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Cohort study of the relationship between individual psychotherapy and pregnancy outcomes

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Abstract

Introduction: Antenatal depression is associated with poor obstetric outcomes, but it has not been determined if treatment improves these outcomes. We hypothesized that psychotherapy for antenatal depression would decrease rates of low Apgar score, preterm birth, low birthweight, and high maternal weight gain.

Methods: Using longitudinal clinical data from the electronic health record (EHR) of a large academic medical center, we examined the association between exposure to psychotherapy during pregnancy among women with a history of major depressive disorder and obstetric outcomes. We compared outcomes between women with and without psychotherapy treatment during pregnancy, and included a dose response analysis.

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Author Contributions

Leslie A. Snapper drafted and revised the manuscript, planned the experiments, and analyzed data. Kamber L. Hart drafted and revised the manuscript, analyzed the data, and contributed to experiment planning. Kartik K. Venkatesh contributed to generating and cleaning the data. Anjali J. Kaimal revised the manuscript and contributed to generating and cleaning the data. Roy H. Perlis drafted and revised the manuscript, planned the experiments, cleaned and analyzed data.

Conflicts of Interest

Roy Perlis has served on advisory boards or provided consulting to Genomind, Healthrageous, Perfect Health, Pfizer, Psybrain, and RIDVentures. All other authors declare that they have no conflicts of interest.

Author Statement

All persons who meet authorship criteria are listed as authors, and all authors certify that they have participated sufficiently in the work to take public responsibility for the content, including participation in the concept, design, analysis, writing, or revision of the manuscript. Furthermore, each author approves the submission of this manuscript and certifies that this material or similar material has not been submitted to or published elsewhere. Manuscript was constructed in accordance with editorial policy.

IRB Approval

This study was approved by the Partners Healthcare Institutional Review Board with a waiver of the informed consent requirement as it utilized de-identified data only.

Disclosures

LAS, KLH, KKV, and AJK have no disclosures to report or competing interests.

RHP has served on advisory boards or provided consulting to Genomind, RID Ventures, and Takeda, and holds equity in Psy Therapeutics and Outermost Therapeutics.

Supplementary materials

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Results: Of 50,856 women with pregnancies between 1998 and 2013, 5413 had a lifetime diagnosis of depression (948 had a diagnosis of depression during pregnancy), and 536 received psychotherapy at least once during pregnancy. Women who received one or more psychotherapy sessions during pregnancy had increased odds of preterm delivery and decreased odds of high maternal weight gain (more than 40 pounds). Individuals who received four or more psychotherapy sessions during pregnancy had increased odds of preterm birth and low infant birth weight and decreased odds of high maternal weight gain.

Limitations: Patients may have pursued treatment outside of this hospital's EHR data, and we cannot control for the quality of treatment or type of psychotherapy.

Discussion: Psychotherapy was associated with negative obstetric outcomes. While treatment of depression in pregnant women has been shown to benefit the mother, the absence of benefit in terms of pregnancy outcomes merits further investigation.

Keywords

Pregnancy; Antenatal depression; Psychotherapy; Pregnancy outcomes; Preterm birth

1. Introduction

Major depressive disorder (MDD) is a common illness during pregnancy, affecting nearly 15% of pregnant women (Bennett et al., 2004; Lee et al., 2007). There is evidence showing antenatal depression is associated with adverse outcomes for both the mother and the child (Milgrom et al., 2015). These include preterm birth, low birth weight, epidural analgesia, emergency caesarean section, and admission to a neonatal care unit (Chung et al., 2001). If left untreated, antenatal depression is also associated with decreased self-care during pregnancy, risk of postpartum depression, risk of impaired attachment between mother and infant, and delays in infant development (Field, 2010; Grote et al., 2010).

