

# Does Maternal BMI Really affect Pregnancy Outcome After IVF/ICSI? A Prospective Observational Study

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## ABSTRACT

**Introduction:** The effect of BMI on many assisted reproduction treatment outcomes is still only insufficiently described. Although some studies have reported no adverse effect of raised BMI on IVF outcome others have linked raised BMI with a negative impact on outcome. Objective: To evaluate the impact of body mass index (BMI) on pregnancy outcome after In-vitro fertilization (IVF) / intracytoplasmic sperm injection (ICSI).

**Material and methods:** It's a prospective observational study conducted in NIMS Infertility and Research Centre, Jaipur, over a period of two years from Nov 2013 to Dec 2015. Prepregnancy BMI was calculated for women selected for IVF/ICSI. Patients who had IVF/ICSI were followed till viable pregnancy is confirmed by presence of cardiac activity on ultrasound.

**Results:** Of the studied 160 women, 8(5%) were underweight, 32(20%) were overweight and 25(15.62%) were obese. The positive pregnancy rate among the whole studied women was 33.75% (54 of 160). The positive pregnancy rate is varied by BMI where it was 37.5%, 34.7%, 34.37%, and 24% in underweight, normal, overweight, and obese women, respectively. Although mean age and duration of infertility was higher among obese women, but was not significant ( $P > 0.05$ ). Women with higher BMI were having long menstrual cycles, and significantly low LH levels ( $P < 0.05$ ) but other hormones (FSH, TSH, Prolactin) were normal. Number of IVF/ICSI per woman and number of cycles cancelled were significantly higher among women with high BMI ( $P$  value  $< 0.05$ ).

**Conclusion:** The current results confirm that higher BMI ranges negatively impact pregnancy outcome after IVF/ICSI.

**Keywords:** IVF, ICSI, BMI, Overweight, Obese, Assisted reproductive techniques.

those may add benefits such as receptivity of the uterus after embryos transfer, possibly because of impaired endometrial function.<sup>2</sup>

The endocrine and metabolic environment may influence oocyte quality, and therefore embryo development and subsequent implantation and pregnancy outcome. Another explanation for the lower pregnancy rate associated with obesity is impaired uterine environment, due to disturbed endometrial function.<sup>3,4</sup> The reproductive axis is closely linked to nutritional status, with amenorrhea, anovulation and subfertility, and infertility occurring with higher body weights. Obese women have a lower chance of pregnancy following in vitro fertilization, require higher dosage of gonadotrophins and have an increased miscarriage rate.<sup>3-6</sup>

The effect of female obesity on many assisted reproduction treatment outcomes is still only insufficiently described. Studies are heterogeneous regarding BMI categories, inclusion and exclusion criteria and analytic approach (per patient or per cycle) and results are inconsistent.

The purpose of this study was to evaluate impact of body mass index (BMI) on pregnancy outcome after In-vitro fertilization (IVF) / intracytoplasmic sperm injection (ICSI).

## MATERIAL AND METHODS

It was a prospective observational study conducted in NIMS Infertility and Research Centre, Jaipur, over a period of two years from Nov 2013 to Dec 2015. Patients coming to infertility clinic were first evaluated for the cause, duration and type of infertility. A total of 248 patients were selected for IVF/ICSI and their Pre-pregnancy BMI was calculated and other characteristics of patients were recorded according to the preformed proforma. But only 163 women were followed properly till viable pregnancy is confirmed by presence of cardiac activity on ultrasound (7- 8 wk POG) while others were having incomplete data recordings and some lost to follow up. All subjects included in this study provided informed consent, and the protocol of this study was approved by the Ethics Committee

## STATISTICAL ANALYSIS

SPSS version 16.0 was used. For differences between means of continuous data of all four BMI groups, one-way analysis of variance (ANOVA) was displayed. Sub-analyses on differences

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## INTRODUCTION

The prevalence of obesity is increasing day by day, and its association with increased health risks, maternal mortality and morbidity, including declining fertility rates, are a consequence of the upcoming global obesity epidemic. Obesity is associated with increase risks for adverse health outcomes across the reproduction spectrum including higher rates of subfertility, early pregnancy loss, infertility, fetal deaths, stillbirths, neonatal deaths, congenital anomalies along with pregnancy complications, it is also influences the pregnancy outcome after IVF/ICSI.<sup>1</sup>

The effect of BMI on many assisted reproduction treatment outcomes is still only insufficiently described. Some studies have reported no adverse effect of raised BMI on IVF outcome while others have linked raised BMI with a negative impact on outcome.

