The Impact of Anemia on Fetal Growth Trajectory in Patients with Inflammatory Bowel Disease

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Background

- Inflammatory bowel disease (IBD), which includes Crohn's disease (CD) and ulcerative colitis (UC), affected about 6.8 million people around the world in 2017[1] with prevalence continuing to rise worldwide[2].
- Patients with IBD are at higher risk for anemia, malnutrition, and fistulas[3,4].
- These concerns are augmented in pregnancy. Global prevalence of anemia in pregnant patients is almost 40%[6].
- Anemia in pregnancy is associated with increased rates of postpartum hemorrhage, maternal morbidity, and fetal growth restriction[7].

Objective: This study aims to investigate the effect of anemia on longitudinal fetal growth in patients with IBD.

Hypothesis:

- Patients with IBD flares leading up to or during pregnancy are at higher risk of anemia and downstream consequences such as fetal growth restriction (FGR).

Methods

- **Study design:** Retrospective cohort study at a single academic center from 1/1/2019 to 12/31/2023 consisting of100 singleton deliveries among patients with IBD
- **Primary outcome:** rate of FGR compared between patients with anemia and those without anemia.
  - **Statistical analysis:** Fetal growth trajectories [estimated fetal weights (EFWs) by Hadlock criteria from all maternal-fetal medicine (MFM) ultrasounds and plotting the EFWs against gestational age in days] were modeled using a fourth root transformation and compared using mixed effects models.
- **Secondary outcomes:** hypertensive disorders of pregnancy (HDP), gestational diabetes (GDM), preterm labor, prelabor rupture of membranes (PROM), thrombocytopenia, delivery method, postpartum hemorrhage, chorioamnionitis, and NICU admission
  - **Statistical analysis:** Kruskal-Wallis test or the Chi-squared test.

Maternal anemia was not associated with altered fetal growth trajectory in pregnancies complicated by IBD. 1 in 4 patients in our cohort had anemia at the time of delivery but this was not found to have a significant impact on fetal growth trajectory

Table 1 Demographics and IBD disease status by anemia status (N=100)

	Anemia (hgb < 11 on admission) No (N=74)	Yes (N=26)	P-value
Age (years) at delivery, Mean (SD)	34.6 (4.4)	34.2 (4.8)	0.85[1]
Multiparity, n (%)	29 (39.2%)	13 (50.0%)	0.34[2]
Race, n (%)			0.52[2]
White	44 (59.5%)	11 (42.3%)	
Latinx	12 (16.2%)	4 (15.4%)	
Asian	5 (6.8%)	3 (11.5%)	
Black	2 (2.7%)	1 (3.8%)	
Other	11 (14.9%)	7 (26.9%)	
Insurance / Primary Payor, n (%)			0.82[2]
Commercial (HMO/PPO/Blue Shield/Health Net)	59 (80.8%)	21 (80.8%)	
Other	14 (19.2%)	5 (19.2%)	
Pre-Pregnancy Obesity, n (%)	14 (18.9%)	10 (38.5%)	0.04[2]
BMI Pre-Pregnancy, Mean (SD)	23.4 (4.4)	24.7 (4.4)	0.12[1]
BMI at delivery, Mean (SD)	28.1 (4.1)	29.5 (5.0)	0.12[1]
History of chronic HTN, n (%)	2 (2.7%)	1 (3.8%)	0.77[2]
History of HDP, n (%)	3 (4.1%)	4 (15.4%)	0.05[2]
In vitro fertilization, n (%)	8 (11.0%)	4 (15.4%)	0.55[2]
Diagnosis, n (%)			0.24[2]
Crohn's disease	22 (29.7%)	11 (42.3%)	
UC	52 (70.3%)	15 (57.7%)	
Clinical Remission at conception, n (%)	63 (85.1%)	23 (88.5%)	0.80[2]

[1]Kruskal-Wallis p-value; [2]Chi-Square p-value

Table 2 Fetal growth and outcomes by anemia status (N=100)

	Anemia (hgb < 11 on admission) No (N=74)	Yes (N=26)	P-value
Fetal growth restriction, n (%)	6 (8.3%)	0 (0.0%)	0.13[2]
Birthweight (grams), Mean (SD)	3290.5 (570.6)	3436.1 (371.3)	0.21[1]
Birthweight < 10th percentile, n (%)	7 (9.5%)	1 (3.8%)	0.36[2]
NICU Admission, n (%)	5 (6.8%)	2 (7.7%)	0.89[2]
Fetal weight gain g/day, Mean (SD)	21.2 (5.0)	22.5 (3.8)	0.15[1]

[1]Kruskal-Wallis p-value; [2]Chi-Square p-value

Table 3 Pregnancy complications and outcomes by anemia status (N=100)

	Anemia (hgb < 11 on admission) No (N=74)	Yes (N=26)	P-value
HDP, n (%)	14 (18.9%)	8 (30.8%)	0.21[2]
Gestational Diabetes, n (%)	4 (5.4%)	3 (11.5%)	0.29[2]
Preterm labor or PROM, n (%)	4 (5.4%)	1 (3.8%)	0.75[2]
Thrombocytopenia, n (%)	10 (13.5%)	0 (0.0%)	0.05[2]
Maternal Length of Stay, Mean (SD)	2.76 (1.40)	2.92 (1.29)	0.51[1]
Induction, n (%)	33 (47.1%)	12 (46.2%)	0.93[2]
Delivery Method, n (%)			0.79[2]
Vaginal	52 (70.3%)	19 (73.1%)	
Cesarean	22 (29.7%)	7 (26.9%)	
Recommended Cesarean due to IBD-related reason, n (%)	3 (4.1%)	2 (7.7%)	0.46[2]
Postpartum hemorrhage, n (%)	9 (12.2%)	2 (7.7%)	0.53[2]
Chorioamnionitis or endometritis, n (%)	9 (12.2%)	0 (0.0%)	0.06[2]

[1]Kruskal-Wallis p-value; [2]Chi-Square p-value

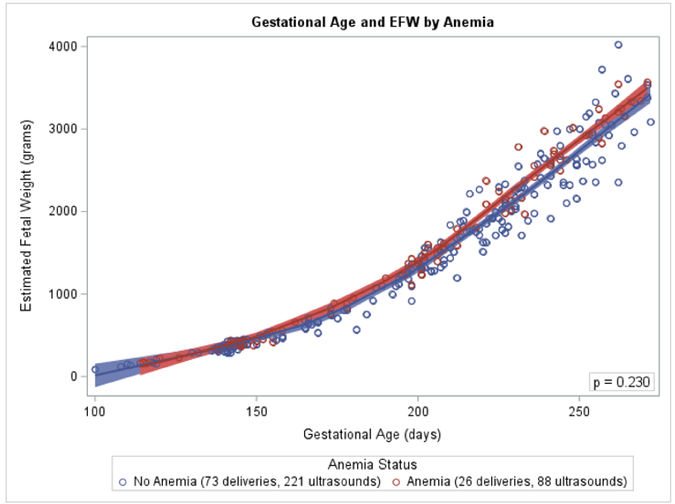

Figure 1. Fetal growth trajectory modeled by anemia status showed no significant difference between the groups (interaction p = 0.230; N=100).

- **Limitations:**
  - Small sample
  - High resource study population with commercial insurance
- **Next steps:**
  - Repeating the study with a larger, more diverse sample population.

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