However, while multiple studies show efficacy for pharmacologic and non-pharmacologic interventions in the treatment of MDD during pregnancy, it is unclear whether treating the symptoms of antenatal depression has an effect on birth outcomes (Leichsenring et al., 2016). While seemingly self-evident, another possible hypothesis is that antenatal depression is more accurately a marker for another underlying risk factor that impacts obstetric outcomes. A systematic review of randomized controlled trials comparing untreated with non-pharmacologically treated depressed women found improved maternal outcomes but found no studies reporting neonatal outcomes (Dennis et al., 2007). Likewise, a more recent review found no studies matching their criteria for examining the association between non-pharmacological treatment for antenatal depression and risk of adverse outcomes for the infant (such as preterm birth) (Jarde et al., 2015).

While randomized trials represent the gold standard for demonstrating efficacy, they are not always feasible. In light of the paucity of data establishing benefit in terms of pregnancy outcomes, we instead used electronic health record (EHR) data to examine whether psychotherapy meaningfully impacts obstetric outcomes. Using logistic regression,

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we directly compared women who were or were not treated with psychotherapy at any time during pregnancy.

2. Methods

This longitudinal cohort was drawn from Massachusetts General Hospital (MGH), Boston, Massachusetts, a large tertiary care academic medical center. Among all women who delivered at the MGH obstetrics unit between 1998 and 2013, we identified those who delivered at 20 weeks of gestation or greater for inclusion in the current study, limited the cohort to the index pregnancy, and also excluded pregnancies with multiple gestations. From within this cohort of births, we screened women for a past or current diagnosis of major depressive disorder as well as other diagnoses in the International Statistical Classification of Diseases and Related Health Problems-9 (ICD-9), and limited the cohort to women with a history of depression at any point during their lifetime.

As detailed in prior work, we assessed the following sociodemographic and clinical characteristics from the EHR: age, race, household zip code, parity, reported pre-pregnancy body mass index (BMI, calculated as weight (kg)/[height (m)]^2), maternal comorbid conditions (including diabetes and hypertension during current pregnancy), tobacco use during pregnancy, and enrollment in a government insurance program (Venkatesh et al., 2016).

Data were extracted from the EHR and managed using i2b2 server software, which is a scalable computational framework for managing human health data. Further details about the i2b2 platform can be found in earlier analyses by this group (Blumenthal et al., 2014; Uchida et al., 2015). This study was approved by the Partners Healthcare Institutional Review Board with a waiver of the informed consent requirement as it utilized de-identified data only.

Primary obstetrical study outcomes included preterm delivery, infant Apgar score of less than seven at five minutes of life, low infant weight at birth (less than 2500 g), and maternal weight gain of 40 or more pounds during pregnancy (18.14 kg); these cut-offs were chosen for consistency with prior work (Venkatesh et al., 2016). Preterm birth was defined in accordance with World Health Organization (WHO) criteria which indicates that a preterm delivery occurs at less than 37 weeks of gestation (WHO, 2014).

In regression models, we incorporated potential confounding variables identified in prior investigations (Venkatesh et al., 2016). Those variables include maternal age, parity, antidepressant exposure during pregnancy, enrollment in a government insurance program, tobacco use during pregnancy, history of substance abuse, past diagnosis of an anxiety disorder, psychiatry or psychotherapy visit within two years prior to pregnancy, and maternal comorbidities (diabetes and hypertension during current pregnancy). We also controlled for MDD during pregnancy using ICD-9 codes (296.2x, 296.3x, or 311).

We applied multivariable logistic regression to examine the association between psychotherapy exposure and each of the outcomes of interest, with and without adjustment for the covariates noted above. Primary analysis investigated any psychotherapy exposure

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(one or more psychotherapy sessions) during pregnancy; secondary analysis investigated the possibility of a dose response by incorporating extent of psychotherapy exposure (four or more psychotherapy sessions during pregnancy). Finally, we repeated these analyses in individuals who received a diagnostic code for depression during pregnancy.