Mechanisms through which body mass affects reproduction include menstrual disturbance but these problems can be solved through assisted reproduction treatment. Other mechanisms

between means of normal-weight (BMI 18.5–24.99 kg/m<sup>2</sup>) versus obese (BMI 30 kg/m<sup>2</sup>) women were performed with Student's t-test. Differences between distributions for both comparisons of all four BMI groups and comparisons between normal-weight and obese women were assessed using chi-squared test. A P-value < 0.05 was considered statistically significant.

## RESULTS

Table-1 shows patients characteristics according to BMI strata. Of the studied 163 women, 8 (5%) were underweight, 32 (20%) were overweight and 25 (15.62%) were obese.

1/3<sup>rd</sup> of patient were having BMI > 25 kg/m<sup>2</sup>. Although mean age and duration of infertility was higher among obese women, but was not significant (P >0.05). Among all cases primary infertility was more prevalent (65 – 70%) compared to secondary infertility (28 – 38%).

Table-2 shows patient's endocrinal profile n other characteristics according to BMI strata. Women with higher BMI (> 30 kg/m<sup>2</sup>) were having long menstrual cycles, and significantly low LH levels (P<0.05) but other hormones (FSH, TSH, Prolactin) were normal. There was no significant difference among day of HCG trigger, endometrial thickness and no. of embryo transfer.

Table-3 shows outcome of IVF/ICSI according to BMI strata. The number of IVF/ICSI per woman was significantly higher ( P<0.05) among the obese women compared to those with normal BMI. There were a higher proportion of cancelled cycles

in the underweight and the obese group Compared to normal-weight and overweight groups.

The positive pregnancy rate among the studied women was 33.12% (54 of 163). The positive pregnancy rate is varied by BMI where it was 37.5%, 34.7%, 34.37%, and 24% in underweight, normal, overweight, and obese women.

## DISCUSSION

The major findings of this study of 163 patients undergoing IVF/ICSI cycles were:

- (i) Women with higher BMI (> 30 kg/m<sup>2</sup>) were having long menstrual cycles, and significantly low LH levels, probably because of association with anovulation
- (ii) The number of IVF/ICSI cycles per women and cancelled cycles per woman was significantly higher in the obese group.
- (iii) Pregnancy rate was lower and abortion rate were higher among obese versus normal-weight women.

This study correlates with the study of B.Luke et al<sup>7</sup> and S. Shen et al<sup>8</sup> who also reported decreased probability of positive pregnancy outcome in overweight and obese women after infertility treatment. Luke et al reported that increasing BMI was associated with significantly greater odds of failure to achieve a clinical intrauterine pregnancy per treatment cycle.

The systematic review by Maheshwari et al<sup>9</sup> revealed that BMI 25 kg/m<sup>2</sup> decreases the chance of pregnancy following assisted reproduction treatment. In agreement, the present study found

	Underweight < 18.5	Normal BMI 18.5 - 24.9	Overweight 25 - 29.9	Obese > 30	P value
No. of cases	8(5%)	98(61.25%)	32(20%)	25(15.62%)	-
Age	27.1 ± 5.1	28.8 ± 4.2	29.1 ± 4.4	31.2 ± 5.4	NS
Weight (kg)	49.6 ± 4.3	63.1 ± 5.6	71.3 ± 5.8	94 ± 7.8	-
BMI (kg/m <sup>2</sup> )	17.2 ± 1.1	22.3 ± 1.6	27.2 ± 1.7	34.1 ± 2.3	-
Duration of infertility	3.1 ± 2.3	3.4 ± 3.2	3.4 ± 3.9	5.4 ± 4.6	NS
Primary Infertility	5(62.5%)	70(71.43%)	21(65.63%)	17(68%)	NS
Secondary Infertility	3(37.5%)	28(28.57%)	11(34.37%)	8(32%)	NS
Prior infertility treatment	5(62.5%)	58(59.1%)	18(56.25%)	16(64%)	NS

