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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.  
  
  IOM 2009

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

  AJOG 2009;200(2):167.e1-7

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

  Cardiovascular Res 2008;78(2):386-93

**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-weight (U-N) women and under-/appropriate-gainers (U-AG), respectively.

**Materials & Methods**

- Inclusion Criteria
  - Chronic HTN
  - Renal Disease/C KD
  - Prematurity greater than 22 weeks
  - History of Preeclampsia
  - Teen Pregnancy
  - Obesity (BMI > 29.0)
  - Multiple gestations
  - Preeclampsia diagnosis

  RR
  - Chronic HTN: 2.37
  - Renal Disease/C KD: ----- 
  - Prematurity greater than 22 weeks: 7.19
  - History of Preeclampsia: 2.98
  - Teen Pregnancy: 2.93 (twins)
  - Multifetal gestation: 2.83 (triplets)
  - Obesity (BMI > 30): 2.47
  - APL Ab Syndrome: 0.72
  - SLE: ------ 

- Subjects recruited: 127
- Exclusions: 10
- Pregnancy outcomes: 3
- Gestational HTN: 5
- Chronic HTN: 15
- Multiple gestations: 25
- Preeclampsia diagnosis: 12

Subjects included in analyses: 82 (342 samples)

- sFlt1, PlGF, and sEng levels were measured by ELISA

BMI & GWG adherence categories by 1990 IOM recommendations

- Pre-pregnancy BMI* (kg/m²) 
  - Underweight (<19.8)
  - Normal weight (19.8-26.0)
  - Overweight (26.1-29.0)
  - Obese (OB) (>29.0)

- Total GWG at 40 weeks
  - 20-40 lbs
  - 25-35 lbs
  - 15-25 lbs
  - At least 15 lbs

Adherence defined by BMI and GA at 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 U-W-N vs. OW-OB BMI and Under-Appropriate vs. Over-gainers (see figures 1-6)

- T-test compared means in 3 windows

**Results**

- 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 31-36 weeks (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 31-36 weeks (Figure 6)

**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