# Cycles	Avg # Eggs	Avg # 8 cells	Implantation	Live Birth
14-18	50	9.9	2.9	26%	34%
19-28	1828	9.7	3.6	40%	50%
29-43	484	10.6	3.8	35%	45%

Implantation rates were significantly higher in the normal BMI group as compared to the very thin group ( $P < 0.05$ ) and also higher in the normal BMI group as compared to the obese group ( $P < 0.003$ ). The difference in implantation rates between the thin and obese groups was not statistically significant.

**CONCLUSION:** Although the number of eggs and 8 cell embryos were similar between 3 groups of IVF patients based on BMI, the implantation and live birth success rates were higher in the normal BMI group compared to the thin and obese groups. This could be due to differences in uterine receptivity, or with embryo transfer efficiency in the obese patients. This issue deserves further study.

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**NUMBER OF BLASTOCYSTS AVAILABLE FOR TRANSFER DURING IVF CYCLE AND PATIENT AGE ARE THE BEST PREDICTORS OF PREGNANCY WHEN COMPARED TO AMH, FSH, OR RESPONSE TO COH.** E. Trukhacheva, J. Ding, N. Rana, M. Noursalehi, P. Dmowski. Reproductive Medicine Institute, Oak Brook, IL.

**OBJECTIVE:** There is currently a search for the best markers to predict pregnancy rates (PR) after IVF and select patients for single embryo transfer (SET). Our objective was to determine whether patient age, AMH, FSH, response to COH, number of blastocysts, or a combination of above variables can be used to predict clinical PR after IVF.

**DESIGN:** Prospective study.

**MATERIALS AND METHODS:** 194 women undergoing first IVF cycle in 2010-2011 were included and the following data was collected: age, AMH, day 3 FSH and E2, total units of gonadotropins used, peak E2, oocytes retrieved, MII, 2PN, cleavage stage embryos, number of blastocysts available for transfer, clinical PR.

Descriptive statistics and multivariate logistic regression analysis with stepwise selection and no intercept were employed to identify variables predictive of clinical PR. Number of blastocysts, age, number of oocytes, MII, peak E2, AMH and FSH were included in the model.

**RESULTS:** Mean age was  $35 \pm 4.3$  years (23-45), mean AMH was  $2.16 \pm 2.15$  mg/ml (0.02-12.87), mean FSH was  $8.56 \pm 3.19$  mIU/ml (2.3 -22.00), mean number of blastocysts was  $4.5 \pm 3.6$  (0-22). Clinical PR was 50.3% per retrieval, 61% per embryo transfer.

Based on the logistic analysis number of blastocysts ( $P=0.0031$ ), age ( $P=0.0003$ ), and AMH ( $P=0.0057$ ) demonstrated strong effect in predicting clinical PR, where all other variables including day 3 FSH ( $P=0.1196$ ) did not.

Number of blastocysts and age were inversely correlated. Patients with 4 or more blastocysts had 70% (49 out of 71) PR. Patients with 9 or more blastocysts had 87% (13 out of 15) and those with 11 and more had 100% (7 out of 7) PR.

**CONCLUSION:** Number of blastocysts available for transfer and patient age are the best predictors of clinical PR after IVF and can be used to select patients for SET. Patient age and AMH also demonstrated predictive value and can be used to counsel patients about potential success prior to IVF cycle start. Day 3 FSH, patient response to COH, and other evaluated variables had no predictive value on clinical PR.

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**HIGH ACCURACY PREDICTIONS OF IVF PROGNOSIS ATTAINED USING A COMBINATION OF AMH AND DAY 3 FSH/LH RATIO.** I. Park, K. H. Lee, H. G. Sun, S. K. Kim, J. H. Lee, G. H. Jeon. OB&GY, Mapapapa & Baby OBGY, Ulsan, Korea; OB&GY, Inje University Haeundae Paik Hospital, Busan, Korea.

**OBJECTIVE:** Anti-Mullerian hormone (AMH) has been used as the most valuable ovarian reserve marker and a good predictor of IVF outcomes. Some studies have shown that the day 3 FSH/LH ratio can be used as a IVF outcome predictor. The purpose of this study was to assess the values of AMH and day 3 FSH/LH ratio and their combination as predictors of IVF outcomes.