**Table-1:** Patients characteristics according to BMI strata

	Underweight < 18.5	Normal BMI 18.5 - 24.9	Overweight 25 - 29.9	Obese > 30	P value
Cycle length	28.1 ± 3.3	28.4 ± 5.4	29.8 ± 4.8	36.1 ± 6.3	P<0.05
FSH (mIU/ml)	6.6 ± 2.3	6.3 ± 2.1	6.2 ± 2.4	6.4 ± 2.6	NS
LH	6.8 ± 2.3	6 ± 2.3	5.4 ± 2.1	5.1 ± 2.7	P<0.05
PRL	17.2 ± 10.1	18.3 ± 11.6	17.2 ± 10.7	19.1 ± 9.3	-
TSH	1.1 ± 1.3	1.4 ± 0.6	2.4 ± 1.4	2.5 ± 1.1	NS
Endometrial thickness (mm)	11 ± 1.1	10.6 ± 1.9	10.8 ± 2.1	11 ± 2.1	NS
Day of HCG Trigger	13.1 ± 2.1	13.2 ± 2.6	13.0 ± 2.4	13.6 ± 2.1	NS
No. of embryo transfer	2.3 ± 0.8	2.1 ± 0.9	2 ± 1.0	2.6 ± 0.8	NS

**Table-2:** Patient's endocrinal profile n other characteristics according to BMI strata.

	Underweight < 18.5	Normal BMI 18.5 - 24.9	Overweight 25 - 29.9	Obese > 30	P value
No. of IVF/ICSI per female	2.8 ± 1.3	2 ± 1.6	2.5 ± 1.5	3.5 ± 1.9	P < 0.05
No. of cancelled cycles per female	0.4 ± 0.9	0.3 ± 0.3	0.2 ± 0.3	0.8 ± 1.1	P < 0.05
Conceived (viable pregnancy > 7 wk) 54/163 (33.12%)	3 (37.5%)	34 (34.7%)	11 (34.3%)	6 (24%)	P < 0.05
Abortion	2(25%)	19(19.38%)	7(21.87%)	8(32%)	P < 0.05

**Table-3:** Outcome of IVF/ICSI according to BMI strata.

that women's BMI influences the pregnancy outcome after IVF/ICSI; however, the BMI cut-off was higher ( $>30 \text{ kg/m}^2$ ) in our study than in the systematic review.

In coherence with previous studies by McClure et al<sup>10</sup> and Mulders et al<sup>11</sup>, the current study observed a significantly higher number of cancelled cycles in obese versus normal-weight women. Additionally, this study found more cancelled cycles in the underweight group.

#### Limitation

The sample size was too limited to draw firm conclusions regarding specific differences in number of cycles, hormonal milieu, conception and abortion rates. Time frame was small, so live-birth rates and perinatal outcomes in terms of term/preterm fetus, NICU admission and any effect on congenital malformations could not be studied between different BMI groups.

It was stated that sufficient knowledge on the impact of BMI on IVF live-birth rates, preterm delivery, congenital malformations, number of cycles, cancelled cycles, reason for cancelling, collected oocytes, developed embryos and surplus embryos for freezing is still only weakly understood and documented.

#### CONCLUSION

Our study confirms that it's challenging to treat women with higher BMI and that these women are at a disadvantage compared with their normal-weight counterparts. Obese women have a lower chance of pregnancy following in vitro fertilization, and have an increased miscarriage rate.

Women should be counselled regarding weight reduction, dietary and lifestyle modifications and negative implications of high BMI on maternal and perinatal outcome.

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