Trajectories of Perinatal Depressive and Anxiety Symptoms in a Community Cohort

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ABSTRACT

Objective: The evidence on trajectories of perinatal depression is mostly based on studies composed of women at high risk for poor mental health. Research on maternal anxiety trajectories is also scarce. Using a large community cohort, the All Our Babies study, in Alberta, Canada, we examined trajectories of perinatal depressive and anxiety symptoms and compared characteristics of women across trajectories.

Methods: Anxiety and depressive symptoms were measured at the second and third trimesters and at 4 and 12 months postpartum among 1,445 women recruited between May 2008 and December 2010. The state subscale of the Spielberger State-Trait Anxiety Inventory was used to measure anxiety symptoms, and depressive symptoms were measured with the Edinburgh Postnatal Depression Scale. Semiparametric group-based mixed modeling was performed to identify the optimal trajectory shape, number of groups, and proportion of the sample belonging to each trajectory. Model fit was evaluated using the Bayesian information criterion. Multinomial logistic regression analysis was conducted to compare characteristics across the trajectories.

Results: Five distinct trajectory groups with constant and variable patterns were identified for both depressive and anxiety symptoms: minimal, mild, antepartum, postpartum, and chronic. Common risk factors of depression and anxiety across groups with elevated symptoms were history of mental health issues (odds ratios [ORs] varied from 1.83 to 7.64), history of abuse/neglect (ORs varied from 1.67 to 8.97), and low social support (ORs varied from 1.64 to 11.37). The magnitude of the influence of the psychosocial risk factors was greater in the chronic group compared to others, suggesting a dose-related relationship.

Conclusions: Heterogeneity of anxiety and depressive symptoms highlights the importance of multiple mental health assessments during the perinatal period. The patterns and intensity of postpartum depression differed between community and high-risk samples, underlining the significance of defining suitable cutoffs. Research to examine the impact of these trajectories on child outcomes is needed.

J Clin Psychiatry 2016;77(11):e1467–e1473
dx.doi.org/10.4088/JCP.15m10176

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Pregnancy and the transition to parenthood are unique life events that can be concomitant with symptoms of anxiety and depression.[1–6] There are opposing perspectives about whether the courses of perinatal depressive and anxiety symptoms are constant or variable. Initial evidence about the variability of symptoms emerged from clinical interviews, which suggested that most women experience depression either during pregnancy or during postpartum but not in both periods.[7] However, subsequent research has supported continuity of symptoms throughout the perinatal period. Grant et al[8] found that three-quarters of women with antepartum depression experienced postpartum depression, and half of those with prenatal anxiety had anxiety during the postpartum period. In a review[9] of risk factors of postpartum depression, antepartum depression was found to be the strongest predictor, followed by antepartum anxiety.

Evidence of symptom continuity is based on research that often relies on changes in raw or residual scores to study variations over the perinatal period. Recently, researchers have conducted trajectory analysis of longitudinal data to examine the course of maternal depressive and anxiety symptoms. This methodology enables evaluation of multinomial patterns of change, including both the strength and direction of changes.[10] Mora et al[11] examined data from young, low-income, inner-city American women and identified 5 trajectories of depressive symptomatology: never, always, only antepartum, early postpartum, and late postpartum. Vanska et al[12] replicated these findings among women with a history of infertility. Both studies focused on samples of women at high risk for poor mental health. To understand the course of depressive symptoms among a low-risk population, Sutter-Dallay et al[13] examined the trajectories of depression among 570 women in France. They identified 4 trajectories with mixed patterns, including a crossover between the group who had never been depressed and the postpartum depression group. One of the limitations of the latter study, as noted by the authors, was a small sample size that did not allow reporting the 5-group model. Thus, questions remain about what patterns of change in perinatal depressive symptoms can be expected in a general population of women.

Evidence on maternal anxiety trajectories is limited due to small sample sizes and the sample composition (ie, the inclusion of both male and female participants).[14–16] Kuo et al[15] identified 4 trajectory groups with constant patterns, including low, mild, high, and very high from late pregnancy to 6 months postpartum. Others reported variable patterns. In a sample of 159 women, Agrati et al[16] identified 2 trajectories: a U-shaped pattern and an increasing linear pattern. In contrast, Don et al[14] identified a declining group and a moderate-stable group among 104 couples. Although, these studies suggest the existence of distinct trajectories of perinatal anxiety, findings on number of trajectories, continuity or variability of symptoms, and their patterns are mixed.[14–16]

Clinical Points

- The evidence on the trajectories of perinatal depression is mostly based on studies composed of women at high risk for poor mental health. However, these trajectories are not well defined in community samples. Also, research on maternal anxiety trajectories is scarce.
- Heterogeneity of mental health symptoms highlights the importance of multiple assessments during the perinatal period. Antepartum screening for anxiety and depression is reasonable for timely identification of women with chronic symptoms as well as women with poor antepartum mental health. Additionally, considering the fluctuations of symptoms around labor, a second screening is recommended to identify symptoms that have emerged during the postpartum period.

