Adverse Social Determinants of Health: Association with Adipokine Levels During Pregnancy

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Background

- Social determinants of health (SDH) impact health quality and care.
- Pregnant people of color are at increased risk of being exposed to psychosocial adversity and of pregnancy complications that lead to increased risk of maternal and neonatal morbidity and mortality.
- Adversity directly alters the hypothalamic-pituitary-adrenal axis.
  - Elevated levels of leptin, an adipokine, are associated with increased insulin resistance.
  - Altered leptin levels have also been observed with psychological stress and mood disorders/depression.
- The effects of adverse social determinants of health on adipokine levels during pregnancy is unclear.

Objective

- To determine the association between adverse SDH and perinatal outcomes in a racially and ethnically diverse cohort of pregnant people.
- To determine associations between adverse SDH, maternal metabolic hormones (leptin) and perinatal outcomes in this high-risk population.

Methods

PARTICIPANTS/SETTING:

- Pregnant people who were followed at Montefiore Medical Center and delivered at Jack D. Weiler Hospital, Bronx, NY from 5/11/22 to 1/26/23.

DESIGN:

- Cross-sectional cohort study.
- *Questionnaire data*:
  - Participants completed online surveys related to food, housing and financial insecurity, discrimination, and perception of disparate health care.
  - Measures of psychosocial adversity were collected using the PhenX toolkit.
- *Medical record data:*
  - Baseline maternal and neonatal characteristics.
  - Obstetric and neonatal outcomes.
- *Molecular studies:*
  - Maternal blood samples were analyzed for plasma leptin levels using ELISA.

ANALYSES:

- Fisher's exact test were used to assess associations between categorical variables.
- T-tests, ANOVA or Pearson's correlations were used to assess associations between categorical and continuous variables, as appropriate.

Results

Table 1. Maternal Characteristics (N=100)

Maternal age (yrs, mean ± SD)	30.2 ± 5.9
Race (N, %)	
White	13 (3)
Black	36 (36)
Other (more than 1 race)	10 (10)
Did not report	41 (41)
Ethnicity (N, %)	
Hispanic	58 (58)
Non-Hispanic	30 (30)
Did not report	12 (12)
Mode of Delivery (N, %)	
Vaginal delivery	44 (47.3)
C-section	44 (47.3)
Not yet delivered	12 (12)
Education (N, %)	
<High school	13 (13)
High school/GED	21 (21)
>High school	54 (54)
Did not report	12 (12)
Pre-pregnancy BMI (mean±SD)	31.4 ± 9.2
BMI at delivery (mean±SD)	34.9 ± 8.5
Weight gain during pregnancy (mean±SD)	21.7 ± 16.9
Gestational diabetes (N, %)	14 (14)
Hyperglycemic disorders in pregnancy (N, %)	17 (17)
Preeclampsia (N, %)	22 (22)
Hypertensive disorders in pregnancy (N, %)	38 (38)

Table 2. Neonatal Characteristics (N=87)

Gestational age (wks; mean±SD)	36.9 ± 3.8
Preterm birth (N; %)	26 (29.8)
Birthweight (Kg; mean ± SD)	2.9 ± 0.9
AGA vs. IUGR vs. LGA	
AGA (N; %)	72 (82.8)
IUGR (N; %)	11 (12.6)
LGA (N; %)	4 (4.6)
Male sex (N; %)	48 (55.1)
NICU vs. NBN admission	
NICU admission	18 (20.7)
NBN admission	69 (79.3)
Adverse pregnancy outcome (fetal/neonatal demise) (N, %)	2 (2.3)

