# Antenatal Depressive Symptoms Predict Cesarean Birth

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## Introduction

Background:

- In 2023, the CDC Vital Statistics recorded the total number of births of 3,591,328 in the US. Amongst the total number of births, in 2022 the Cesarean Delivery (CD) rate sat at 32.1%, then increased to 32.4% in 2023 (Hamilton et al., 2024). The CD rate within nulliparous patients increased from the previous year to 26.6% in 2023 (Hamilton et al., 2024)
- Maternal depression is a mood disorder that includes a persistent feeling of sadness and loss of interest in activities that can be rooted from causations acute to biological factors associating with life events
- 1 in 5 women are not asked about depression during their prenatal visit (Centers for Disease Control and Prevention , 2022)
- Previous studies have not reported association between AD and CD, whereas no study has done the study of looking at depression symptoms with CD
- Women of color increase in their chances to experience complications during pregnancy compared to White mothers (Rattan, 2022)

## Research Question

Is there an association between level of antenatal depressive symptoms and mode of delivery?

## Methods

- **Datasource**: The Nulliparous Pregnancy Outcomes Study: Monitoring Mothers-to-Be (NuMoM2b) study, a publicly available dataset, which enrolled women expecting their first birth (nulliparous women) to investigate various aspects of pregnancy, childbirth, and maternal health outcomes. The study had a total of 19 sites involved, but 16 sites recruited participants from 2010 – 2013. Study participants recorded surveys and medical records were abstracted.
- The Edinburgh Postnatal Depression Scale (EPDS) is a 10-item questionnaire screening tool that identifies depression symptoms that could be carried into the postnatal period. The EPDS screening was completed by participants within the first trimester (6-13 weeks) and third trimester (22–29 weeks)
- **Inclusion Criteria:** Completed EPDS tool in third trimester.
- **Statistical Analysis**: identify association between patients who experienced depression symptoms within the antenatal periods and the mode of delivery . We used the EPDS screening tool that identifies depression symptoms
- Used STATA version 18 to run bivariate tests
  - Chi-squared test – run to factor factored symptoms and mode to delivery
  - Logistic Regression Analysis - Used to view the odds of the antenatal depression (primary predictor) and added predictors: SODH, Maternal Characteristics, and comorbidities; to see the influence on CD to occur (outcome measure)
  - Literature review on previous studies depicting associations between antenatal depression and CD

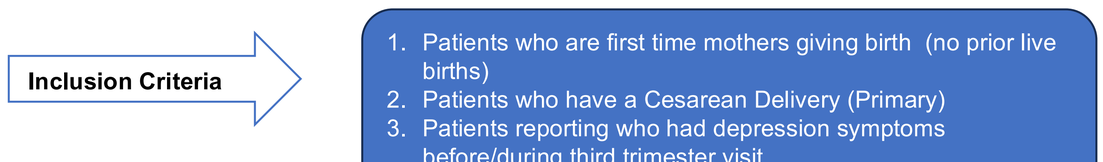



**Figure 1a.** Of the 9,289 participants who met the inclusion criteria; 8,226 participants responded to the Edinburgh Perinatal Depression Scale survey during visit 3, and 2,273 participants out of the sample reported mode of delivery of Cesarean birth outcome

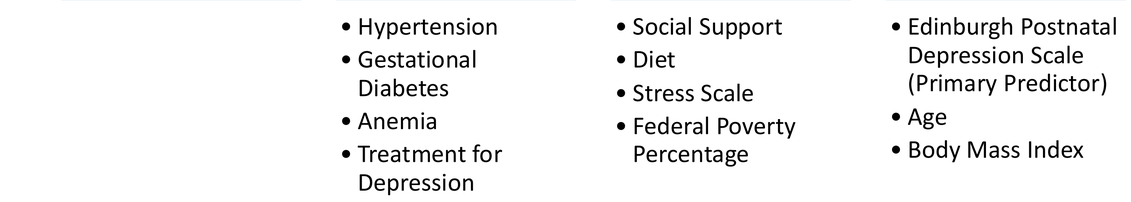



**Figure 1b.** Represents the controlling influence of our predictors using depression symptoms from the EPDS survey in odds for Cesarean Delivery

## Results

- N = 8,388 participants completed the Edinburgh Depression Scale during Visit 3 (measures identifying anxiety and depressive symptoms during pregnancy)
- Non-Hispanic White - (N=3,935), the odds for CD escalated as age, BMI increased. Conversely, for each 1-point higher scoring diet based on the HEI in 2010, the odds for CD decreased by 1% (p=0.025)
- Non-Hispanic Black - (N=426 participants), the odds for CD increased by 11.8% (p<0.001). Every point increase in BMI, there was a 6.3% (p<0.001) increase. Whereas higher depression scores, and healthy eating scores were not associated with CD.
- Hispanic population -(N=668 participants), the odds for CD increase by 9% (p<0.001) as age increases, along with a 5% (p=0.001) increase for every point increase in BMI. Patients with anemia, compared to those without anemia, had 74% (p=0.036) higher odds for CD.
- Asian - (N=250 participants), as age increases, the odds for a CD increases by 9.5% (p=0.016), along with a 10% (p=0.007) increase for every point increase for body mass index. We found that there is a significant increase by 227% (p=0.042) in odds for CD among those who experience gestational diabetes
- Other - (N=246 participants) We see that an increase by 8.8% (p=0.025) for CD for as age increases per year, along with an increase by 6.2% (p=0.013) with for each point increase in BMI. there is a significant increase by 500% (p=0.001) for CD among those assessed with diabetes during pregnancy, but there is missing data within this subset