3. Results

From the 50,856 deliveries identified from the medical record at a large tertiary care academic medical center, 8219 (16.0%) women had a history of depression at some point in their lifetime. The cohort was limited to index pregnancy, and pregnancies with multiple gestations or a gestational age of less than 20 weeks at delivery were excluded. This yielded a cohort of 5413 (10.6%) women with a history of depression for subsequent analysis. Table 1 reports sociodemographic and clinical features of these women. In all, 536 out of 5413 (10%) women received one or more psychotherapy sessions during pregnancy. On average, there was a modest (but statistically significant) difference in age, with women receiving psychotherapy being significantly younger ($M = 27.90$ years, SD = 7.35) than women who did not receive psychotherapy ($M = 30.07$ years, SD = 6.59, $p < 0.001$). Women receiving psychotherapy were also more likely to have had a psychiatry or psychotherapy visit in the prior two years (psychiatry visit: $t = 9.05$, $p < 0.001$; psychotherapy visit: $t = 15.25$, $p < 0.001$), and were more likely to have a current diagnosis of depression ($\chi^2 = 383.78$, $p < 0.001$).

Table 1 also reports additional demographic comparisons between women who did or did not receive psychotherapy during pregnancy. Of the women who received psychotherapy, 85 (15.86%, $\chi^2 = 13.98$, $p = < 0.001$) used tobacco, 139 (25.93%, $\chi^2 = 44.30$, $p < 0.001$) had a history of substance abuse, 93 (17.35%, $\chi^2 = 179.42$, $p < 0.001$) had a history of generalized anxiety disorder, 226 (42.16%, $\chi^2 = 40.94$, $p < 0.001$) had government insurance, and 154 (28.73%, $\chi^2 = 85.17$, $p < 0.001$) were exposed to antidepressants during pregnancy.

In this cohort of 5413, 397 (7.33%) women delivered preterm (less than 37 weeks of gestation), 430 (7.94%) infants were less than 2500 g at birth, 143 (2.64%) infants were delivered in distress (Apgar score less than seven at five minutes), and 937 (17.31%) women had weight gain greater than 40 pounds during pregnancy. In univariate analyses, we found significant differences in the risk for low birth weight, preterm delivery, and increased maternal weight gain between those who received one or more psychotherapy sessions and those who received no psychotherapy treatment during pregnancy (Table 2). Women who received at least one session of psychotherapy were less likely to gain more than 40 pounds during pregnancy, but were more likely to deliver preterm, and have an infant with a low birth weight. Likewise, in models adjusted for potential confounding variables, women who had one psychotherapy visit during pregnancy were less likely to gain more than 40 pounds during pregnancy, but were more likely to deliver preterm (Table 2).

Recognizing the possibility of a dose-response – i.e., that greater treatment intensity in terms of more psychotherapy visits might be more likely to demonstrate benefit – we next examined the effects of at least four psychotherapy visits. Among those who were exposed to psychotherapy during pregnancy, 219 had four or more psychotherapy sessions (219

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out of 5413 (4.05%) women with a history of depression). Table 3 contains demographic comparisons between women who were exposed to four or more psychotherapy sessions during pregnancy and women who received less than four psychotherapy sessions. Table 4 reports crude and adjusted odds ratios for obstetric outcomes among this cohort comparing women who had four or more psychotherapy sessions during pregnancy to women who had less than four psychotherapy sessions. After adjusting for potential confounding variables, we again found increased odds of preterm delivery and increased odds of low infant birth weight among women who received four or more psychotherapy sessions during pregnancy. Conversely, odds of high maternal weight gain during pregnancy were reduced among women who had four or more psychotherapy visits during pregnancy. We identified no change in obstetric outcome odds for increased infant distress during delivery.

Finally, we repeated our analyses in the subset of women with a diagnosis of antenatal depression. In this cohort of 948 women, 258 (27.22%) received one or more psychotherapy sessions, and 133 (14.03%) received four or more psychotherapy sessions. No significant differences were observed between women who received one or more psychotherapy sessions and those who did not receive psychotherapy (Supplemental Table 1), or between women who received four or more psychotherapy visits and those who received less (Supplemental Table 2).

4. Discussion

In this study of pregnancy outcomes from 5413 women with a history of depression, we found increased odds of preterm delivery and decreased odds of high maternal weight gain in pregnant women who were treated with one or more psychotherapy sessions during pregnancy. Among individuals who received four or more psychotherapy sessions during pregnancy, we identified similar results. These women were also at increased risk of low infant birth weight in adjusted models. Within the subset of women with a current diagnosis of depression, there were no significant differences in obstetric outcomes between women who received psychotherapy and those who did not receive psychotherapy, or between women who received four or more psychotherapy sessions and those who received fewer than four psychotherapy sessions.