**DESIGN:** Retrospective study.

**MATERIALS AND METHODS:** We retrospectively reviewed 178 patients undergoing IVF using GnRH agonist and antagonist protocols from January 2010 to December 2010. Three groups of patients were formed based on Day 3 serum FSH/LH ratio. Group I consisted of patients with serum FSH/LH  $< 2$ , Group II consisted of patients with  $2 \leq$  FSH/LH  $< 3$ , Group III consisted of patients with FSH/LH  $\geq 3$ . Each group was divided into subgroups according to AMH (AMH  $< 2$ ,  $2 \leq$  AMH  $< 5$ , AMH  $\geq 5$ ).

**RESULTS:** In each group, the patients' characteristics as measured by age, parity and cause of infertility reflected no difference. Group I (FSH/LH  $< 2$ ) had significantly higher pregnancy rates (PR) than Group II and Group III. [62.5%(45/72), 48.1%(26/54), 28.8%(15/52),  $P < 0.05$ ]. In group I (FSH/LH  $< 2$ ), when AMH was higher than 5, the PR was 75.0%(33/44). This percentage was higher than the PR of other subgroups [AMH  $< 2$ : PR 30.8%(4/13),  $2 \leq$  AMH  $< 5$ : PR 53.3%(8/15)]. In group III (FSH/LH  $\geq 3$ ), when AMH was lower than 2, the PR was 14.3%(3/21). This rate was lower than the PRs of the other subgroups [ $2 \leq$  AMH  $< 5$ : PR 32.0%(8/25), AMH  $\geq 5$ : 50.0%(3/6)]. The PRs were significantly different according to AMH. [AMH  $< 2$ , PR 29.6%(16/54);  $2 \leq$  AMH  $< 5$ , PR 44.3%(27/61); AMH  $\geq 5$ , PR 66.7%(42/63);  $P < 0.05$ ]

**CONCLUSION:** Day 3 FSH/LH ratio as well as AMH can be used as a predictor of IVF prognosis. The data states that when day 3 FSH/LH ratio  $< 2$  and AMH  $\geq 5$ , we can anticipate higher PR (65.9%) but when day 3 FSH/LH ratio  $\geq 3$  and AMH  $< 2$ , it is hard to expect good IVF outcomes (PR 14.3%). Therefore, when we combine day 3 FSH/LH ratio and AMH, we can predict IVF prognosis with higher accuracy.

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**GONADOTROPHIN STIMULATION PERIOD DISTINGUISHES BETWEEN PATIENTS WITH ADVANCED MATERNAL AGE WHO DID AND DID NOT ACHIEVE IMPLANTATION AND PREGNANCY.** R. S. Rodrigues, A. S. Setti, L. L. Maldonado, D. P. A. F. Braga, A. Iaconelli, Jr, E. Borges, Jr. Fertility - Assisted Fertilization Center, Sao Paulo, SP, Brazil; Sapietiae Institute - Educational and Research Center in Assisted Reproduction, Sao Paulo, SP, Brazil.

**OBJECTIVE:** The goal of this study was to investigate the impact of GnRH antagonists on the outcomes of intracytoplasmic sperm injection (ICSI) cycles, considering the stimulation and the suppression duration, in women with advanced maternal age.

**DESIGN:** Retrospective.

**MATERIALS AND METHODS:** This retrospective study enrolled a total of 138 couples with maternal age  $\geq 37$  years old which underwent ICSI cycles with antagonist protocol. Logistic regression models were used to evaluate the influence of stimulation and suppression duration on the response to controlled ovarian stimulation, fertilization, implantation, pregnancy, miscarriage and embryo transfer rates. Receiver operating characteristic (ROC) curve analysis was performed to assess the predictive value of the stimulation period on implantation and pregnancy achievement. Results are expressed as regression coefficients (RC) or odds ratios (OR) with 95% confidence intervals (CI) and p values. For ROC curve results are expressed as area under curve (AUC) with 95% CI. Results were considered to be significant at the 5% critical level ( $P < 0.05$ ).

**RESULTS:** The duration of pituitary suppression and gonadotrophin stimulation was  $4.2 \pm 1.1$  and  $9.7 \pm 1.3$  days, respectively. The antagonist suppression had no influence on the implantation rate (RC: -2.033,  $P=0.315$ ), pregnancy rate (OR: 0.89, CI: 0.60 – 1.31,  $P=0.555$ ), miscarriage rate (OR: 1.20, CI: 0.52 – 2.77,  $P=0.658$ ), whereas the gonadotrophin stimulation period negatively influenced the implantation rate (RC: -4.200,  $P=0.023$ ) as well as tended to determine a diminished odds of pregnancy (OR: 0.69, CI: 0.48 – 1.01,  $P=0.051$ ). The AUC calculated could distinguish between women with positive and negative implantation (AUC: 0.611; CI: 0.546 – 0.673) and pregnancy (AUC: 0.593; CI: 0.528 – 0.656).