| Demographic Characteristics | Non-Hispanic White | Non-Hispanic Black | Hispanic | Asian | Other | p-value |
|---|---|---|---|---|---|---|
| Edinburgh Postnatal Depression Scale | 5.27 (3.96) | 6.19 (4.84) | 5.89 (4.25) | 5.39 (4.02) | 5.93 (4.00) | p < 0.001 |
| Maternal Age (years) | 28.18 (5.12) | 23.22 (5.22) | 24.84 (5.55) | 30.8 (4.59) | 25.82 (6.06) | p < 0.001 |
| Maternal Body Mass Index | 25.82 (5.79) | 28.92 (8.24) | 26.68 (5.99) | 23.25 (4.05) | 26.93 (6.72) | p < 0.001 |
| **Social Determinants of Health** | | | | | | |
| Self-Reported Social Support | 75.7 (13.43) | 69.89 (16.19) | 73.18 (14.09) | 75.12 (12.7) | 72.35 (15.25) | p < 0.001 |
| Healthy Eating Index in 2010 | 65.03 (12.16) | 54.06 (10.8) | 60.64 (12.05) | 68.79 (10.3) | 60.33 (13.6) | p < 0.001 |
| Perceived Stress Scale | 10.75 (6.18) | 13.48 (7.35) | 12.1 (6.74) | 11.16 (5.84) | 12.25 (6.51) | p < 0.001 |
| Federal Poverty Percentage | 488.18 (300.0) | 204.11 (240.43) | 299.73 (267.07) | 590.067 (315.37) | 351.72 (292.27) | p < 0.001 |
| **Co-Morbidities** | | | | | | |
| Hypertension | 274 (5.31%) | 96 (9.03%) | 73 (5.48%) | 18 (5.49%) | 33 (7.99%) | p < 0.001 |
| Gestational Diabetes | 102 (1.98%) | 18 (1.69%) | 36 (2.7%) | 22 (6.71%) | 7 (1.69%) | p < 0.001 |
| Anemia | 517 (10.03%) | 159 (14.96%) | 174 (13.0%) | 30 (9.15%) | 57 (13.8%) | p < 0.001 |
| Treatment for Depression | 314 (6.12%) | 38 (3.62%) | 40 (3.04%) | 2 (0.62%) | 12 (2.93%) | p < 0.001 |

**Table 1.** The data represents the differences in race/ethnicity groups by the controlling influenced predictors. We see that women from the Non-Hispanic Black community were more likely to experience antenatal depression symptoms using the Edinburgh Postnatal Depression Scale screening tool (Non-Hispanic White, 5.27; Hispanic, 5.89; Asian, 5.39; Other, 5.93; p<0.001)

**Table 2.** represents that with every 1-point increase in the EPDS (which measures perinatal depression symptoms) at the third trimester visit, the odds for CD were increased 2.6% (p =0.024), increasing age was associated with an 8% increase in odds for a CD (p<0.001). AS BMI increases, 6% increase in odds for a CD (p<0.001). Each point increase in the healthy eating index score, the odds for CD decreased 1% (p=0.006). Finally, treatment of depression (compared to patients without any depression treatment) was associated with 27% reduced odds for CD (p = 0.05).

| Demographic Variables | OR (95% CI) | Adjusted OR (95% CI) |
|---|---|---|
| Edinburgh Perinatal Depression Scale | 1.017 (1.005, 1.029) | 1.026 (1.003, 1.050) |
| Maternal Age | 1.061 (1.052, 1.071) | 1.087 (1.071, 1.103) |
| Maternal Body Mass Index | 1.072 (1.063, 1.080) | 1.065 (1.054, 1.076) |
| **Social Determinants of Health** | | |
| Self-Reported Social Support | 0.998 (0.994, 1.00) | 1.000 (0.996, 1.005) |
| Healthy Eating Index in 2010 | 1.000 (0.996, 1.000) | 0.992 (0.986, 0.997) |
| Perceived Stress Scale | 1.005 (0.998, 1.013) | 0.997 (0.982, 1.011) |
| Federal Poverty Percentage | 1.000 (1.0002, 1.0003) | 0.999 (0.999, 1.000) |
| **Co-Morbidities** | | |
| Hypertension | 1.766 (1.464, 2.131) | 1.205 (0.939, 1.546) |
| Gestational Diabetes | 1.614 (1.194, 2.182) | 1.091 (0.736, 1.617) |
| Anemia | 1.082 (0.931, 1.258) | 1.079 (0.889, 1.310) |
| Treatment for Depression | 0.946 (0.755, 1.186) | 0.736 (0.541, 1.000) |

## Conclusions

In this large sample of nulliparous mothers, there is an association between first time mothers who experienced depression symptoms within the antenatal periods and the mode of delivery. While other studies researched with diagnosis with antenatal depression and cesarean delivery, there was no association. We researched reviewing all depression symptoms as our protective factor and adjusting variables that were previously confounding variables associating with cesarean delivery from prior literature

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