Previous studies on maternal depression have shown an association between antenatal depression and adverse obstetric outcomes (Milgrom et al., 2015). While prior research has shown that psychotherapy can lead to significant improvements in antenatal depression symptomology – i.e., that psychotherapy is an efficacious intervention – none have investigated the impact of non-pharmacological treatments on obstetric outcomes (Jarde et al., 2015; Spinelli et al., 2013). The current findings indicate an increased risk for negative obstetric outcomes (low birth weight and preterm delivery) in a cohort of women with a history of MDD who were receiving psychotherapy during pregnancy. These results suggest that even if depression symptoms in the mother are being treated using psychotherapy, women with a history of depression who receive more psychotherapy treatments for their symptoms are still at increased risk for negative obstetric outcomes.

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We note that the most likely explanation for our findings is confounding by indication - that is, individuals receiving more psychotherapy are likely to be sicker. Indeed, we see smaller change in risk for the broader treatment group (one or more psychotherapy treatment) than for the four or more psychotherapy group (Tables 2 and 4). Women receiving no psychotherapy or only one session during pregnancy may be mostly asymptomatic, but women receiving four or more psychotherapy visits most likely exhibit increased depressive symptoms necessitating treatment. However, the covariates used in these analyses to capture prior illness course in terms of treatment intensity (i.e., number of psychopharmacologic and psychotherapeutic visits prior to pregnancy) are as extensive as those used in most other studies examining treatment risk during pregnancy (Castro et al., 2016; Clements et al., 2014). We suspect that if the present findings pertained to antidepressants rather than psychotherapy, they would be seized upon as evidence of harm attributable to the intervention.

Treating antenatal depression can improve symptoms that affect many aspects of daily life including self-care and nutrition (Bernard-Bonnin, 2004; Monk et al., 2013). In turn, this can improve a mother's ability to care for her child. Although psychotherapy has been shown to be an effective treatment for antenatal depression, antidepressants may also be required in some circumstances to effectively treat more severe maternal depression symptoms (Clearinghouse, 2010; Elkin et al., 1995; Hallberg and Sjöblom, 2005; Yonkers et al., 2011). The current study highlights the risk for confounding by indication when studying treatment risk during pregnancy, and the need for better assessment of clinical intensity in such analyses.

We note several additional limitations in interpreting our results. First, our analysis is limited to data available within the EHR of Partners Healthcare; as an open health system, it is likely that many patients pursued psychotherapy elsewhere, which would bias our results toward the null (i.e., failure to detect associations). In addition, there is no control for quality of care and effectiveness of the treatment on the depression symptoms - it is notable that contemporary EHR's do not include metrics that allow estimation of treatment quality. There is also no way to examine different types of psychotherapy, such as cognitive-behavioral therapy, based on the data available to us, nor to examine provider-level effects.

In light of conflicting data about the association between maternal depression and obstetric outcomes, as well as uncertainty regarding the risk-benefit ratio of antidepressant utilization in pregnancy, estimating the benefit of various treatment options is of particular importance to clinical providers. Our results suggest the need for further study to characterize the relationship between antenatal depression and obstetric outcomes, and particularly the impact of non-pharmacologic treatment on both maternal depression and pregnancy outcomes. More generally, our results should provide a cautionary tale about the potential for confounding by indication, even in studies that purport to adequately capture depression severity.

Supplementary Material

Refer to Web version on PubMed Central for supplementary material.

