# THE MINIMAL EFFECT OF BODY MASS INDEX ON ICSI OUTCOME

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## ABSTRACT

***Objectives***: To determine the effect of BMI on ICSI outcome.

***Design***: Retrospective study.

***Setting***: The ART Unit in the International Islamic Center for Population Studies and Research (IICPSR), Al-Azhar University.

***Patients***: The study used data collected from 550 who women had ICSI cycles at our center; the women were classified according BMI as follow; ( <18.5 Kg/m$^2$; > 18.5 - < 25 Kg/m$^2$; >25- 30 Kg/m$^2$; >30 Kg/m$^2$).

***Main Outcome Measures***: Duration of stimulation, consumption of gonadotropin, cycle cancellation, total oocyte retrieval, laboratory outcome and pregnancy outcome.

***Results***: The pregnancy outcome was 27% for BMI > 18.5 - <25 Kg/m$^2$- and 20% for BMI >25 - <30 Kg/m$^2$ and BMI >30 Kg/m$^2$, this difference was not statistically significant; also the number of HMG ampules were 34.1 ± 13.1 for BMI >30 Kg/m$^2$ and 32.2 ± 12.5 for BMI >25 - < 30 Kg/m$^2$ and 25.1 ± 11.9 for BMI 18.5 - < 25 Kg/m$^2$, this difference was statistically significant.

***Conclusion***: The overweight and obesity did not affect the ICSI outcome.

***Key Words***: BMI, Obesity, Ovarian Stimulation, ICSI outcome.

## INTRODUCTION

Obesity is increasing rapidly among women allover the world, and more women in the fertile age become overweight and obese, besides all other problems, like hypertension, type 2 diabetes, coronary artery disease, stroke, gall bladder disease, sleep apnoae, endometrial carcinoma [1]. The women who are obese have higher rates of amenorrhoea and infertility, the fecundity decreases in obese women and some researcher advise weight reduction to improve fecundity [2].

Obesity is defined as a BMI >30 Kg/m$^2$-. Normal weight is defined as BMI between 18.5 Kg/m$^2$- and 24.9 Kg/m$^2$ -. Overweight is defined as 25.0 Kg/m$^2$- 29.9 Kg/m$^2$- and extreme obesity is >40 Kg/m$^2$- .

Many obese individuals of reproductive age attempt to conceive using ART. Some researchers examined the effect of BMI on IVF. They examined amount of follicles aspirated, egg number , number of embryos, peak estradiol, clinical pregnancy rate, miscarriage rate, implantation rate and incidence of ovarian hyperstimulation syndrome compared to controls with normal BMI; they found no significant effect on ICSI outcome [3,4,5,6].

Other clinical studies, however, found significant effect of obesity on ICSI outcome in the form of low birth rate and impaired response to ovarian stimulation [7,8,9,10,11,12,13] and some investigators advise weight reduction to improve outcome [14] .

The huge number of obese women seeking for assisted reproduction and controversial research related to this issue led to the performance of this work. The aim was to study the effect of BMI on the ICSI outcome.

## PATIENTS & METHODS

A retrospective study was conducted to explore the impact of BMI on the ICSI outcome. The study used data collected from 550 women who had ICSI cycles at the assisted reproduction unit, International Islamic Center for Population Studies and Researches, Al-Azhar University, during the period from the first of July 2005 to the end of December 2006. The women above the age of 38 years and those with Basal FSH above 10 mIU/L were excluded from the study. The women were distributed by their BMI as flow, <18.5 Kg/$m^2$; 18.5 - <25 Kg/$m^2$; >25-30 Kg/$m^2$; >30 Kg/$m^2$. The BMI was calculated as weight in Kg divided by height square in Meter square.

### ICSI Protocol:

The ICSI embryo transfer protocol has been described in detail elsewhere [15]; we used the long protocol; the down regulation started at day 21 of the cycle by injection of Decapeptyl 3.75 mg single dose or Decapeptyl 0.1 mg SC (Ferring, Germany) daily dose until time of HCG injection, after complete down regulation, HMG started in the form of Merional 75 IU (IBSA) or Menogon 75 IU (Ferring). The initial dose was 150 IU for women less than 30 years and 225 IU for women above the age of 30 years and those with high BMI. The main outcome was duration of stimulation, consumption of gonadotropin, cycle cancellation, total oocyte retrieval, laboratory outcome and pregnancy outcome.