Table 3. Exposure to Psychosocial Stressors

	N=86 (%)
Any Discrimination	44 (51.2)
Food Insecurity	49 (57)
Financial Insecurity	59 (68.6)
Housing Insecurity	12 (14)
Public Health Insurance	44 (51.2)
No psychosocial adversity	11 (12.8)
At least 1 psychosocial adversity	75 (87.2)
Any 2 psychosocial adversities	63 (73.2)
Any 3 psychosocial adversities	24 (27.9)
Any 4 psychosocial adversities	18 (20.9)
All 5 psychosocial adversities	4 (4.7)
Perception of Disparate health care	15 (17.4)

Table 4. Degree of Exposure to Psychosocial Stressors

	N = 86 (%)
Low stress (0-2 stressors)	62 (72.1)
High stress (3-5 stressors)	24 (27.9)

Figure 1. Association of Psychosocial Stressors with Hyperglycemic Disorders

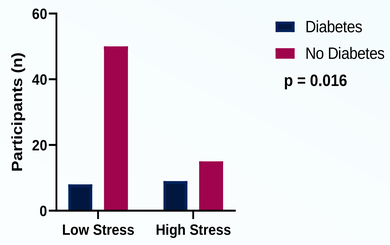
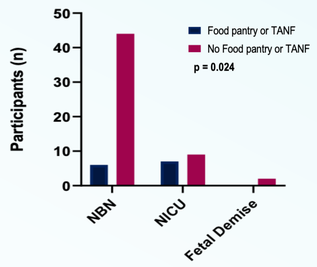


Figure 2. Use of Food Pantry/Temporary Government Assistance and NICU Admission



Results

Figure 3. Leptin Levels by Psychosocial Adversity

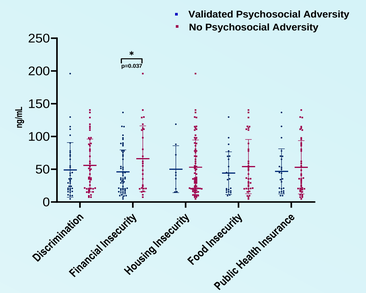


Figure 4. Leptin Levels by Pre-Pregnancy Weight Classification

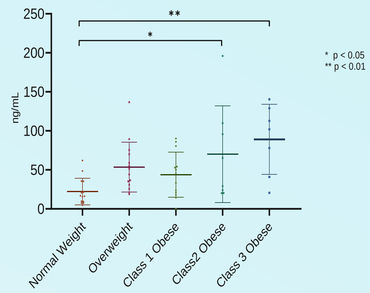


Table 5. Association of Leptin Levels with Maternal Factors and Perinatal Outcomes

	Leptin Levels		
Variable	Mean	SD	P value
Ethnicity			0.138
Hispanic/Latina	56.4	41.8	
Non-Hispanic/Non-Latina	41.9	36.1	
Adverse SDH			0.136
No-low	55.3	43.9	
Mid-high	40.1	26.6	
Disorders of glucose metabolism during pregnancy			0.256
No	53.7	40.9	
Yes	47.8	41.2	
Hypertensive disorders of pregnancy			0.090
No	45.9	33.8	
Yes	61.5	47.4	
Pregnancy outcome			0.012
NICU admission/fetal demise	71.6	41.4	
NBN admission	45.0	38.4	

Table 6. Association of Leptin Levels with Maternal Factors and Perinatal Outcomes

Variable	Pearson Correlation	P value
Pre-pregnancy BMI	0.573	<0.001
BMI at delivery	0.559	<0.001
Weight gain	-0.102	0.448
Birthweight	-0.209	0.070
Gestational age	-0.267	0.019

Mean leptin levels: 52.8±40.0 ng/mL.
Range: 4.72 – 195.98 ng/mL

Conclusions and Speculations

- Increased circulating leptin levels are associated with adverse perinatal outcomes.
  - Socioeconomic and psychosocial factors may affect adipokine levels and birth outcomes.
- Adverse SDH negatively impact maternal and neonatal clinical outcomes.
- Serial measurement of serum adipokines may offer insights into the development of biomarkers that may help identify pregnancies at increased risk for adverse outcomes.

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