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Biographies

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Roy Perlis is the director of the Center for Quantitative Health in the Department of Psychiatry at Massachusetts General Hospital, the Associate Director of the Psychiatric Genetics Program in Mood and Anxiety Disorders, and Professor of Psychiatry at Harvard Medical School. He also serves as consultant to the American Psychiatric Association's bipolar treatment guidelines workgroup. A graduate of Brown University, Harvard Medical School and Harvard School of Public Health, he completed his residency, chief residency, and clinical/research fellowship at Mass General before joining the faculty. Dr. Perlis' clinical work and research is focused on difficult-to-treat or treatment resistant mood disorders, including major depressive disorder and bipolar disorder. He has authored more than 125 articles reporting original research, as well as numerous book chapters and reviews. Current research efforts include identifying genetic variations which might predict treatment response, creating neuronal models of disease, and identifying and studying novel treatments for mood disorders. His research has been supported by awards from NARSAD, NIMH, NSF, the American Philosophical Society, the Bowman Family Foundation, and the Stanley Center for Psychiatric Research, among others. In 2010, Dr. Perlis was awarded the Depression and Bipolar Support Alliance's Klerman Young Investigator Award.

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References

Bennett HA, Einarson A, Taddio A, Koren G, Einarson TR, 2004. Prevalence of depression during pregnancy: systematic review. Obstet. Gynecol. 103, 698–709. [PubMed: 15051562]

Bernard-Bonnin A, 2004. Maternal depression and child development. Paediatr. Child Health 9, 575–583. [PubMed: 19680490]

Blumenthal SR, Castro VM, Clements CC, Rosenfield HR, Murphy SN, Fava M, Weilburg JB, Erb JL, Churchill SE, Kohane IS, 2014. An electronic health records study of long-term weight gain following antidepressant use. JAMA Psychiatry 71, 889–896. [PubMed: 24898363]

Castro VM, Kong SW, Clements CC, Brady R, Kaimal AJ, Doyle AE, Robinson EB, Churchill SE, Kohane IS, Perlis RH, 2016. Absence of evidence for increase in risk for autism or attention-deficit hyperactivity disorder following antidepressant exposure during pregnancy: a replication study. Transl. Psychiatry 6, e708. [PubMed: 26731445]

Chung TK, Lau TK, Yip AS, Chiu HF, Lee DT, 2001. Antepartum depressive symptomatology is associated with adverse obstetric and neonatal outcomes. Psychosom. Med. 63, 830–834. [PubMed: 11573032]

Clearinghouse NG, 2010. Practice Guideline for the Treatment of Patients with Major Depressive Disorder, third ed. Agency for Healthcare Research and Quality (AHRQ), Rockville MD.

Clements CC, Castro VM, Blumenthal SR, Rosenfield HR, Murphy SN, Fava M, Erb JL, Churchill SE, Kaimal AJ, Doyle AE, Robinson EB, Smoller JW, Kohane IS, Perlis RH, 2014. Prenatal antidepressant exposure is associated with risk for attention-deficit hyperactivity disorder but not autism spectrum disorder in a large health system. Mol. Psychiatry 20, 727–734. [PubMed: 25155880]

Dennis CL, Ross LE, Grigoriadis S, 2007. Psychosocial and Psychological Interventions for Treating Antenatal Depression. The Cochrane Library.

Elkin I, Gibbons RD, Shea MT, Sotsky SM, Watkins JT, Pilkonis PA, Hedeker D, 1995. Initial severity and differential treatment outcome in the National Institute of Mental Health Treatment of Depression Collaborative Research Program. J. Consult. Clin. Psychol. 63, 841. [PubMed: 7593878]

Field T, 2010. Postpartum depression effects on early interactions, parenting, and safety practices: a review. Infant Behav. Dev. 33, 1–6. [PubMed: 19962196]

Grote NK, Bridge JA, Gavin AR, Melville JL, Iyengar S, Katon WJ, 2010. A meta-analysis of depression during pregnancy and the risk of preterm birth, low birth weight, and intrauterine growth restriction. Arch. Gen. Psychiatry 67, 1012–1024. [PubMed: 20921117]

Hallberg P, Sjöblom V, 2005. The use of selective serotonin reuptake inhibitors during pregnancy and breast-feeding: a review and clinical aspects. J. Clin. Psychopharmacol. 25, 59–73. [PubMed: 15643101]

Jarde A, Morais M, Kingston D, Giallo R, Giglia L, MacQueen G, Wang Y, Beyene J, McDonald S, 2015. Does non-pharmacological therapy for antenatal depression reduce risks for the infant? Arch. Women's Mental Health 1–4.

