BODY MASS INDEX (BMI) AND TWINNING, OREGON, 2000

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Background
Methods
Results
Discussion
Background:

- Rate of twinning has been increasing since the 1980s
- Dizygotic twinning has been attributed to maternal age, race and family history
- A recent study\(^1\) found that, compared with normal-weight women, obese women are more likely to give birth to twins
  - Denmark National Birth Cohort 1998-2001 (60% participation)
  - 3816 women who reported fertility treatment were excluded from analysis
  - \(n = 55435\) births
  - Twinning: 1.3% no infertility treatment (2.2% overall)
  - Referent: women with BMI 20-24.9
  - OR 0.71 (95% CI 0.57 – 0.90) for underweight women (BMI < 20)
  - OR 1.44 (95% CI 1.13 – 1.83) for obese women (BMI \(\geq\) 30)

\(^1\) Basso O, Nohr EA, Christensen K, Olsen J. Risk of twinning as a function of maternal height and body mass index. *JAMA*. 2004;291:1564-1566
Study Question:

To determine the association between body mass index (BMI) and twinning among Oregon women.
Background

Methods

Results

Discussion
Methods: PRAMS

Oregon Pregnancy Risk Assessment Monitoring System (PRAMS)

- Surveyed a stratified random sample of postpartum women
- Women who delivered January – December 2000
- Strata based on race/ethnicity and low vs. normal birthweight among non-Hispanic white women
- Respondents were weighted for oversampling, nonresponse and noncoverage
- 2950 women were sampled
- 2100 responded (71.0%) – of these, there were 77 twin births
- 1817 respondents remained, after excluding women who bore triplets or whose height or weight were missing
- Unable to exclude women who had received fertility treatment
Methods: Variables

- Respondents were asked their prepregnancy height and weight.
- Information on multiple births was obtained from the birth certificate.
- BMI categories were:
  - obese (BMI ≥ 30.0)
  - overweight (BMI 25.0-29.9)
  - normal weight (BMI 20.0-24.9) - referent
  - underweight (BMI < 20.0).
- The underweight category was expanded from CDC’s standard definition (<18.5), in order to allow a sufficient sample size in the underweight category and to allow comparison with the previous report.
Methods: Statistical Analysis

- Logistic Regression using SUDAAN 8.0.2
- Maternal age, maternal height and parity – as categorical variables – were used in the final adjusted model
- Power calculations
  - DEFF calculations using SUDAAN 8.0.2
  - Power calculations using EpiInfo 3.2.2
  - Used unweighted subsample sizes adjusted for design effect \(^2,^3\)

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Results: Distribution of BMI among Respondents

- Underweight: 13.3%
- Normal: 48.1%
- Overweight: 20.5%
- Obese: 18.1%
Results: Weighted Proportion of Twinning by BMI

<table>
<thead>
<tr>
<th>BMI</th>
<th>Weighted Proportion</th>
</tr>
</thead>
<tbody>
<tr>
<td>&lt; 20</td>
<td>1.0%</td>
</tr>
<tr>
<td>20-24.9</td>
<td>2.1%</td>
</tr>
<tr>
<td>25-29.9</td>
<td>2.1%</td>
</tr>
<tr>
<td>30+</td>
<td>3.7%</td>
</tr>
</tbody>
</table>
Results: BMI and twinning, crude odds ratio

<table>
<thead>
<tr>
<th>Characteristic</th>
<th>n*</th>
<th>Twinning†</th>
<th>Univariable OR (95% CI)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total</td>
<td>2099</td>
<td>2.3%</td>
<td>---</td>
</tr>
<tr>
<td>BMI &lt; 20</td>
<td>296</td>
<td>1.0%</td>
<td>0.47 (0.18–1.28)</td>
</tr>
<tr>
<td>BMI 20-24.9</td>
<td>828</td>
<td>2.1%</td>
<td>Referent</td>
</tr>
<tr>
<td>BMI 25-29.9</td>
<td>398</td>
<td>2.1%</td>
<td>0.99 (0.31 –3.11)</td>
</tr>
<tr>
<td>BMI ≥ 30</td>
<td>297</td>
<td>3.7%</td>
<td>1.80 (0.54 – 5.96)</td>
</tr>
</tbody>
</table>

* unweighted n       † weighted proportion
Results: BMI and twinning, adjusted odds ratio

<table>
<thead>
<tr>
<th>Characteristic</th>
<th>Multivariable OR (95% CI)</th>
</tr>
</thead>
<tbody>
<tr>
<td>BMI &lt; 20 (underweight)</td>
<td>0.51 (0.18 – 1.44)</td>
</tr>
<tr>
<td>BMI 20-24.9 (normal)</td>
<td>Referent</td>
</tr>
<tr>
<td>BMI 25-29.9 (overweight)</td>
<td>0.97 (0.31 – 3.08)</td>
</tr>
<tr>
<td>BMI ≥ 30 (obese)</td>
<td>1.76 (0.55 – 5.56)</td>
</tr>
</tbody>
</table>

Adjusted for: mother’s age, mother’s height and parity.
### Results: BMI and twinning, adjusted odds ratio

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<th>Characteristic</th>
<th>Multivariable OR (95% CI)</th>
</tr>
</thead>
<tbody>
<tr>
<td>BMI &lt; 20 (underweight)</td>
<td>0.49 (0.18 – 1.34)</td>
</tr>
<tr>
<td>BMI 20-24.9 (normal)</td>
<td>Referent</td>
</tr>
<tr>
<td>BMI 25-29.9 (overweight)</td>
<td>0.98 (0.31 – 3.09)</td>
</tr>
<tr>
<td>BMI ≥ 30 (obese)</td>
<td>1.78 (0.55 – 5.73)</td>
</tr>
</tbody>
</table>

Adjusted for: mother’s age, mother’s height and parity, plus race/ethnicity.
Results: Power Calculations

- This study had a power of:
  - 0.24 to detect an OR of 1.76 for obese mothers (0.42 without the design effect)
  - 0.42 to detect an OR of 0.51 for underweight mothers (0.22 without the design effect)

- To achieve a power of 0.80, taking into account the design effect, the sample size would need to be:
  - 537 obese and 3935 normal weight mothers
  - 796 underweight and 1359 normal weight mothers
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Conclusions:

- We found that, compared to normal weight women, obese women were more likely to have twins and underweight women were less likely to have twins.
- In this small sample, neither finding was statistically significant, but are comparable to the earlier report in JAMA.
- Larger studies, including perhaps multi-state, multi-year PRAMS studies, are needed to explore these issues.
Public Health Implications:

- Twins are at higher risk for low birth weight and other morbidity than singletons.
- Previous work has also found that obese women are at increased risk for babies with birth defects.
- Obese women should be encouraged to lose weight before becoming pregnant.