



Peripartum Antibiotic Exposure and Postpartum Mental Health: A Retrospective Study

Dr. Elisabeth Guenther MD (PI), Alexis Amatisto, Emily Cloward, Ashlyn Lawson, Ashley Hoeck Anderson DO, Danielle Guthrie DO, DeeAnna Hess DO



BACKGROUND

A significant proportion of women experience mental health issues in the postpartum period such as postpartum depression, anxiety, and psychosis. Postpartum depression (PPD) is the most common peripartum mental health issue occurring in an estimated 13% of women.^{1,2} The use of antibiotics has become increasingly prevalent within the peripartum period with nearly 40% of pregnant women being exposed to them.^{3,4,5} This makes them the most commonly prescribed medication for pregnant and peripartum women.^{3,4} This study aims to identify a possible correlation between intrapartum and postpartum antibiotic use and the development of postpartum depression.

OBJECTIVES

Primary Study Aim: Identify a possible correlation between intrapartum and postpartum antibiotic use and the development of postpartum depression.

Secondary Study Aim: This study also aims to suggest an association between postpartum anxiety or depression due to potential changes in the microbiome due to intrapartum and postpartum antibiotic use.

METHODS

A retrospective chart review was conducted. Data was collected from the electronic health record on all pregnant patients ages 18 to 40 who were seen within the Samaritan Health Services system and who delivered a live infant between 2014 and 2018. For patients with multiple pregnancies in this timeframe, only their most recent pregnancy was included.

Patient data collected included patient demographics, diagnoses of anxiety or depression on patient problem lists, antibiotics prescribed within 1-week prior to delivery or 5 weeks post-delivery, and Edinburgh Postnatal Depression Scale (EPDS)⁶ scores recorded within 1 year post-delivery.

We defined postpartum depression as: Mothers who either had a maximum EPDS score ≥ 12 within 1 year of delivery, or who had a PPD diagnosis within 1 year of delivery. Per this definition, our final N=5922, with 12.5% (N=738) experiencing post-partum depression.

Age data in the table 1 was subjected to a Wilcoxon rank sum test and all other data in that table was compared using Chi square tests. Results in table 2 were calculated using a logistic regression model.

RESULTS

Patients with vs without PPD within 1 year of delivery significantly differed by age (patients with PPD were younger), primary insurance (patients with PPD were more likely to have Medicare/Medicaid and less likely to have commercial insurance), history of depression/anxiety (patients with PPD had higher rates of prior depression/anxiety) and antibiotics prescribed (patients with PPD were prescribed antibiotics more frequently, and were prescribed antibiotics both inpatient and outpatient more frequently). Patients with vs without PPD did not significantly differ by race, ethnicity, or delivery method.

| Demographics of Study Population | Post-partum Depression (N=738) | No Post-partum Depression (N=5,184) | P-value |
|--|--------------------------------|-------------------------------------|---------|
| Average Age (SD) | 27.4 (5.7) | 28.2 (5.2) | <0.01 |
| Primary insurance at time of delivery | | | |
| Commercial | 40% (297) | 51% (2649) | <0.01 |
| Medicare/Medicaid | 58% (425) | 47% (2417) | |
| Other | 2% (16) | 2% (118) | |
| Race | | | |
| American Indian or Alaska Native | 3% (23) | 4% (209) | 0.32 |
| Asian | 2% (18) | 3% (139) | |
| White | 89% (660) | 87% (4510) | |
| Other | 4% (30) | 5% (237) | |
| Unknown | 1% (7) | 2% (89) | |
| Ethnicity | | | |
| Hispanic or Latino | 11% (79) | 13% (664) | 0.27 |
| Not Hispanic or Latino | 88% (650) | 86% (4458) | |
| Unknown | 1% (9) | 1% (62) | |
| Delivery Method | | | |
| Vaginal | 72% (530) | 73% (3797) | 0.62 |
| C-Section | 27% (200) | 26% (1343) | |
| Unknown | 1% (8) | 1% (44) | |
| Depression or anxiety diagnosis noted prior to delivery | 48% (356) | 24% (1256) | <0.01 |
| Depression or anxiety diagnosis noted prior to delivery, resolved before delivery | 7% (53) | 4% (196) | <0.01 |
| Depression or anxiety diagnosis noted prior to delivery and still active at time of delivery | 46% (337) | 23% (1182) | <0.01 |
| Antibiotics prescribed within 1 week before delivery to 5 weeks post-delivery | 64% (469) | 56% (2897) | <0.01 |
| Antibiotics provided | | | |
| Inpatient | 76% (357/469) | 82% (2372/2897) | 0.01 |
| Outpatient | 7% (33/469) | 6% (160/2897) | |
| Both | 17% (79/469) | 13% (365/2897) | |