Lee AM, Lam SK, Lau SMSM, Chong CSY, Chui HW, Fong DYT, 2007. Prevalence, course, and risk factors for antenatal anxiety and depression. Obstet. Gynecol. 110, 1102–1112. [PubMed: 17978126]

Leichsenring F, Steinert C, Hoyer J, 2016. Psychotherapy versus pharmacotherapy of depression: what's the evidence? Zeitschrift für Psychosomatische Medizin und Psychotherapie 62, 190–195. [PubMed: 27439555]

Milgrom J, Holt C, Holt CJ, Ross J, Ericksen J, Gemmill AW, 2015. Feasibility study and pilot randomised trial of an antenatal depression treatment with infant follow-up. Arch. Women's Mental Health 18, 717–730.

Monk C, Georgieff MK, Osterholm EA, 2013. Research review: maternal prenatal distress and poor nutrition–mutually influencing risk factors affecting infant neurocognitive development. J. Child Psychol. Psychiatry 54, 115–130. [PubMed: 23039359]

Spinelli MG, Endicott J, Leon AC, Goetz RR, Kalish RB, Brustman LE, Carmona YR, Meyreles Q, Vega M, Schulick JL, 2013. A controlled clinical treatment trial of interpersonal psychotherapy for

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depressed pregnant women at 3 New York City sites. J. Clin. Psychiatry 74, 393–399. [PubMed: 23656847]

Uchida M, Spencer AE, Biederman J, Castro VM, Kenworthy T, Chan J, Rosales AM, Newton-Cheh C, Perlis RH, 2015. A systematic evaluation of the QTc interval and antidepressants in youth: an electronic health record study. J. Dev. Behav. Pediatr. 36, 434–439. [PubMed: 26154713]

Venkatesh KK, Riley L, Castro VM, Perlis RH, Kaimal AJ, 2016. Association of antenatal depression symptoms and antidepressant treatment with preterm birth. Obstet. Gynecol. 127, 926–933. [PubMed: 27054941]

WHO, 2014. Preterm Birth. WHO.

Yonkers KA, Gotman N, Smith MV, Forray A, Belanger K, Brunetto WL, Lin H, Burkman RT, Zelop CM, Lockwood CJ, 2011. Does antidepressant use attenuate the risk of a major depressive episode in pregnancy? Epidemiology. 22, 848–854. [PubMed: 21900825]

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Table 1

Sociodemographic and clinical features of individuals who did or did not receive psychotherapy during pregnancy.

	Received psychotherapy (n = 536)		No psychotherapy (n = 4877)			
Obstetric outcomes	*n*	%	*n*	%	χ^2	*P*
Preterm Delivery	56	10.45	341	6.99	8.17	**0.004**
Low Apgar Score	15	2.80	128	2.62	0.01	0.923
High Maternal Weight Gain	74	13.81	863	17.70	4.82	**0.028**
Low Infant Birth Weight	60	11.19	370	7.59	7.94	**0.005**
Maternal demographics	Mean	SD	Mean	SD	*t*-statistic	*P*
Maternal Age (years)	27.90	7.35	30.07	6.59	6.56	< **0.001**
Psychiatry Visit Two Years Prior (visits)	2.71	5.83	0.420	2.10	9.05	< **0.001**
Psychotherapy Visit Two Years Prior (visits)	11.11	16.24	0.408	2.362	15.25	< **0.001**
	n	%	*n*	%	χ^2	*P*
Antidepressant Exposure	154	28.73	663	13.59	85.17	< **0.001**
History of Generalized Anxiety Disorder	93	17.35	185	3.79	179.42	< **0.001**
Government Insurance	226	42.16	1400	28.71	40.94	< **0.001**
History of Substance Abuse	139	25.93	720	14.76	44.30	< **0.001**
Tobacco Use	85	15.86	509	10.44	13.98	< **0.001**
Hypertension	23	4.29	262	5.37	0.93	0.336
Diabetes	11	2.05	89	1.82	0.04	0.839
Current MDD	258	48.13	690	14.15	383.78	< **0.001**

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Table 2

Crude and adjusted odds ratios for association between one or more psychotherapy sessions and pregnancy outcomes.