The first objective of the present study was to examine the trajectories of depressive symptoms in a large community sample of women and to determine whether the trajectories identified for high-risk groups of women are applicable to this population. The second aim was to explore trajectories of anxiety symptoms during the perinatal period. The third objective was to describe the demographic, psychosocial, and obstetric characteristics of women in each trajectory group of anxiety and depressive symptoms to determine whether women's characteristics differ among symptom subgroups.

METHODS

Data for this study were obtained from the All Our Babies (AOB) study, a longitudinal pregnancy cohort in Alberta, Canada.[17,18] Participants were recruited before 25 weeks' gestation from health care offices, communities, and Laboratory Services between May 2008 and December 2010. The AOB study was approved by the Conjoint Health Research Ethics Board of the University of Calgary, and participants gave informed consent. The response rates ranged from 76%–84% across the first 3 data collection points. At 12 months postpartum, due to funding timelines, only two-thirds of the cohort (n = 2,001) were invited to participate, with a response rate of 78%. Detailed descriptions of the recruitment process and questionnaires were reported previously.[17,18] For the present study, participants who completed all questionnaires from the second trimester of pregnancy through 12 months postpartum were selected (N = 1,445).

Measures

Anxiety and depressive symptoms were measured at 4 time points, including < 25 and 34–36 weeks' gestation and at 4 and 12 months postpartum. The state subscale of the Spielberger State-Trait Anxiety Inventory (STAI)[19] was used to measure anxiety symptoms. This tool consists of 20 items rated on a 4-point Likert scale. The total score ranges from 20 to 80, and higher scores indicate higher anxiety. The STAI has been validated against clinical diagnostic interview during the perinatal period and has acceptable sensitivity, specificity, and predictive values.[8,20] The mean scores on the STAI correlated moderately over time (*r* values varied from 0.50 to 0.61, $P < .001$), and its internal consistency was high at each assessment point (Cronbach α varied from .91 to .93).

Depressive symptoms were measured with the Edinburgh Postnatal Depression Scale (EPDS),[21] a self-reported questionnaire validate to use during both pregnancy and the postpartum period. The scale has an internal consistency of 0.87.[22] The total score ranges from 0 to 30, with higher scores indicating higher depressive symptoms. A score of greater than or equal to 13 may help to identify women with major depression.[23] In the present study, EPDS scores correlated moderately over time (*r* values varied from 0.44 to 0.59, $P < .001$), and its internal consistency was high (Cronbach α varied from .84 to .86).

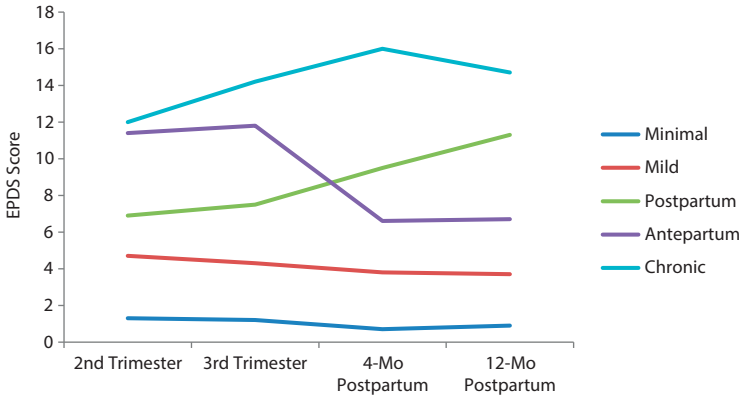
Demographic and psychosocial variables were retrieved from the first questionnaire and included age, marital status, education, household income, immigration status, history of mental health issues (any self-reported depressive episode > 2 weeks or other mental disorders), history of abuse/neglect, perceived social support, and perceived stress.