**CONCLUSION:** The gonadotrophin stimulation period negatively influences the implantation rate and distinguishes between patients who did and did not achieve implantation and pregnancy.

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**DOES DECREASING THE INTRAMUSCULAR hCG DOSE REDUCE THE RISK OF OVARIAN HYPERSTIMULATION SYNDROME?** M. D. Johnson, C. K. Seager, N. M. Barker, S. Mesiano, W. W. Hurd. Reproductive Biology, Case Western Reserve University, Cleveland, OH; Obstetrics and Gynecology, University Hospitals Case Medical Center, Cleveland, OH.

**OBJECTIVE:** To determine if decreasing the intramuscular (IM) hCG dose in patients with estradiol levels greater than 3,000 pg/mL reduces the risk of ovarian hyperstimulation syndrome (OHSS) occurrence.

**DESIGN:** Retrospective cohort study in a university hospital-based practice.

**MATERIALS AND METHODS:** We reviewed 411 IVF cycles from 288 women between January 1, 2006 and September 21, 2010. We included patients whose serum estradiol (E2) level on hCG trigger day was  $\geq 3,000$  pg/mL (Range 3,007-8,841 pg/mL). Stepwise multiple logistic regression (MLR) was performed to examine if OHSS was predicted by age, body mass index (BMI), number oocytes retrieved (a marker for number of follicles), E2 level at trigger, hCG trigger dose, or serum hCG level after trigger. MLR was then used to determine if OHSS rates were decreased in cycles where the IM hCG trigger dose was decreased from 10,000 IU to 7,500 IU or 5,000 IU. Adjusted odds ratios (OR) and 95% confidence intervals (CI) were calculated.

**RESULTS:** OHSS occurred in 21/109 (19%) of cycles with E2 levels on hCG trigger day  $\geq 3,000$  pg/mL. Significant predictors of OHSS were age and number of oocytes retrieved. The risk of OHSS was greater in women <30 years old (OR 5.04, 95% CI 1.26-20.14) and each oocyte retrieved increased the risk of OHSS by 8% (OR 1.08, 95% CI 1.02-1.14). When adjusted for all other factors, administering a decreased hCG trigger dose did not lower the OHSS risk.

Risk of OHSS by hCG Dose

Dose (IU)	Mean E2 Level, pg/mL (range)	Mean Age, years (range)	Mean # Oocytes (range)	OHSS, n (%)	Adjusted OR (95% CI)	P
10000	4,037 (3,007-8,772)	34 (25-46)	22 (9-46)	9/59 (15)	Referent	
7500	4,978 (3,082-8,716)	33 (21-42)	22 (8-50)	10/45 (22)	1.5 (0.5-4.6)	0.45
5000	6267 (4,229-8,841)	34 (30-37)	26 (15-36)	2/5 (40)	5.9 (0.7-46.5)	0.09

**CONCLUSION:** Decreasing the hCG trigger dose for IVF does not reduce the risk of OHSS occurrence in women with elevated estradiol levels. The best predictors of OHSS are age and number of oocytes retrieved (a marker for number of follicles).

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**FSH/LH RATIO AS AN INDEPENDENT PREDICTOR OF RESPONSE TO CONTROLLED OVARIAN STIMULATION.** J. D. Kofinas, T. Singer, Y. J. Huang, R. T. Abdallah, Ronald O. Perelman and Claudia Cohen Center for Reproductive Medicine, Weill Cornell Medical Center, New York, NY; Department of Obstetrics and Gynecology, New York Presbyterian Hospital, New York, NY.

**OBJECTIVE:** To determine whether a FSH/LH ratio > 3 in the setting of a normal FSH (<12 IU/L) is associated with a higher rate of failed controlled ovarian stimulation cycles.

**DESIGN:** Retrospective Cohort.

**MATERIALS AND METHODS:** A retrospective chart review was performed for the year 2010 at CRMI of Weill Cornell Medical College. A total of 676 patients were identified. 198 patients had a FSH/LH>3 and 477 patients had a FSH/LH<3. Exclusion criteria included age>40, protocols using an estrogen patch, estrogen at start of >70 pg/ml, and FSH at start > 12 IU/L. The outcome measures included cycle cancellations, peak estrogen level, total gonadotropin dose, days of stimulation, total number of oocytes retrieved, and number of mature oocytes (MII), eggs fertilized and frozen blastocysts.