### Statistical Analysis:

The data were analyzed by using statistical analysis, software system (SAS Version 9.0; 2002). The clinical, laboratory, ovarian response and pregnancy outcome of the studied women were expressed as mean ± SD for continuous variables and percent distribution for categorical variables and compared between different categories of body mass index, chi-square Fisher exact and F (ANOVA) test were used as appropriate.

## RESULTS

The study analysis included, 550 patients who participated in our ICSI program, according the distribution of BMI; Table (I), <18.5 Kg/$m^2$ ( n=10, 2%); > 18.5 - <25 Kg/$m^2$ (n=80, 14%); > 25- <30 Kg/$m^2$ (n=290, 52%); ≥ 30 Kg/$m^2$ (n=179, 32%), surprisingly most of our patients (85% of cases) were obese and overweight.

Table (II): No correlation was observed between different BMI and duration of HMG stimulation, but positive correlation was observed with total dose of HMG required for complete ovarian stimulation. Also no correlation was observed between various BMI categories and incidence of poor responder.

Table (III), Table (IV): No correlations were observed between various BMI and percent of oocyte fertilization, number and quality of transferred embryos.

Table (V): As regard pregnancy outcome, no correlation was observed between different BMI and pregnancy outcome; the pregnancy outcome was 20% for overweight and obese women and 27% for normal weight women.

## DISCUSSION

We found that, overweight and obesity did not affect pregnancy outcome, oocyte fertilization, embryo quality and number of embryos available for transfer. Also, no correlation was observed with increased incidence of poor responders. On the other hand, a positive correlation was observed between increased BMI and number of HMG ampules required for ovarian stimulation.

These findings agree with observations reported by Lashen et al., 1999; Wang et al., 2000; Winter et

al., 2002; Nicholes et al., 2003; Dokras et al., 2006) [3,7,6,11,16]. On the other hand, our findings contradict, the studies that correlate increased BMI with low birth rate during IVF (Fedorcsak et al., 2000; Wang et al., 2002; Fedorcsak et al., 2004) [12,17,13].

Fedorosak (2004) [13], referred decreased birth rate in obese women to increased incidence of spontaneous abortion and not due to IVF procedures itself. Wang et al. (2002) [17], explained increased incidence of spontaneous abortion during IVF procedures and referred such increase to endocrinological and biochemical mileu associated with obesity operating through the functional state, such as insulin resistance, which can create a hostile intrauterine environment for the oocyte or embryo. We observed an association, between increased BMI and increased HMG dose during ovarian stimulation. The correlation between obesity and increased HMG dose was not clear, because we used higher HMG dose in obese women, so the initial dose has to be fixed in order to refer increased dose to obesity.

Imani et al. (2002), found low threshold for HMG stimulation in the obese women and they advised increased initial dose of HMG in obese women in order to achieve proper ovarian response.

We did not find statistically significant differences in the fertilization rate, quality of embryo and number of embryos available for transfer; other studies however suggested that obesity and associated endocrine alterations may affect corpus luteum function [19,12], early embryo development (20,21), trophoblastic function [22] and endometrial receptivity [23].

In our IVF Center, we counselled the obese women about the impact of increased BMI on the ICSI outcome and we advised the patients to control their weight before starting ICSI program.

Although our study does not support a policy of excluding obese women from ICSI program based on poor ICSI outcome, we recommend counselling of obese women regarding the obstetric risks like; low birth weight [24] and a higher rate of gestational DM and delivery by C.S. [25], Stillbirth and neonatal death [26]. On the other hand, the weight reduction was difficult to achieve in some women and time consuming particularly in old women, where age had definite deleterious effect on the ICSI outcome.

So, our recommendation is to advise women to control weight before ICSI program to minimize the obstetric risk; we did not recommend weight reduction in older women because the age has marked deleterious effect on ICSI outcome.