The Medical Outcomes Study (MOS) Social Support Survey[24] is a 19-item self-report scale that measures 4 dimensions of social support. The total score ranges from 0 to 100, with higher scores indicating a greater perceived support. The scale has high internal consistency, ranging from 0.91 to 0.97.[24] The Perceived Stress Scale (PSS)[25] is a 10-item scale with a total score ranging from 0 to 40. Higher scores indicate more perceived stress, and its internal consistency is acceptable (Cronbach α of .85). The obstetric variables included difficulty obtaining prenatal care, infertility history, unplanned pregnancy, perceived physical health, delivery mode, preterm birth (birth < 37 weeks), and low birth weight (< 2,500 g).

Statistical Analyses

To address the first 2 objectives, we conducted semiparametric, group-based mixed modeling[26] using SAS ProcTraj.[27] This approach assumes that the population is composed of groups with different trajectories and seeks to identify those groups as they change over time.[26] This modeling identifies the optimal shape of the trajectory, number of groups, and proportion of the sample belonging to each group.[26] Although individual trajectories may not perfectly overlap with the group trajectory, individuals are classified into identified patterns of change and are assumed to follow approximately the same course as other individuals in their group.[28,29] In our analyses, the parameters defining the shape of the trajectory were free to vary across groups, and these coefficients were then used to calculate each individual's probability of group membership (posterior probability). Posterior probability greater than 0.70 is acceptable and greater than 0.80 is recommended.[30] Models were estimated with intercept, linear, quadratic, cubic, and quartic coefficients, which were removed if they were not significant for particular groups. To determine the number of groups that best fit the anxiety and depression data, the Bayesian information criterion (BIC) was calculated. The BIC scores with greater (less negative) values indicate a better fit. Prior to conducting

Figure 1. Trajectories of Maternal Depressive Symptoms From Second Trimester of Pregnancy to 12 Months Postpartum



Abbreviation: EPDS = Edinburgh Postnatal Depression Scale.

Table 1. Depressive and Anxiety Symptoms Trajectory Parameter Estimates (N = 1,445)

Group	%	n	Intercept	Linear	Quadratic	Cubic
Depressive symptoms						
Minimal	26.3	380	0.68*	1.08	−1.70*	0.41**
Mild	51.4	743	4.44***	−0.35***	…	…
Postpartum	9.6	138	6.66***	1.22***	…	…
Antepartum	10.2	148	11.07***	5.86***	−7.49***	1.69***
Chronic	2.4	35	12.00***	2.98**	−7.72*	…
Anxiety symptoms						
Minimal	54.3	785	15.17***	16.94***	−7.53***	0.99***
Mild	32.9	476	20.83***	20.97***	−9.46***	1.27***
Postpartum	4.7	68	54.70***	−31.95*	15.92**	−2.06*
Antepartum	6.6	95	−8.77	85.59***	−38.03***	4.90***
Chronic	1.5	21	41.71***	11.02***	−2.07**	…

*$P < .05$. **$P \leq .01$. ***$P \leq .001$.

the analysis, several parameters were specified, including the BIC value, theoretical considerations (expected numbers and shapes of the different trajectories), and interpretability of the trajectories.

Sample characteristics were described using descriptive statistics. To assess bivariate associations between the trajectories of symptoms and the characteristics of women, χ^2 analysis was used and the magnitude of the associations was assessed using multinomial logistic regression. Odds ratios and 95% confidence intervals were calculated, and an α level of .05 was used for the statistical tests. These analyses were performed using IBM SPSS version 19.0.[31]

RESULTS

Most participants were married or in common-law relationships, had some postsecondary or completed postsecondary education, and were born in Canada. Approximately 75% of participants were between the ages of 25 and 34 years and had annual household incomes over $80,000. One-third of the women were pregnant for the first time (see eAppendix 1).

Identifying Depression Trajectory Groups

First, we estimated models with one trajectory group to identify the common trajectory of depression scores across time. Results suggested that the EPDS scores varied over the course of the study. We then calculated BIC values for 2-group to 6-group models to determine whether a multitrajectory approach provided a better fit to the data. The BIC values increased from the 1-group (BIC = −15,375.30) to the 2-group (BIC = −14,709.29) to the 3-group (BIC = −14,578.06) to the 4-group (BIC = −14,531.31) to the 5-group models (BIC = −14,475.20) and then to the 6-group model (BIC = −14,467.76). In the 6-group model, all trajectory groups with elevated depressive symptoms remained the same as those in the 5-group model. The only substantive difference was that 2 groups with low symptoms (EPDS score < 5 throughout the study) were divided into 3 groups. Because, the average posterior probability for the 5-group model was superior to that of the 6-group model, and the improvement of the BIC score for the 6-group model was minor (7.44), we adopted the 5 trajectory groups as our final model (Figure 1). Table 1 shows the parameter estimates and observed trajectories for this model.