Table 1

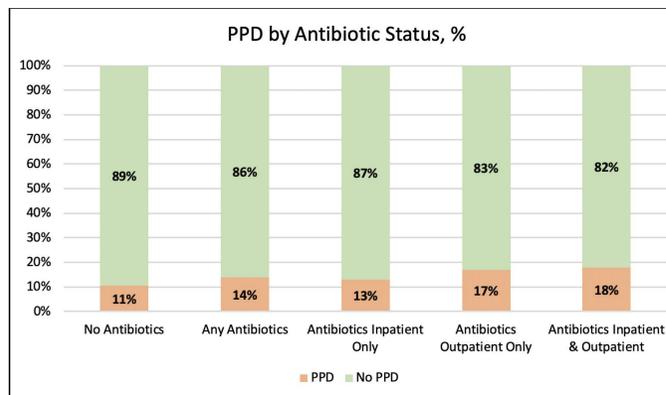


Figure 1

| | Odds Ratio | 95% CI | P-value |
|---|------------|------------|---------|
| Antibiotics prescribed within 1 week before delivery to 5 weeks post-delivery | 1.06 | 1.02, 1.10 | 0.002 |
| History of depression or anxiety diagnosis (noted prior to delivery) | 2.80 | 2.39, 3.28 | <0.001 |
| Mother's age at time of delivery | 0.98 | 0.96, 0.99 | 0.01 |
| Primary insurance at time of delivery | | | |
| Commercial | Ref | Ref | |
| Medicaid or Medicare | 1.39 | 1.18, 1.64 | <0.001 |
| Other | 1.20 | 0.67, 2.01 | 0.52 |

Table 2

Adjusting for patient history of depression/anxiety, mother's age, and mother's primary insurance, the odds of PPD are significantly higher for patients who were prescribed antibiotics within 1 week before delivery to 5 weeks post-delivery. Patients prescribed antibiotics have 6% higher odds of PPD. Patients with a hx of anxiety/depression had 2.8 times higher odds of being diagnosed with PPD per this data review. Age is also significantly associated with PPD, with older patients having lower odds of PPD. For every 1 year increase in age, the odds of PPD is estimated to decrease by 2%. Patients with Medicare or Medicaid had 1.39 times higher odds of PPD compared to patients with Commercial insurance.

DISCUSSION

Pregnancy and the peripartum period are associated with a myriad of unique health concerns,⁸ one of the most notable and common within the postpartum period is the development of postpartum psychiatric disorders (PPDs).^{1,2} The effects of these PPDs on the health of the mother as well as the baby are varied, widespread, and have long term implications.⁹ Postpartum depression has been found to be influenced by many different variables.⁹ It has been suggested that antibiotic use and postpartum depression are connected through their effect on the microbiome.^{4,10,12} The use of antibiotics is common during the peripartum period; 56% of women in our sample received antibiotics within this period (1 week antepartum to 5 weeks postpartum).⁴ The retrospective chart review conducted sought to investigate a possible correlation between peripartum antibiotic use and the development of postpartum depression. Peripartum antibiotic use was found to increase the odds of PPD by 6% indicating a statistically significant association between the two. Additionally, we found other variables, such as mother's age at delivery, insurance type, prior history of anxiety or depression, to influence the development of PPD. Better understanding the variables that influence the development of PPD can help providers to better screen and address this important postpartum health issue. Further research is indicated.