Outcomes	Unadjusted odds ratio	95% Confidence interval	Adjusted odds ratio	95% Confidence interval
Low Apgar Score	1.002	0.988–1.016	1.001	0.984–1.018
Low Birth Weight	1.036	1.012–1.062	1.026	0.997–1.056
High Maternal Weight Gain	0.959	0.925–0.995	0.95	0.911–0.993
Preterm Delivery	1.036	1.012–1.060	1.037	1.008–1.065

One or more psychotherapy sessions (n = 536); no psychotherapy (n = 4877).

Adjusted odds ratios control for maternal age, parity, antidepressant exposure during pregnancy, enrollment in a government insurance program, tobacco use during pregnancy, history of substance abuse, past diagnosis of an anxiety disorder, psychiatry or psychotherapy visit within two years prior to pregnancy, and maternal comorbidities (diabetes, hypertension, and major depressive disorder (ICD-9 codes (296.2x, 296.3x, or 311) during pregnancy).

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Table 3

Sociodemographic and clinical features of individuals who received four or more psychotherapy sessions during pregnancy and women who received fewer than four sessions.

	Received 4+ psychotherapy sessions (n = 219)		Less than 4 psychotherapy sessions (n = 5194)			
Obstetric outcomes	*n*	%	*n*	%	χ^2	*P*
Preterm Delivery	26	11.87	371	7.14	6.44	**0.011**
Low Apgar Score	7	3.20	136	2.62	0.09	0.759
High Maternal Weight Gain	26	11.87	911	17.54	4.29	**0.038**
Low Infant Birth Weight	30	13.70	400	7.70	9.34	**0.002**
Maternal demographics	Mean	SD	Mean	SD	*t*-statistic	*P*
Maternal Age (Years)	29.02	7.3	29.89	6.667	1.73	0.085
Psychiatry Visit Two Years Prior (Visits)	4.67	7.5	0.48	2.25	-8.26	***p* < 0.001**
Psychotherapy Visit Two Years Prior (Visits)	20.6	19.99	0.66	3.19	-14.75	***p* < 0.001**
	n	%	*n*	%	χ^2	*P*
Antidepressant Exposure	82	37.44	735	14.15	87.15	***p* < 0.001**
History of Generalized Anxiety Disorder	52	23.74	226	4.35	158.26	***p* < 0.001**
Government Insurance	84	38.36	1542	29.69	7.096	**0.008**
History of Substance Abuse	66	30.14	793	15.27	33.7	***p* < 0.001**
Tobacco Use	33	15.07	561	10.80	3.49	0.062
Hypertension	11	5.02	274	5.28	0.00009	0.993
Diabetes	5	2.28	95	1.83	0.06	0.816
Current MDD	133	60.73	815	15.69	291.97	***p* < 0.001**

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Table 4

Crude and adjusted odds ratios for association between four or more psychotherapy sessions and pregnancy outcomes.

Outcomes	Unadjusted odds ratio	95% Confidence interval	Adjusted odds ratio	95% Confidence interval
Low Apgar Score	1.006	0.984–1.028	1.011	0.983–1.039
Low Birth Weight	1.061	1.023–1.101	1.050	1.002–1.100
High Maternal Weight Gain	0.941	0.891–0.994	0.921	0.859–0.988
Preterm Delivery	1.049	1.013–1.087	1.055	1.009–1.104

Four or more psychotherapy sessions (n = 219); less than 4 psychotherapy sessions (n = 5194).

Adjusted odds ratios control for maternal age, parity, antidepressant exposure during pregnancy, enrollment in a government insurance program, tobacco use during pregnancy, history of substance abuse, past diagnosis of an anxiety disorder, psychiatry or psychotherapy visit within two years prior to pregnancy, and maternal comorbidities (diabetes, hypertension, and major depressive disorder (ICD-9 codes (296.2x, 296.3x, or 311) during pregnancy).