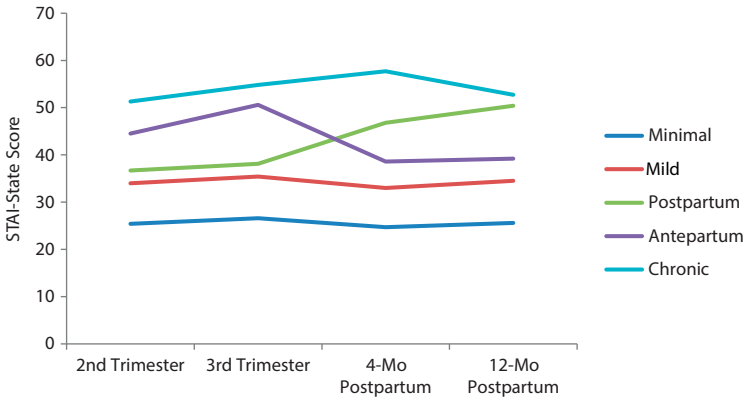
The first group (26.3%) included women with slightly fluctuating symptoms throughout the study but with consistently low levels of symptoms ("minimal"). The second and largest group (51.4%) was characterized by higher baseline scores than the minimal group that slightly decreased from pregnancy to the postpartum period but consistently remained low ("mild"). The third group consisted of approximately 10% of women with a linear increase in depressive symptoms from early pregnancy through 1 year postpartum ("postpartum"). The fourth trajectory group included women (10%) with a higher intercept at the beginning and scores that remained high throughout pregnancy. At the fourth month postpartum, the scores substantially decreased and remained low until 12 months postpartum ("antepartum"). A small proportion of women (2.4%) had the highest depression scores at baseline with slight fluctuation that peaked at 4 months postpartum but consistently remained high ("chronic").

Identifying Anxiety Trajectory Groups

Similar to the depression trajectory analysis, anxiety trajectory groups were identified by calculating the BIC values for the 1-group to 6-group models. The BIC value increased from −19,276.13 for the 4-group to −19,221.32 for the 5-group models. The BIC continued to increase slightly for the 6-group model (19.01); however, one of the posterior probability indices decreased to 0.72, and one of the trajectory groups accounted for only 1% of the sample. The posterior probability estimates for all indices of the 5-group model remained above 0.80. Thus, we adopted the 5-group model for anxiety symptoms (Figure 2, Table 1).

The first and largest anxiety trajectory group (54.3%) of women (minimal) had slightly fluctuating

Figure 2. Trajectories of Maternal Anxiety Symptoms From Second Trimester of Pregnancy to 12 Months Postpartum



Abbreviation: STAI = State-Trait Anxiety Inventory.

anxiety throughout the perinatal period; however, their scores remained low at all assessment points. The next largest group of women (32.9%) (mild) had higher baseline anxiety than the minimal group, but similarly, mean scores remained below the cutoff of 40 throughout the study. Compared with the first 2 groups, the third group (4.7%) started with a higher intercept, which increased over time (postpartum). The fourth trajectory group, which included 6.6% of the women, had elevated anxiety throughout pregnancy, which decreased after delivery and remained moderate at 1-year postpartum (antepartum). Finally, similar to the depression trajectories, the fifth trajectory of anxiety included a small proportion of the women (1.5%) with elevated and slightly fluctuating symptoms throughout perinatal period, peaking at 4 months postpartum (chronic). Mean values of the STAI and EPDS scores by each trajectory group are presented in eAppendices 2 and 3.

Fluctuations in the anxiety symptoms were more evident: In the final anxiety trajectory model, 4 cubic and 1 quadratic component remained significant, while for depressive symptoms, 2 linear, 1 quadratic, and 2 cubic components were significant (Table 1). Overlap between trajectories of anxiety and depression in the final models varied from 45% to 67% ($P < .001$).

Tables 2 and 3 present the associations between maternal characteristics and the trajectory groups. The mild depression trajectory group and minimal anxiety trajectory group were used as reference groups in the regression analyses, as each of these had the largest proportion of women in the respective trajectory analyses. Two distinct risk factors for chronic depression were being single and younger maternal age (Table 2). Women in the antepartum depression and anxiety groups were more likely to be new immigrants or have an infertility history. Unplanned pregnancy and low income contributed to the chronic and antepartum depression. Common risk factors of depression and anxiety across groups with elevated symptoms were history of mental health issues (ORs varied from 1.83 to 7.64), history of abuse/neglect (ORs varied from 1.67 to 8.97), and low social support (ORs varied from 1.64 to 11.37). The magnitude of risk associated with psychosocial factors was larger for the chronic groups compared with the other groups.