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**Table I : Clinical Data of Women According to BMI.**

| Variable | BMI Kg / m² | | | | P. Value |
|---|---|---|---|---|---|
| | < 18.5 (n = 10) | 18.5- < 25 (n = 80) | 25 - < 30 (n = 290) | ≥ 30 (n = 176) | |
| Age in years (mean ± SD) | 28.5±5.2 | 27.5±4.8 | 30.2±5.7 | 32.8±3.5 | 0.001* |
| Duration of infertility in years (mean ± SD) | 7.4±5.3 | 5.9±4.4 | 7.7±4.9 | 8.9±5.0 | 0.002** |
| Main cause of infertility | | | | | |
| Male factor | 2(20.0) | 36(55.0) | 138(52.0) | 60(66%) | |
| Female factor | 8(80.0) | 44(45.0) | 150(48%) | 115(44%) | 0.01 |
| Age (Categories) | | | | | |
| < 24 yrs | 1 (10.0) | 18 (22%) | 34 (12.0) | 7 (4.0) | |
| 24 - < 30 yrs | 6 (60.0) | 35 (44.0) | 100 (34.0) | 48 (27.0) | |
| 30 - < 36 yrs | 2 (20.0) | 23 (29.0) | 102 (35.0) | 58 (33.0) | |
| > = 36 yrs | 1 (10.0) | 4 (5.0) | 52 (19.0) | 63 (36.0) | < 0.0001 |
| Number of ICSI cycle | | | | | |
| One cycle | 9 (90.0) | 68 (85.0) | 225 (78.0) | 128 (73.0) | |
| More than one cycle | 1 (10.0) | 12 (15.0) | 65 (22.0) | 48 (27.0) | 0.12 |

* Significance

**Table II: Ovarian Response According to BMI.**

| Variable | BMI Kg / m² | | | | P. Value |
|---|---|---|---|---|---|
| | < 18.5 (n = 10) | 18.5- < 25 (n = 80) | 25 - < 30 (n = 290) | ≥ 30 (n = 176) | |
| Duration of HMG treatment (mean ± SD) | 13.2±2.3 | 13.3±2.5 | 16.9±5.1 | 13.3±2.3 | 0.77 |
| Total HMG dose (mean ± SD) | 29.4±12.0 | 25.1±11.9 | 32.2±12.5 | 34.1±13.2 | < 0.0001* |
| Poor Responder | 0(0.0) | 12 (15.0) | 25 (9.0) | 23(13.0) | 0.80 |

* Significance

Table III: Fertilization Percent According to BMI.

| Variable | BMI Kg / m² | | | | P. Value |
|---|---|---|---|---|---|
| | < 18.5 (n = 10) | 18.5- < 25 (n = 80) | 25 - < 30 (n = 290) | ≥ 30 (n = 176) | |
| % of fertilization | | | | | |
| Positive | 10 (100.0) | 66 (97%) | 254 (95%) | 149 (97.0) | 0.77 |
| Negative | 0 (0.0) | 2 (3.0) | 11 (5.0) | 4 (3.0) | |
| Mean % fertilization of injected oocyte | 81.0 ± 25.0 | 71.0±23.0 | 74.0±25.0 | 77.0±23.0 | 0.41 |

Table IV: Laboratory Data According to BMI .

| Variable | BMI Kg / m² | | | | P. Value |
|---|---|---|---|---|---|
| | < 18.5 (n = 10) | 18.5- < 25 (n = 80) | 25 - < 30 (n = 290) | ≥ 30 (n = 176) | |
| Mean number of embryo transfer | 3.0 ± 0.9 | 2.8 ± 0.9 | 2.8 ± 1.0 | 2.9 ± 1.1 | 0.75 |
| mean number of embryo (Grade A) | 4.0 ± 2.6 | 3.6 ± 2.3 | 3.6 ± 2.3 | 3.4 ± 2.4 | 0.54 |
| Mean number of embryo (Grade B) | 3.0 ± 2.4 | 1.8 ± 1.2 | 2.2 ± 1.6 | 1.8 ± 1.2 | 0.16 |
| Mean number of cells of embryo transfer | 5.6 ± 4.3 | 4.3 ± 2.9 | 4.6 ± 3.2 | 4.1 ± 2.9 | 0.30 |

Table V : ICSI Outcome According to BMI.

| Variable | Clinical Pregnancy | | | | Total | P. Value |
|---|---|---|---|---|---|---|
| | No. | % | No. | % | | |
| < 18.5 Kg / m2 | 2 | 20.0 | 8 | 80.0 | 10 | |
| 18.5 - < 25 Kg / m2 | 18 | 27.0 | 48 | 73.0 | 66 | |
| 25 - <30 Kg/m2 | 51 | 20.0 | 203 | 80.0 | 254 | |
| ≥ 30 - Kg / m2 | 30 | 20.0 | 119 | 80.0 | 149 | |
| Total | 101 | 21.0 | 378 | 78.9 | 479 | 0.60 |