# Impact of Body Mass Index on Transfer Outcomes

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## BACKGROUND

- Obesity is associated with higher miscarriage rates after natural conception and assisted reproductive technology
- No prior association was noted between increased aneuploidy and elevated body mass index (BMI)
- Mechanisms linking obesity and poorer ART outcomes are unclear

## OBJECTIVE

- To evaluate the effect of BMI on embryo ploidy and pregnancy outcomes after single euploid transfer

## METHODS

- **Study design:** retrospective cohort study
- **Subjects**
  - Inclusion
    - First frozen embryo transfer of one euploid embryo
    - Single academic institution
    - January 2014 to December 2024
  - Exclusion
    - Missing BMI, age at oocyte retrieval
    - Transfer of donor embryos
    - Transfer of mosaic or aneuploid embryos
- **Outcomes**
  - Primary: ongoing pregnancy rate per transfer (≥20 w)
  - Secondary: # oocytes, # MII, # 2PN, %ploidy per cycle, implantation, biochemical, and spontaneous abortion rates
- **Data analysis**
  - Comparisons by BMI group
  - Demographics: Pearson's chi-square or Fisher's exact test for categorical variables, Kruskal-Wallis test for continuous variables
  - Retrieval and ploidy outcomes: negative binomial (#) and linear regression (%), adjusted for age and AMH
  - Pregnancy outcomes: logistic regression, adjusted for age

## RESULTS

### Retrieval and Ploidy Outcomes

| | Body Mass Index (kg/m²) | | | |
|---|---|---|---|---|
| | **<18.5** | **18.5-24.9** | **25.0-29.9** | **≥30.0** |
| **# oocytes retrieved** | | | | |
| Median [IQR] | 14 [9-20] | 13 [9-19] | 13 [9-19] | 13 [8-19] |
| Adjusted IRR | 1.00 (0.96, 1.06) | Ref | 1.02 (0.99, 1.05) | **1.07 (1.03, 1.12)** |
| **# mature oocytes** | | | | |
| Median [IQR] | 11 [7-15] | 9 [6-14] | 9 [6-14] | 9 [6-14] |
| Adjusted IRR | 0.97 (0.92, 1.03) | Ref | 1.03 (0.99, 1.06) | **1.06 (1.02, 1.11)** |
| **# 2PN** | | | | |
| Median [IQR] | 8 [5-12] | 8 [5-12] | 8 [5-12] | 7 [5-12] |
| Adjusted IRR | 0.98 (0.92, 1.04) | Ref | 1.03 (0.99, 1.06) | **1.05 (1.01, 1.10)** |
| **# biopsied blasts** | | | | |
| Median [IQR] | 5 [3-8] | 5 [3-8] | 5 [3-8] | 4 [3-7] |
| Adjusted IRR | 0.96 (0.89, 1.04) | Ref | 1.02 (0.98, 1.07) | 1.03 (0.98, 1.09) |
| **% euploid per cycle** | | | | |
| Mean ± SD | 38.5 ± 29.0 | 35.5 ± 29.3 | 33.1 ± 29.4 | 32.2 ± 29.4 |
| Adjusted β | -1.08 (-4.14, 1.99) | Ref | -0.06 (-1.69, 1.58) | 0.88 (-1.22, 2.98) |
| **% mosaic per cycle** | | | | |
| Mean ± SD | 11.9 ± 19.1 | 10.2 ± 17.9 | 9.6 ± 17.3 | 9.6 ± 17.3 |
| Adjusted β | 0.99 (-1.08, 3.05) | Ref | 0.07 (-1.03, 1.18) | 0.34 (-1.08, 1.76) |
| **% aneuploid per cycle** | | | | |
| Mean ± SD | 49.2 ± 32.2 | 53.8 ± 32.1 | 56.7 ± 32.3 | 57.6 ± 32.9 |
| Adjusted β | 0.96 (0.87, 1.05) | Ref | -0.11 (-1.85, 1.62) | -1.36 (-3.59, 0.88) |

- Adjusted for age and AMH
- Similar proportions of euploid and aneuploid embryos across BMI groups