No associations were found between labor induction and the symptom categories. Emergency caesarean birth was related to membership in the antepartum anxiety group. Preterm birth was associated with membership in all groups with elevated depressive symptoms and the antepartum and postnatal anxiety groups.

DISCUSSION

In this large community sample, 5 trajectory groups for depressive and anxiety symptoms from the second trimester to 1 year postpartum were identified. Consistent with previous depression trajectory research,[11–13] 77% of women experienced consistent minimal or mild depression, a finding supporting the stability of the symptoms among a large proportion of women. This research extends these findings to the trajectories of anxiety, with 87% of the women experiencing consistently low or mild symptoms. With 2 antepartum assessments, this study expands on previous trajectory analyses based on a single pregnancy assessment.[11–15] We identified a distinct group for postpartum depression with no overlaps with other groups, unlike a previous community study.[13] The postpartum group in our study comprised approximately 10% of the sample, a rate within the reported postpartum depression prevalence in the general population.[1,3]

The proportion of women belonging to each trajectory group varied: the chronic depression group in our sample (2.4%) was smaller than that observed in high-risk samples. Studies with high-risk populations identified 2 distinct postpartum depression groups, 1 composed of women with early postpartum depression with symptoms abated later and a second in which symptoms emerged late in the postpartum period.[11,12] We observed only a single postpartum depression group with significantly higher scores at 4 months postpartum than during pregnancy. The symptoms continued to rise until 1 year postpartum. These findings suggest that late-onset postpartum depression is more evident among high-risk populations. Future research is warranted to confirm trajectories of postpartum depression in community samples.

Moreover, the intensity of postpartum depression varied across studies. In the present study, the mean score of the postpartum group approached the EPDS cutoff of 10 at 4 months postpartum (9.54 ± 3.80) and remained below the cutoff of 13 at 12 months (11.35 ± 3.36). In 2 previous studies,[12,13] the mean score of the early postpartum depression group also remained below or only approached the cutoffs, as measured using the Beck Depression Inventory or Center for Epidemiologic Studies Depression (CES-D). The only trajectory research in which depression scores (CES-D) in the early postpartum reached clinical significance is Mora and colleagues' study.[11] These differences might be related

Table 2. Demographic, Psychosocial, and Obstetric Variables by Trajectories of Maternal Depression[a]

	(1) Minimal		(3) Postpartum		(4) Antepartum		(5) Chronic	
Variable	OR	95% CI	OR	95% CI	OR	95% CI	OR	95% CI
Income								
< $40,000	**0.33****	0.15–0.70	1.27	0.62–2.63	**2.29***	1.21–4.32	**3.43***	1.21–9.71
$40,000–$79,999	**0.58****	0.41–0.82	0.96	0.61–1.52	**1.85****	1.23–2.77	1.85	0.84–4.09
Education ≤ high school	**0.57***	0.36–0.92	0.45	0.20–1.00	0.83	0.45–1.53	1.47	0.55–3.90
Single	0.60	0.28–1.27	1.71	0.79–3.70	1.79	0.85–3.76	**4.09****	1.48–11.31
Maternal age								
< 25 y	0.60	0.29–1.25	1.75	0.82–3.71	1.12	0.45–2.78	**3.61***	1.15–11.36
≥ 35 y	0.79	0.58–1.08	0.60	0.35–1.01	1.11	0.72–1.72	0.98	0.38–2.50
Not born in Canada	**0.60****	0.42–0.87	0.67	0.40–1.15	**2.18*****	1.47–3.23	1.33	0.59–3.00
History of mental health issues	**0.45*****	0.33–0.62	**2.33*****	1.61–3.37	**3.10*****	2.16–4.46	**7.64*****	3.42–17.08
History of abuse/neglect	**0.62****	0.45–0.87	**2.02*****	1.37–2.98	**2.13*****	1.46–3.10	**3.40*****	1.71–6.75
Low perceived social support	**0.23*****	0.14–0.38	**1.64***	1.07–2.50	**3.50*****	2.39–5.12	**5.57*****	2.70–11.48
High perceived stress	**0.16*****	0.09–0.31	**3.61*****	2.43–5.35	**14.29*****	9.44–21.64	**21.00*****	8.93–49.36
Multigravidity	0.97	0.75–1.26	1.00	0.68–1.45	1.02	0.71–1.48	1.62	0.75–3.50
Infertility history	**0.62***	0.42–0.91	0.88	0.53–1.48	**2.12*****	1.41–3.19	1.31	0.56–3.08
Unplanned pregnancy	**0.52*****	0.36–0.73	0.92	0.59–1.43	**1.70****	1.16–2.50	**2.92****	1.47–5.81
Low perceived physical health	**0.50***	0.27–0.91	**1.83***	1.02–3.26	**3.47*****	2.14–5.64	**6.78*****	3.20–14.39
Mode of delivery								
Emergency cesarean section	0.87	0.60–1.26	1.23	0.75–2.01	1.78	1.14–2.77	0.84	0.29–2.47
Elective cesarean section	0.74	0.49–1.13	0.47	0.22–1.00	0.80	0.43–1.49	1.21	0.45–3.24
Induction of labor	1.05	0.80–1.38	1.29	0.88–1.90	1.00	0.68–1.48	0.95	0.45–2.01
Preterm birth	1.48	0.85–2.58	**2.19***	1.10–4.38	**2.99****	1.61–5.55	**5.71*****	2.32–14.09

