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THE RELATIONSHIP BETWEEN FEMALE BODY MASS INDEX (BMI) AND EMBRYONIC EUPLOIDY AS DETECTED VIA NEXT GENERATION SEQUENCING BUT (NGS): A STUDY OF 5,703 CYCLES

Jenna Friedenthal, MD¹, Dmitry Gounko, MA², Taraneh Gharib Nazem, MD², Joseph A. Lee, BA², Beth McAvey, MD¹ and Alan B Copperman, MD¹

1. Obstetrics, Gynecology and Reproductive Science, Icahn School of Medicine at Mount Sinai, Klingenstein Pavilion 1176 Fifth Avenue 9th Floor New York, New York, United States, 10029.
2. Reproductive Medicine Associates of New York, 635 Madison Ave 10th Floor New York, New York, United States, 10022

OBJECTIVE:

Women with an elevated BMI (≥ 25 kg/m²) have been shown to experience poor reproductive outcomes[1, 2]. Obese patients are at particularly high risk for adverse pregnancy outcomes[3]. Several studies have evaluated the impact of BMI on assisted reproductive technology (ART) outcomes [4, 5]. However, the association between BMI and rate of embryo euploidy as determined by NGS has yet to be fully explored. We sought to assess the impact of BMI on euploid rate (ER) as determined by NGS.

DESIGN:

Retrospective cohort study

MATERIALS AND METHODS:

The study included patients at an academic center who underwent in vitro fertilization with intracytoplasmic sperm injection from 2016 to 2020. BMI (kg/m²) was categorized as follows: underweight (<18.5), normal weight (18.5-24.9), overweight (25-29.9), and obese (≥ 30). A secondary analysis that compared obese patients with all other BMI categories was also performed. Baseline demographics were obtained: age, AMH, cumulative gonadotropin dose (GND), total number of eggs retrieved, and number of metaphase II (MII) oocytes retrieved. Our primary outcome was ER as diagnosed by NGS. Secondary outcomes were maturation rate (MR), fertilization rate (FR), blastulation rate (BR), and biopsied blastocyst rate (BBR). Data were analyzed using ANOVA, Kruskal-Wallis test, chi-square, and logistic multivariate generalized



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estimating equation (GEE) regression models to adjust for confounders, with $P < 0.05$ considered significant.

RESULTS:

4,067 patients underwent 5,703 cycles during the study time period and were included in analysis. Overweight ($n=1,267$ cycles) and obese ($n=660$ cycles) patients were older, had lower average AMH levels, required higher cumulative GND, and had significantly fewer total oocytes and MII oocytes retrieved than patients with a low ($n=210$ cycles) or normal ($n=3,566$ cycles) BMI ($P < 0.05$ for all).

After adjusting for age, AMH, cumulative GND, and number of oocytes retrieved, overweight patients demonstrated a slightly higher BR (OR 1.02, CI 1.01-1.03) compared to patients with normal weight; however, we found no association between BMI and ER, MR, FR, or BBR ($P > 0.05$ for all). Additionally, when comparing obese patients with all other BMI groups, after adjusting for confounders, we found no association between obesity and ER (OR 1.01, CI 0.98-1.04).

There was also no association between obesity and MR (OR 0.99, CI 0.98-1.01), FR (OR 0.99, CI 0.98-1.01), BR (OR 1.01, CI 0.99-1.03), or BBR (OR 1.00, CI 0.98-1.01).

CONCLUSIONS:

In the largest study to date evaluating the association between BMI and rate of embryonic euploidy as diagnosed by NGS, our results demonstrated that BMI is not predictive of euploid rate. In particular, obesity does not appear to result in increased risk of embryonic aneuploidy. Although mouse models have suggested potentially deleterious effects of abnormal metabolites from obesity on oocyte quality, spindle formation, and chromosome alignment, our findings suggest that the detrimental effect of elevated BMI on pregnancy and ART outcomes may be the result of non-genomic, endocrine, uterine, or an unspecified alternative etiology.

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