Obesity in Relation to Ovarian Response in IVF Treatment

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Abstract

Introduction: The effect of Body Mass Index (BMI), which reflects the woman’s obesity, in IVF treatment cycle, remains unclear. In 1997, the World Health Organization (WHO) provided authoritative refinements to the overweight terminology and BMI cutoffs [1]. Objective: To verify the relationship between BMI and ovarian response in IVF treatment cycle. Design: Retrospective study. Materials & Methods: The study includes 2625 IVF treatment cycles performed in our IVF center in the period of 4 years. Patients were divided into five groups using the WHO criteria according to their BMI [2]. Cancellation rate, mean last E2 before hCG administration, mean endometrial thickness, mean duration of stimulation, number of eggs retrieved, fertilization rate, pregnancy and abortion rates were analyzed. The unpaired t-test was used in statistical analysis. Results: There was statistically significant less mean oestradiol level prior to hCG, less endometrial thickness and less number of simulation days as BMI gets higher. In contrast, there was a positive relationship between cancellation rate and higher BMI except with BMI >39 which was not, possibly due to lower number of patients available. But if we look at the cause of cancellation, it was 100% due to insufficient number of follicles obtained for this group (BMI >39). Also, days of stimulation are significantly lower for the same group of patients in comparison with the other groups. Retrieval, fertilization and pregnancy rates were not significant between all groups. Abortion rate gets significantly higher as BMI increased. Conclusion: Overweight affects ovulation, if we consider the cause of cancellation being insufficient number of follicles reflects the poor response. The fertilization and pregnancy rate were not affected once oocytes retrieved. The reduction of weight is an important
part of infertility treatment in obese women with regards to the ovarian response and abortion rate in IVF cycle.

**Keywords**

Body Mass Index, IVF, Pregnancy Rate

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**1. Introduction**

There are numerous studies and publications that demonstrate the sub-optimal reproductive ability of obese women, the consequences of the obesity on *in vitro* fertilization/Intracytoplasmic Sperm Injection (IVF/ICSI) have been in the focus of contemporary infertility research. Overweight and obese women experience a lower probability for pregnancy after IVF [3]. Body Mass Index (BMI) is inversely related to intrafollicular human chorionic gonadotropin (hCG) concentrations, embryo quality and IVF outcome [4]. Despite the increasing prevalence of obesity, obese women make up a lesser proportion of women who obtain fertility-related services and the large majority of infertile women are still in the non-obese BMI range [5] [6] [7]. Against this background, it would be important to evaluate the influence of BMI on IVF outcome among the non-obese women [8] [9] [10].

**2. Method**

We investigated the influence of BMI on outcome of fresh IVF cycles in obese women. This investigation was made in a retrospective observation in the period of 4 years. Medical records in our department were kept in an electronic format.

A standardized infertility evaluation was performed on all study participants. In order to disable the effects of male infertility on IVF outcome, we included only women whose partners had normal semen analysis.

Study participants’ included cycles (2625) were divided into five groups using the WHO criteria according to their BMI: group 1 (BMI < 25), group 2 (BMI 25 - 30), group 3 (BMI 31 - 34), group 4 (BMI 35 - 39) and group 5 (BMI > 39) (*Table 1*). Calculation of BMI was performed from anthropometric measurements of patients obtained in our department. Patients were measured on a digital scale that shows body weight in kilograms by the reliability of ±100 g. Measurement of body height was done in standing position (without shoes) with the shoulders in relaxing position and was measured in centimeters to the nearest 0.5 cm tick marks.

Several characteristics of study participants were analyzed to eliminate possible confounding factors influencing the outcome of IVF such as age, anti-mullerian hormone (AMH), basal serum concentrations of estradiol (E2), follicle-stimulation hormone (FSH), duration of infertility, type of infertility (primary, secondary) and type of stimulating protocol [11] [12] [13] [14] [15].
Table 1. Distribution of patients according to the BMI category.

<table>
<thead>
<tr>
<th>Group</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
</tr>
</thead>
<tbody>
<tr>
<td>No. of Cases</td>
<td>482</td>
<td>1112</td>
<td>639</td>
<td>345</td>
<td>47</td>
</tr>
<tr>
<td>BMI</td>
<td>&lt;25</td>
<td>25 - 30</td>
<td>31 - 34</td>
<td>35 - 39</td>
<td>&gt;39</td>
</tr>
</tbody>
</table>

At the level of stimulation protocol, we evaluated the cancellation rate and the reason of cancellation whether, due to excessive number of follicles or not sufficient number of follicles.

3. Results

The number of cycles evaluated was 2625 IVF/ICSI cycles. Statistical significant difference was found at less mean estradiol level prior to hCG, less endometrial thickness and less number of simulation days as BMI gets higher.

In contrast, there was a positive relationship between cancellation rate and higher BMI except with BMI > 39 which was not, possibly due to lower number of patients available.

But if we look at the cause of cancellation it was 100% due to insufficient number of follicles obtained for this group (BMI > 39). Also, days of stimulation are significantly lower for the same group of patients in comparison with the other groups. Retrieval, fertilization and pregnancy rates were not significant between all groups. Abortion rate gets significantly higher as BMI increased.

4. Discussion

According to the Centers for Disease Control and prevention (CDC), the Body Mass Index (BMI) is a person’s weight in kilograms divided by the square of height in meters. A high BMI can be an indicator of high body fatness. BMI can be used to screen for weight categories that may lead to health problems but it is not diagnostic of the body fatness or health of an individual.

The present study investigated the BMI with relation to the cancellation of the IVF/ICSI cycle, no oocyte donation was included in this group [16] [17] [18]. There was no statistical significant effect found on the fertilization and preg-
nancy rate between five groups [19]-[28]. Studies of IVF published in 2011 by Luke et al. and in 2008 by Sneed ML et al. [29] and [30], evaluated the age-related effect and obesity on IVF. This study analyzed the number of 45,000 embryo transfers and concluded that higher obesity levels (BMI values) resulted in a significant increase in the ability to achieve clinical pregnancy via the use of autologous oocytes but resulted in no differences in the use of donor oocytes. Besides, it reported that the adverse effects of obesity were more evident in the group aged under 35 years old [31] [32] [33] [34] [35]. The present study observed the negative effect of obesity on the ovarian response in IVF/ICSI cycles looking at the rate of cancellation of the cycle due to the insufficient number of follicles available.

In conclusion, the present study evaluated the obesity in relation to the cancellation rate in IVF/ICSI cycles. Overweight affects ovulation [36]-[43], if we consider the cause of cancellation being insufficient number of follicles reflects the poor response [44] [45]. The fertilization and pregnancy rate were not affected once oocytes retrieved [46] [47] [48]. The reduction of weight is an important part of infertility treatment in obese women with regards to the ovarian response and abortion rate.

Conflict of Interest

No conflict of interest was declared by the authors.

Financial Disclosure

The authors declared that this study received no financial support.

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Reproduction, 28, 2425-2431. https://doi.org/10.1093/humrep/det251