[a]The mild depression trajectory group was used as the reference group, as this group had the largest proportion of women in the trajectory analysis. Boldface indicates statistical significance.
*$P < .05$. **$P \leq .01$. ***$P \leq .001$.
Abbreviation: OR = odds ratio.

Table 3. Demographic, Psychosocial, and Obstetric Variables by Trajectories of Maternal Anxiety[a]

	(1) Mild		(3) Postpartum		(4) Antepartum		(5) Chronic	
Variable	OR	95% CI	OR	95% CI	OR	95% CI	OR	95% CI
Income								
< $40,000	**2.86*****	1.63–5.02	**7.77*****	3.50–17.23	**7.81*****	3.68–16.58	4.34	0.92–20.49
$40,000–$79,999	**1.42***	1.06–1.89	1.74	0.95–3.21	**2.60*****	1.57–4.30	2.01	0.75–5.39
Education ≤ high school	1.18	0.79–1.78	1.33	0.59–3.04	1.72	0.89–3.33	1.22	0.28–5.38
Single	1.38	0.74–2.57	**5.05*****	2.23–11.40	**3.50****	1.57–7.82	3.48	0.77–15.84
Maternal age								
< 25 y	1.09	0.59–2.00	**2.81***	1.10–7.18	1.70	0.63–4.59	3.40	0.72–16.09
≥ 35 y	1.13	0.85–1.51	**1.00**	0.51–1.96	0.91	0.50–1.66	0.91	0.25–3.30
Not born in Canada	**1.70*****	1.26–2.28	1.31	0.68–2.53	**2.60*****	1.60–4.23	0.31	0.04–2.31
History of mental health issues	**1.83*****	1.43–2.35	**3.65*****	2.20–6.04	**3.33*****	2.15–5.15	**7.64*****	2.92–19.97
History of abuse/neglect	**1.67*****	1.27–2.19	**2.78*****	1.65–4.68	**1.78***	1.10–2.89	**8.97*****	3.55–22.61
Low perceived social support	**4.32*****	3.19–6.16	**7.21*****	4.14–12.57	**11.37*****	6.98–18.52	**11.37*****	4.56–28.37
High perceived stress	**6.83*****	4.81–9.70	**14.42*****	8.25–25.19	**41.59*****	24.15–71.63	**91.75*****	26.11–322.38
Multigravidity	1.19	0.94–1.52	1.10	0.66–1.85	1.22	0.78–1.92	0.98	0.40–2.38
Infertility history	**1.67*****	1.22–2.29	1.21	0.60–2.46	**2.41*****	1.45–4.02	2.20	0.79–6.14
Unplanned pregnancy	**2.01*****	1.52–2.66	**1.81***	1.00–3.23	**2.98*****	1.87–4.75	**2.71***	1.07–6.85
Low perceived physical health	**2.46*****	1.57–3.85	**4.12*****	1.99–8.86	**6.92*****	3.88–12.36	**16.03*****	6.34–40.56
Mode of delivery								
Emergency cesarean section	0.86	0.61–1.22	1.31	0.67–2.53	**2.13***	1.28–3.53	2.09	0.73–5.99
Elective cesarean section	1.31	0.91–1.89	0.96	0.40–2.31	0.75	0.31–1.79	1.84	0.51–6.62
Induction of labor	0.91	0.71–1.17	0.79	0.45–1.37	0.88	0.55–1.41	1.34	0.55–3.28
Preterm birth	1.50	0.92–2.46	**3.99*****	1.93–8.25	**2.43***	1.17–5.07	1.03	0.14–7.92