**RESULTS:** The group with an FSH/LH >3 was more likely to have their cycle cancelled (15% vs. 5.24%  $P=0.0001$ ). The total gonadotropin dosage was greater in the higher ratio versus lower ratio group (2636 IU, C.I 2447-2825 vs. 2242 IU C.I = 2136-2347). In addition the peak E2 was significantly lower in the group with a higher ratio when compared to the lower ratio group (Peak E2 = 1635 pg/ml, C.I = 1524-1746 vs. Peak E2 = 1942 pg/ml C.I = 1868-2016). However, lower E2 didn't translate into a lower cycle outcome as demonstrated by similar average stimulation days, number of harvested oocytes, MII oocytes, fertilized oocytes, and frozen blastocysts.

	FSH/LH<3 (N = 477)	FSH/LH >3 (N = 198)	p-value
Total days of stimulation	9.28	9.38	0.48
Total oocytes	12.59	11.89	0.16
Mature oocytes	10.25	9.63	0.13
Fertilized oocytes	7.47	7.04	0.24
Frozen Blastocysts	0.85	0.66	0.15

**CONCLUSION:** The value of FSH/LH ratio in patients with normal FSH levels, may have a role in determining the appropriate stimulation protocol as patients with a higher ratio (>3) need a higher total dose of gonadotropins in order to achieve similar outcomes to patients with a lower ratio (<3). In addition the FSH/LH ratio may help predict the chance of cycle cancellation and may assist in counseling patients.

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**LOW SERUM HUMAN CHORIONIC GONADOTROPIN (hCG) LEVELS AFTER TRIGGER INJECTION FOR IN VITRO FERTILIZATION (IVF): ASSOCIATED FACTORS, IMPACT, AND PREVENTION.** D. M. Prinz, C. K. Seager, A. Ahmady, S. Weil, J. H. Liu, W. W. Hurd. Obstetrics and Gynecology, Division of Reproductive Endocrinology and Infertility, University Hospitals Case Medical Center, Cleveland, OH.

**OBJECTIVE:** To determine 1) what factors predict serum hCG levels, 2) if low serum hCG levels are detrimental to oocyte quantity, quality, or maturity, and 3) if hCG administration in the deltoid rather than the gluteus muscle increases serum hCG levels in women with body mass index (BMI) >30 kg/m<sup>2</sup>.

**DESIGN:** Retrospective cohort study.

**MATERIALS AND METHODS:** We reviewed the data for 411 women who underwent conventional IVF. When clinical criteria for ovulation triggering were achieved, patients received 5,000 - 10,000 IU of hCG. Serum hCG levels were measured 12 hours after hCG injection. The relationship between serum hCG levels, age, BMI, pre-injection serum estradiol levels, dose of hCG administered, number of total oocytes, and total mature oocytes retrieved was assessed with stepwise multiple linear regression analysis. The percent oocyte maturity was then compared in cycles where serum hCG levels were above or below 45 IU/mL using two-tailed unpaired Student's t-test. Lastly, hCG levels were compared for women with BMI>30kg/m<sup>2</sup> given trigger injections in deltoid versus gluteus muscles using two-tailed unpaired Student's t-tests. P values <0.05 were considered significant.

**RESULTS:** Post trigger serum hCG levels decreased with increasing age ( $P<0.005$ ) and increasing BMI ( $P<0.001$ ). Serum hCG levels >45 IU/mL were associated with a greater % mature oocytes ( $68 \pm 22\%$  versus  $50 \pm 24\%$ ,  $P<0.03$ ). In patients with BMI>30kg/m<sup>2</sup>, hCG injection in the deltoid muscle resulted in significantly higher average hCG levels compared to injections in the gluteus muscle ( $182 \pm 116$  versus  $114 \pm 74$  IU/mL, respectively,  $P<0.04$ ).

**CONCLUSION:** Serum hCG levels are decreased in older women and those with greater BMIs. The serum hCG threshold below which oocyte maturation is reduced is approximately 45 IU/mL. In women with BMI >30 kg/m<sup>2</sup>, hCG administration in the deltoid rather than the gluteus muscle results in higher serum hCG levels.