**Introduction**

- Iron deficiency anemia in pregnancy is associated with poor obstetric outcomes.1-4
  - Low birth weight
  - Preterm delivery
  - Perinatal mortality
  - Postpartum depression

- Non-anemic iron deficiency (NAID), defined by low serum ferritin with a normal serum hemoglobin, has been recently recognized as a precursor to iron deficiency anemia.2

- Threshold values for low ferritin or iron stores are poorly studied in pregnancy.4

**Objectives**

Determine the association between an early pregnancy ferritin level in the non-anemic patient and its prediction of anemia at delivery.

**Study Design**

- Prospective observational pilot study October 2020 – June 2021
- Inclusion criteria:
  - Non-anemic (Hgb ≥ 11 g/dL), singleton pregnancies up to 23 weeks GA
- Exclusion criteria:
  - Multifetal gestation, iron supplementation outside of pregnancy, prior bariatric surgery, chronic illness, infection within 3 months

- Iron studies (ferritin, transferrin, Fe, TIBC) collected on all identified specimens, results blinded to providers & not available in medical record
- Primary outcome:
  - Anemia (Hgb < 11) at admission for delivery

- Statistical analysis: Student’s t-test or Wilcoxon rank test, Chi square, Receiver Operator Characteristic (ROC) curve, logistic regression model, p ≤ 0.05 significant

**Results**

- 105 women were enrolled and 98 delivered at our institution with 22 (22%) developing anemia at admission for delivery
- An ROC curve identified an early ferritin value ≤ 26.4 micrograms/L in prediction of anemia (AUC=0.74; p=0.001)
- Patients were divided into low ferritin (n=37) and normal ferritin (n=68) groups within the identified cutoff.
- Groups were similar in age, race, parity, obesity, and 1st trimester hemoglobin.
- Median gestational age at enrollment was 15 weeks with mean ferritin values of 17.0 micrograms/L for low and normal ferritin, respectively (p=0.001)
- The low ferritin group had lower mean hemoglobin values in the third trimester (10.9±1.1 vs 12.1±1.1 g/dL, p=0.007) with a higher rate of anemia in the 3rd trimester (62% vs 19%, p=0.002) and at admission (43% vs 11%, p=0.0004).

  - *Low ferritin group had a lower mean hemoglobin in third trimester & at delivery and a 5x higher rate of developing anemia at delivery*

  - With multivariate logistic regression, only ferritin level between 3rd trimester and at delivery had an independent association with anemia at admission (OR 5.12, 95% CI 1.7-15.4; p=0.003)

- Median ferritin values in the third trimester (26.4 micrograms/L for low ferritin group vs 105 micrograms/L for normal ferritin group) had an AUC of 0.74 for predicting low hemoglobin at delivery (AUC=0.74; p<0.001)

  - *Low ferritin ≤ 26.4 micrograms/L in non-anemic women in early pregnancy is predictive of anemia at delivery*

- Low ferritin group had a lower mean hemoglobin in third trimester & at delivery and a 5x higher rate of developing anemia at delivery

  - There is potential to use a ferritin level as a first trimester screening tool to identify women at risk of developing anemia in pregnancy and provide early intervention.

**Conclusion**

- Ferritin ≤ 26.4 micrograms/L in non-anemic women in early pregnancy is predictive of anemia at delivery

**Tables & Figures**

### Table 1. Demographic information comparing low ferritin and normal ferritin groups

<table>
<thead>
<tr>
<th>Characteristic</th>
<th>Low Ferritin (n = 37)</th>
<th>Normal Ferritin (n = 68)</th>
<th>P</th>
</tr>
</thead>
<tbody>
<tr>
<td>Race</td>
<td>White</td>
<td>Black</td>
<td></td>
</tr>
<tr>
<td></td>
<td>28 (79%)</td>
<td>1 (3%)</td>
<td>0.021</td>
</tr>
<tr>
<td>Hispanic</td>
<td>5 (14%)</td>
<td>7 (10%)</td>
<td>0.022</td>
</tr>
<tr>
<td>Asian</td>
<td>2 (6%)</td>
<td>6 (9%)</td>
<td>0.089</td>
</tr>
<tr>
<td>Unknown or not identified</td>
<td>1 (3%)</td>
<td>2 (3%)</td>
<td></td>
</tr>
<tr>
<td>BMI (kg/m²)</td>
<td>30.3 ± 8.0</td>
<td>26.6 ± 6.9</td>
<td>0.027</td>
</tr>
<tr>
<td>Mode of Delivery</td>
<td>Original delivery</td>
<td>Cesarean Section</td>
<td></td>
</tr>
<tr>
<td></td>
<td>17 (46%)</td>
<td>18 (26%)</td>
<td>0.06</td>
</tr>
<tr>
<td>Birthweight (g)</td>
<td>3415 ± 11.60</td>
<td>3415 ± 471.91</td>
<td>0.79</td>
</tr>
<tr>
<td>Postpartum Hemorrhage (EBL ≤ 1500 mL)</td>
<td>5 (14%)</td>
<td>14 (21%)</td>
<td>0.16</td>
</tr>
</tbody>
</table>

Data presented as mean ± SD

**References**