Maternal Influences on Placental Angiogenesis in a Clinical Population

Lily Woods, MA, LAC[1,2], Erin George, PhD, CNM[1,2], Elise Erickson, PhD, CNM[1], Julienne Rutherford, PhD[2]

[1] University of Arizona College of Medicine, [2] University of Arizona College of Nursing

The University of Arizona Health Sciences

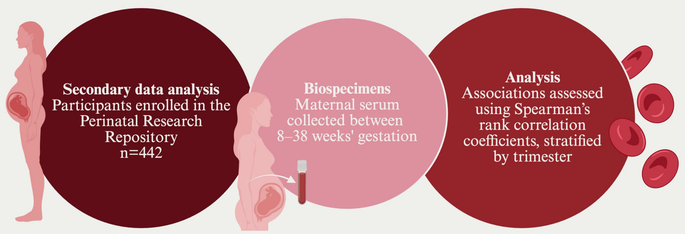
Background

- Angiogenesis supports development of uteroplacental vascular networks during pregnancy
- Imbalances between pro-angiogenic (Placental Growth Factor, PlGF) and anti-angiogenic (soluble fms-like tyrosine kinase-1, sFlt-1) factors have been linked to maladaptive placentation
- Maternal characteristics such as age, body mass index, and cigarette use are associated with adverse pregnancy outcomes, but their relationships to angiogenic signaling are less understood

Research Question

- We examined whether maternal characteristics and behavioral exposures are associated with angiogenic biomarkers across gestation, hypothesizing trimester-specific associations with stronger and more anti-angiogenic patterns in later pregnancy

Methods



- Biomarker concentrations quantified using ELISA and log-transformed to address skewness
- Exclusions for analysis: multifetal gestation, IVF, fetal anomaly, placenta previa/abruption, < 24 weeks
- Predictors: Maternal age, pre-pregnancy BMI, parity, composite measure of substance use (any drugs or alcohol), tobacco use (cigarettes per day)

Results

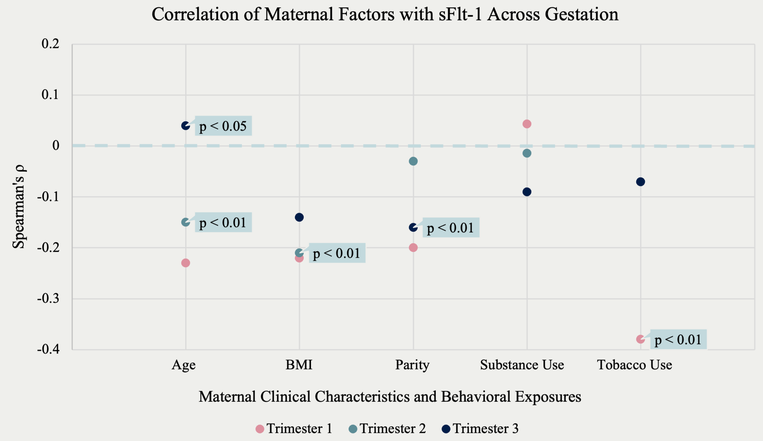


Figure 1. Spearman correlation coefficients (ρ) between maternal clinical characteristics/behavioral exposures and log-transformed sFlt-1 concentrations, stratified by trimester. Correlations were generally weak. In the first trimester, tobacco use was significantly inversely associated with sFlt-1 (p = 0.0098). In the second trimester, maternal age (p = 0.0030) and pre-pregnancy BMI (p = 0.0035) were significantly associated with sFlt-1. In the third trimester, maternal age (p = 0.04) and parity (p = 0.0125) were significantly associated with sFlt-1. Other associations were not statistically significant.

Correlations between maternal factors and biomarkers were modest, with the greatest associations observed in earlier gestation. Later trimesters showed weaker associations, suggesting minimal changes in angiogenic signaling related to these maternal characteristics across gestation

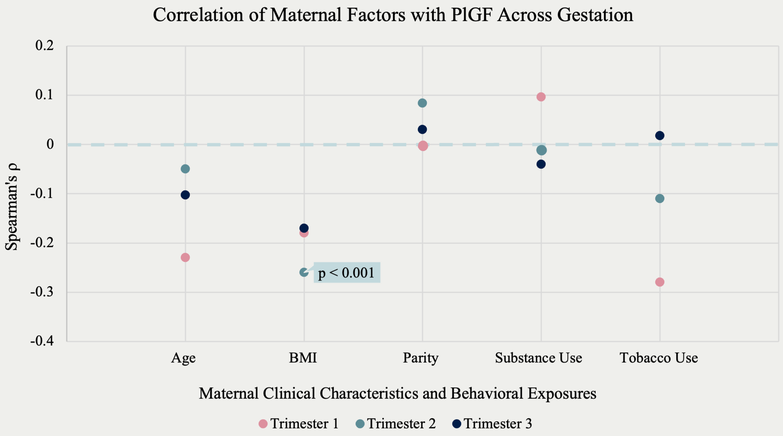


Figure 2. Spearman correlation coefficients (ρ) between maternal clinical characteristics/behavioral exposures and log-transformed PlGF concentrations, stratified by trimester. Correlations were generally weak across all trimesters. A statistically significant association was observed only in the second trimester for pre-pregnancy BMI (p = 0.0002). No other maternal characteristics were significantly associated with PlGF (p > 0.05).

Table 1. Sample characteristics.

Variable	*n*
Maternal Age, mean (SD)	26.4 (5.4)
Gravida, mean (SD)	3.4 (2.5)
Parity, mean (SD)	2.2 (1.7)
Gestational Age at Delivery, mean (SD)	37.0 (3.5)
Cesarean Birth	137 (31%)
Race	
Black or African American	242 (61%)
White	132 (33%)
Other	23 (6%)
Non-Hispanic	303 (94%)
Government-Assisted Insurance	380 (90%)
Biosamples	
1st Trimester Sample Count	106 (24%)
2nd Trimester Sample Count	376 (85%)
3rd Trimester Sample Count	226 (51%)
> 1 Measure	198 (45%)

Discussion

- Limitations: Retrospective design, sample size/low prevalence of some exposures, unadjusted analyses
- We found significant though modest correlations between several maternal factors and angiogenic biomarkers

	Age		BMI		Parity		Substance Use		Tobacco Use	
	sFlt-1	PlGF	sFlt-1	PlGF	sFlt-1	PlGF	sFlt-1	PlGF	sFlt-1	PlGF
1st trimester									-	
2nd trimester	-		-	-						
3rd trimester	+				-					

- Considering maternal context and gestational timing may improve interpretation of angiogenic biomarkers and risk stratification

References and Contact