[a]The minimal anxiety trajectory group was used as the reference group, as this group had the largest proportion of women in the trajectory analysis. Boldface indicates statistical significance.
*$P < .05$. **$P \leq .01$. ***$P \leq .001$.
Abbreviation: OR = odds ratio.

to the use of different tools as well as to sample differences, as socioeconomic profiles,[13] mental health problems,[32] and personality traits[33] can change the course and severity of depression in the perinatal period. Similarly, the mean score of antepartum depression remained below the cutoffs. This evidence calls for defining suitable cutoffs among community women who often experience mild depression. In a systematic review,[23] an EPDS cutoff of ≥ 13 was recommended to detect major depression. However, the inclusiveness of the evidence did not allow the reviewers to provide a recommendation for mild depression. In a community sample,[34] an EPDS score ≥ 10 had higher sensitivity and comparable specificity than greater cutoffs to detect postpartum depression.

The number and patterns of trajectories for perinatal anxiety are inconclusive in the literature.[14,16] We identified 5 trajectories with both constant and variable patterns.

Trajectories of perinatal anxiety and depressive symptoms were similar across all models, with about 50% overlaps between the groups, supporting their strong comorbidity. Approximately one-quarter of women had mean scores that fell just below the STAI cutoff of 40. This group may contribute to the high prevalence of anxiety reported in the literature.

Associations between maternal characteristics and depression trajectories have been reported.[11,13] In our sample, some factors were exclusively associated with a specific trajectory group. Being a recent immigrant or having an infertility history was related to the antepartum anxiety and depression groups. Younger maternal age was exclusively associated with postpartum anxiety and chronic depression.

The impact of psychosocial factors on maternal mental health is well documented in the literature. In this study, we found that the magnitude of the influence of these factors was greater in the chronic group compared to others, suggesting a dose-related relationship. A major risk factor for poor perinatal mental health is a past history of mental health problems.[35,36] This increased vulnerability might be related to the heightened response to stressful events among individuals with a history of poor mental health compared to those without.[37] In a systematic review of 57 studies, Lancaster et al[38] found that life stress and lack of social support were consistently related to an increased risk of depression during pregnancy. Childhood abuse and neglect are also related to the development of several mental health disorders over the course of adulthood. A relationship between adverse childhood events, mood disorders, and substance abuse has been reported in the literature.[39] Additionally, depressive, anxiety, and substance use disorders among individuals with a history of early childhood abuse show an earlier onset, greater symptom severity, more comorbidity, and poorer treatment response than the same disorders among individuals without childhood adverse events.[40]

Substantial symptom variations affected approximately one-fifth of the women, with switches occurring around the birth. To understand the impact of the labor, we compared pregnancy outcomes in each category of symptoms. Women in the antepartum anxiety group were more likely to have an emergency cesarean birth. Consistent with previous research,[7] preterm birth was associated with trajectories of depression and anxiety.

The characteristics of the AOB cohort align with those of the pregnant and parenting population of an urban center in Canada.[18] The large community-based sample, 2 antepartum assessments, and use of validated instruments are strengths of this study. However, the findings are applicable only to anxiety and depressive symptoms. Women who discontinued may have been at higher risk for poor psychosocial factors, which would result in an underestimation of mental health problems. Approximately 3.4% of women reported taking prescription medications for their mental health condition during pregnancy. Our data, however, did not include detailed information about the timing of, duration of, or compliance with the treatment. Although the prevalence of the pharmacologic treatment in our sample was very low, this remains a limitation of the study. The number of individuals in the group with chronic anxiety was small; thus, the identified characteristics and estimated effects of the risk factors warrant further validation.

CONCLUSION

Heterogeneity of anxiety and depressive symptoms highlights the importance of multiple mental health assessments during the perinatal period. On the basis of findings in this study, antepartum screening for anxiety and depression is reasonable for timely identification of women with chronic symptoms as well as women with poor antepartum mental health. Considering the fluctuations of symptoms around labor, a second screening is also recommended to identify symptoms that may emerge during the early postpartum period. Our findings also suggest that women with onset of depression in the postpartum period had high-risk psychosocial profiles identifiable during pregnancy (ie, history of mental health issue/abuse, low social support, and high-perceived stress) or had an unplanned pregnancy. Thus, antepartum screening for high-risk psychosocial profiles may also aid in early detection and the ability to address poor mental health issues, which could improve postpartum mental health. The patterns and intensity of postpartum depression differed between community and high-risk samples, underlining the significance of defining suitable cutoffs. Research is needed to examine the relationship between these trajectories and long-term child outcomes. This information can help clinicians identify women with greater needs for early interventions to benefit them and their children.

