BMI, Gestational Weight Gain and Angiogenic Biomarker Profiles for Preeclampsia Risk

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**Background**

- In May 2009, after considering short and long-term maternal/child outcomes, the Institute of Medicine (IOM) revised recommendations for gestational weight gain (GWG); however, preeclampsia was dismissed due to insufficient evidence.

- Since change in recommendations, epidemiologic studies have published that support an association between GWG adherence and hypertensive disease of pregnancy.

- Numerous studies have revealed adipose tissue’s ability to stimulate angiogenesis.

**Objective**

To evaluate preeclampsia risk by angiogenic-biomarker profile by both BMI and GWG-adherence.

**Hypothesis**

We hypothesized that overweight/obese (OW-OB) women and over-gainers (OG) would have altered angiogenic profiles as compared to underweight-normal (U-N) women and under-/appropriate-gainers (U-AG), respectively.

**Materials & Methods**

- Pregnant subjects <24 weeks gestation enrolled from outpatient prenatal clinics at UMass Memorial Health Care between May 2004 and January 2006.

- Each subject had ≥1 of the following risk factors for preeclampsia:
  
  **Inclusion Criteria**
  - Chronic HTN
  - Renal Disease/CKD
  - Pregestational DM
  - History of Preeclampsia
  - Teen Pregnancy
  - Multiple gestations
  - Preeclampsia diagnosis

- Subjects recruited: 127

- Exclusions: missing outcomes, gestational HTN, multiple gestations, preeclampsia diagnosis

- Subjects included in analyses: 82 (342 samples)

- BMI & GWG adherence categories by 1990 IOM recommendations

- Pre-pregnancy BMI* Total GWG at 40 weeks
  
  **Pre-pregnancy BMI** | **Total GWG at 40 weeks** |
  - | **(kg/m²)** | **(lb)** |
  Underweight (U) | <19.8 | 28-40 lbs |
  Normal weight (N) | 19.8-26.0 | 25-35 lbs |
  Overweight (OW) | 26.1-29.0 | 25-35 lbs |
  Obese (OB) | >29.0 | At least 15 lbs |

- Adherence defined by GWG and GA @ last prenatal visit subtracted from pre-pregnancy weight; thus preterm and term deliveries included

- Statistical Analysis

  - Demographic comparisons utilized Fisher exact test for categorical variables and Wilcoxon rank sum test for continuous variables (see Table 1).

  - Within-women correlation and right-skewness handled by estimating linear mixed models for ln-transformed biomarkers and then exponentiating on ln scale (i.e., geometric means).

  - Geometric mean and 95% confidence intervals displayed for sFlt1, PlGF and (sFlt1+sEng)/PlGF in each of 3 gestational-age windows for UW-N vs. OW-OB BMI and Under/Appropriate vs. Over-gainers (see figures 1-6).

  - T-test compared means in 3 windows.

- Analytic sample included 82 subjects (342 specimens). See Table 1 for Demographic Comparisons.

- **BMI Comparisons** [see Figures 1-3]

  - Mean sFlt1 lower in all windows in OW-OB compared to U-N (Figure 1)

  - Mean PlGF lower in all windows in OW-OB compared to U-N (Figure 2)

  - Mean ratio ([sFlt1+sEng]/PlGF) trended higher in OW-OB compared to U-N women at 27-30 and 31-36wks (Figure 3)

- **GWG Adherence Comparisons** [see Figures 4-6]

  - Mean sFlt1 lower in all windows in OG compared to U-AG (Figure 4)

  - Mean PlGF lower in all windows in OG compared to U-AG (Figure 5)

  - Mean ratio ([sFlt1+sEng]/PlGF) trended higher in OG compared to U-AG at 31-36wks (Figure 6)

**Results**

- Analytic sample included 82 subjects (342 specimens). See Table 1 for Demographic Comparisons.

- **BMI Comparisons** [see Figures 1-3]

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**Limitations**

- Small sample size required collapsing of BMI and GWG-adherence categories; thus unable to look at adherence within each BMI category

- Secondary analysis not powered for this exploratory analysis

- Only had total GWG at end of pregnancy