### Transfer Outcomes

| | Body Mass Index (kg/m²) | | | |
|---|---|---|---|---|
| | **<18.5** | **18.5-24.9** | **25.0-29.9** | **≥30.0** |
| **Implantation rate** | | | | |
| n/N (%) | 124/211 (58.8) | 1949/3079 (63.3) | 557/902 (61.8) | 260 (442 (58.8) |
| Adjusted OR | 0.8 (0.6, 1.1) | Ref | 0.9 (0.8, 1.1) | 0.8 (0.7, 1.0) |
| **Biochemical rate** | | | | |
| n/N (%) | 14/140 (10.0) | 240/2202 (10.9) | 83/645 (12.9) | 30/291 (10.3) |
| Adjusted OR | 0.9 (0.5, 1.6) | Ref | 1.2 (0.9, 1.6) | 0.9 (0.6, 1.4) |
| **Spontaneous abortion rate** | | | | |
| n/N (%) | 16/124 (12.9) | 173/1944 (8.9) | 58/556 (10.4) | 34/259 (13.1) |
| Adjusted OR | 1.5 (0.9, 2.7) | Ref | 1.2 (0.9, 1.6) | 1.5 (1.0, 2.2) |
| **Ongoing pregnancy rate** | | | | |
| n/N (%) | 107/211 (50.7) | 1733/3079 (56.3) | 489/902 (54.2) | 219/442 (49.6) |
| Adjusted OR | 0.8 (0.6, 1.4) | Ref | 0.9 (0.8, 1.1) | **0.8 (0.6, 0.95)** |

- Adjusted for age
- Obese women had lower ongoing pregnancy rate compared to normal weight women

***Lower ongoing pregnancy rates occurred in obese women despite transfer of a euploid embryo***

### Sample Characteristics

- 7186 retrieval cycles
- 4634 transfer cycles of single euploid embryo

| | Body Mass Index (kg/m²), n (col %) | | | | |
|---|---|---|---|---|---|
| | **<18.5** (n = 323) | **18.5-24.9** (n = 4755) | **25.0-29.9** (n = 1367) | **≥30.0** (n = 742) | ***P*** |
| **Age** | | | | | **<0.001** |
| <35 | 122 (37.8) | 1347 (28.3) | 303 (22.2) | 144 (19.4) | |
| 35-36.9 | 63 (19.5) | 838 (17.6) | 213 (15.6) | 101 (13.6) | |
| 37-39.9 | 86 (26.6) | 1294 (27.2) | 380 (27.8) | 199 (26.8) | |
| ≥40 | 52 (16.1) | 1276 (26.8) | 471 (34.5) | 298 (40.2) | |
| **Race** | | | | | **<0.001** |
| Asian | 92 (28.7) | 1069 (22.8) | 214 (15.9) | 88 (12.0) | |
| Black | 2 (0.6) | 76 (1.6) | 50 (3.7) | 87 (11.9) | |
| White | 170 (53.0) | 2575 (54.9) | 786 (58.3) | 370 (50.6) | |
| Other | 57 (17.8) | 971 (20.7) | 298 (22.1) | 186 (25.4) | |
| **Diagnosis** | | | | | |
| DOR | 147 (45.5) | 2536 (53.3) | 790 (57.8) | 742 (58.3) | **0.001** |
| Endo | 17 (5.3) | 223 (4.7) | 64 (4.7) | 25 (3.4) | 0.4 |
| Idiopathic | 21 (6.5) | 235 (4.9) | 44 (3.2) | 15 (2.0) | **<0.001** |
| Male | 51 (15.8) | 838 (17.6) | 211 (15.4) | 102 (13.8) | **0.03** |
| PCOS | 26 (8.1) | 291 (6.1) | 84 (6.1) | 94 (12.7) | **<0.001** |
| Tubal | 25 (7.7) | 356 (7.5) | 103 (7.5) | 95 (12.8) | **<0.001** |
| Uterine | 16 (5.0) | 271 (5.7) | 74 (5.4) | 57 (7.7) | 0.1 |

*of retrieval cycles*

## STRENGTHS

- Large sample size
- Majority of PGT-A results from a single lab (unless concurrent PGT-M)

## LIMITATIONS

- Retrospective study
- PGT switch from aCGH to NGS (2016-2017)

## CONCLUSION

- Obesity did not affect embryo euploidy rates
- Lower ongoing pregnancy rates were observed in obese women
- Future studies may help elucidate the negative impact of obesity on reproductive outcomes driven by factors other than embryo ploidy