Submitted: June 15, 2015; accepted November 17, 2015.

Potential conflicts of interest: **Drs Bayrampour, Tomfohr,** and **Tough** have no conflicts to disclose.

Funding/support: The All Our Babies (AOB) study was funded by Alberta Innovates Health Solutions Interdisciplinary Team grant #200700595, Calgary, Alberta, Canada. Dr Bayrampour was supported by a Postgraduate Trainee Award from the Alberta Innovates Health Solutions during this research project. Dr Tough is an Alberta Innovates Health Solutions Health Scholar.

Role of the sponsor: The funding agency, Alberta Innovates Health Solutions, was not involved in study design, analysis and interpretation of data, the writing of the report, and in the decision to submit the article for publication.

Acknowledgments: The authors acknowledge the Alberta Children's Hospital Foundation and the contribution and support of AOB team members and our participants.

Additional information: The original dataset for the AOB study is available from Dr Tough upon request.

Supplementary material: See accompanying pages.

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Supplementary material follows this article.

THE JOURNAL OF
CLINICAL PSYCHIATRY
THE OFFICIAL JOURNAL OF THE AMERICAN SOCIETY OF CLINICAL PSYCHOPHARMACOLOGY

Supplementary Material

Article Title: Trajectories of Perinatal Depressive and Anxiety Symptoms in a Community Cohort

Authors: Hamideh Bayrampour, MSc, PhD; Lianne Tomfohr, PhD, RPsych; and Suzanne Tough, PhD

DOI Number: 10.4088/JCP.15m10176

List of Supplementary Material for the article

1. **eAppendix 1** Sample's Demographic Characteristics
2. **eAppendix 2** EPDS Scores by Time and Trajectories of Maternal Depression
3. **eAppendix 3** STAI Scores by Time and Trajectories of Maternal Anxiety

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This Supplementary Material has been provided by the author(s) as an enhancement to the published article. It has been approved by peer review; however, it has undergone neither editing nor formatting by in-house editorial staff. The material is presented in the manner supplied by the author.

Appendices

eAppendix 1. Sample's Demographics Characteristics (N=1445)

Variable	N (%)
Income	
• <$40000	80 (5.8)
• $40000-79999	292 (21.0)
• ≥80000	1019 (73.3)
Marital status	
• Married/Common-law	1379 (95.7)
• Single	62 (4.3)
Maternal Age	
• <25	59 (4.6)
• 25-34	939 (72.8)
• ≥35	292 (22.6)
Born in Canada	
• Yes	1188 (82.4)

• No	254 (17.6)
Education	
• High school or less	127 (8.8)
• Some or completed post-secondary	1314 (91.2)
Gravidity	
• Primigravida	516 (35.8)
• Multigravida	926 (64.2)

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eAppendix 2. EPDS Scores by Time and Trajectories of Maternal Depression

Assessment time	Minimal		Mild		Postpartum		Antepartum		Chronic	
	M	SD	M	SD	M	SD	M	SD	M	SD
2nd trimester	1.3	1.59	4.7	2.89	6.9	3.38	11.4	3.73	12.0	4.38
3rd trimester	1.2	1.44	4.3	2.60	7.5	3.11	11.8	3.78	14.2	3.52
4 months postpartum	0.7	1.15	3.8	2.86	9.5	3.80	6.6	3.30	16.0	4.14
12 months postpartum	0.9	1.44	3.7	2.69	11.3	3.36	6.7	3.13	14.7	3.35

Note. The ns, from the minimal to chronic groups, are as follows: 380, 743, 148, 148, and 35.

eAppendix 3. STAI Scores by Time and Trajectories of Maternal Anxiety

Assessment time	Minimal		Mild		Postpartum		Antepartum		Chronic	
	M	SD	M	SD	M	SD	M	SD	M	SD
2nd trimester	25.4	4.11	34.0	6.38	36.7	7.24	44.5	7.63	51.3	9.67
3rd trimester	26.6	4.58	35.4	6.19	38.1	6.67	50.6	6.72	54.8	7.20
4 months postpartum	24.7	4.34	33.0	6.64	46.8	8.99	38.6	7.82	57.7	8.32
12 months postpartum	25.6	4.61	34.5	6.52	50.4	8.52	39.2	7.81	52.7	7.35

Note. The ns, from the minimal to chronic groups, are as follows: 785, 476, 68, 95, and 21.