FUTURE IMPLICATIONS

The results of this study can be used to identify women with greater risks of developing PPD such as those given more antibiotics during labor. Women at greater risk for development for PPD can be screened more efficiently and followed up more closely. This will allow for the development of better screening tools and methods leading to earlier detection and treatment.

REFERENCES & ACKNOWLEDGEMENTS

Special acknowledgement and thank you: Statistical data retrieved and analyzed by Olivia Pingleton

- Meltzer-Body S, Howard LM, Bergink V, et al. Postpartum psychiatric disorders. *Nat Rev Dis Primers*. 2018;4:18022. Published 2018 Apr 26. doi:10.1038/nrdp.2018.22
- Howard LM, Molyneux E, Dennis CL, Rochat T, Stein A, Milgrom J. Non-psychotic mental disorders in the perinatal period. *Lancet*. 2014;384(9956):1775-1788. doi:10.1016/S0140-6736(14)61276-9
- Murphy JR, Paul S, Dunlop AL, Corwin EJ, et al. Maternal peripartum antibiotic exposure and the risk of postpartum depression. *Res Nurs Health*. 2018; 41: 369-377. <https://doi.org/proxy.westernu.edu/10.1002/nur.21881>
- Broe A, Pottsgård A, Lamont RE, Jørgensen JS, Danker P. Increasing use of antibiotics in pregnancy during the period 2000-2010: prevalence, timing, category, and demographics. *BJOG*. 2014; 121: 988-996.
- Stokholm J, Schjerring S, Pedersen L, Bischoff A, Følsgaard N, et al. (2013) Prevalence and Predictors of Antibiotic Administration during Pregnancy and Birth. *PLoS ONE* 8(12): e82932. <https://doi.org/10.1371/journal.pone.0082932>
- Ukato N, Clare CA, Buijta M. Postpartum Depression Screening Tools: A Review. *Psychosomatics*. 2018;59(3):211-219. doi:10.1016/j.psyc.2017.11.005
- Baker C. J. (2019, August 15). Neonatal group B streptococcal disease: Prevention. Retrieved November 10, 2019, from https://www.uptodate.com/proxy.westernu.edu/contents/management-of-prelabor-rupture-of-the-fetal-membranes-at-term?search=intrapartum+antibiotic+prophylaxis&source=search_result&selectedTitle=15~23&usage=type-default&display=rank=15
- Berens P. (2019, August 29). Overview of the postpartum period: Physiology, complications, and maternal care. Retrieved November 10, 2019, from https://www.uptodate.com/proxy.westernu.edu/contents/overview-of-the-postpartum-period-physiology-complications-and-maternal-care?search=antibiotics&source=search_result&selectedTitle=2~15&usage=type-default&display=rank=2
- Brommelle S, Galea LA. Postpartum depression: Etiology, treatment and consequences for maternal care. *Horm Behav*. 2016;77:150-166. doi:10.1016/j.yhbeh.2015.08.008
- Maes M, Lin AH, Ombdeli W, et al. Immune activation in the early puerperium is related to postpartum anxiety and depressive symptoms. *Psychoneuroendocrinology*. 2000;25(2):121-137. doi:10.1016/S0304-3940(99)00048-8
- Bergella V. (2019, September 4). Cesarean delivery: Preoperative planning and patient preparation. Retrieved November 10, 2019, from https://www.uptodate.com/proxy.westernu.edu/contents/cesarean-delivery-preoperative-planning-and-patient-preparation?search=antibiotic+prophylaxis+caesarean+section&source=search_result&selectedTitle=1~15&usage=type-default&display=rank=1#49
- Wang H, X, & Wang Y, P. (2016). Gut Microbiota-brain Axis. *China Med J*. 129(19), 2373-2380. doi: 10.4103/0366-6999.190667