Effect of maternal depression and anxiety on use of health services for infants

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ABSTRACT

OBJECTIVE To evaluate the association between postpartum maternal depressive symptoms or maternal anxiety and health services utilization (HSU) for infants.

DESIGN Telephone survey.

SETTING London-Middlesex region of Ontario.

PARTICIPANTS Mothers of infants 2 to 12 months of age between 2004 and 2005 (N=655). This sample was drawn from a larger longitudinal cohort of mothers recruited during pregnancy.

MAIN OUTCOME MEASURES Maternal depressive symptoms were measured using the Center for Epidemiologic Studies Depression Scale. Anxiety was measured using the State-Trait Anxiety Inventory. Infant HSU outcomes included number of primary care provider (PCP) visits for infants <6 months of age, number of PCP visits for infants 6 to 12 months of age, emergency department (ED) use, and walk-in clinic (WIC) use.

RESULTS Multivariable regression methods were used to compare HSU for infants. After adjustment for confounders, no significant associations were observed between postpartum maternal depressive symptoms and PCP visits, ED use, or WIC use. Similarly, no significant associations were observed for maternal anxiety and PCP visits, ED use, or WIC use.

CONCLUSION In contrast to some previous studies, this study found no association between postpartum maternal depressive symptoms or anxiety and HSU for infants.

EDITOR'S KEY POINTS

- Few published studies have investigated the influence of maternal depressive symptoms on health services utilization for infants, and even fewer have examined the effects of maternal anxiety. This study assesses these effects in a Canadian setting.
- The results of this study do not support the authors' hypotheses that maternal depression and anxiety are inversely associated with primary care provider visits for infants or positively associated with emergency department and walk-in clinic use. No associations were found.
- Results differed from the authors' expectations based on the literature. Design issues might have affected the findings: although an important strength of this study is that the sample characteristics of respondents and nonrespondents were known, the characteristics differed substantially between groups. Further, health services utilization was self-reported by mothers and could have been subject to measurement error.

Effet de la dépression et de l'anxiété maternelle sur le recours aux services de santé pour le bébé

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RÉSUMÉ

OBJECTIF Déterminer s'il y a une association entre des symptômes de dépression post-partum ou d'anxiété maternelle et le recours aux services de santé (RSS) pour les bébés.

TYPE D'ÉTUDE Enquête téléphonique.

CONTEXTE Région de London-Middlesex, en Ontario.

PRINCIPAUX PARAMÈTRES MESURÉS Mesure des symptômes dépressifs maternels à l'aide du Center for Epidemiologic Studies Depression Scale. Mesure de l'anxiété d'après le State-Trait Anxiety Inventory. Le RSS pour les bébés incluait le nombre de consultations auprès de soignants de première ligne (SPL) pour des bébés de moins de 6 mois, le nombre de consultations auprès de SPL pour enfants de 6 à 12 mois, les visites aux départements des urgences (DU) et celles aux cliniques sans rendez-vous (CSR).

RÉSULTATS On s'est servi de régression multivariable pour comparer le RSS pour les bébés. Après ajustement pour les facteurs parasites, on n'a observé aucune association significative entre les symptômes de dépression post-partum chez la mère et les visites aux SPL, aux DU et aux CSR. De même, aucune association significative n'a été observée entre l'anxiété maternelle et les visites aux SPL, aux DU ou aux CSR.

CONCLUSION Contrairement à certaines études antérieures, cette étude n'a trouvé aucune association entre la présence de symptôme de dépression post-partum ou d'anxiété chez la mère et le RSS pour les bébés.

POINTS DE REPÈRE DU RÉDACTEUR

- Peu de travaux ont étudié les effets de symptômes dépressifs chez la mère, et encore moins ceux de l'anxiété maternelle sur le recours aux services de santé pour les bébés. Cette étude examine ces effets dans un contexte canadien.

- Les résultats de cette étude ne supportent pas l'hypothèse des auteurs voulant que la dépression et l'anxiété maternelles soient inversement associées au nombre de consultations pour les bébés auprès des intervenants de première ligne, et directement reliées aux visites aux services d'urgence et aux cliniques sans rendez-vous. Aucune association n'a été observée.

- Les résultats différaient de ceux auxquels les auteurs s'attendaient d'après les données de la littérature. Des différences sur le plan de la conception de l'étude pourraient avoir affecté les résultats: même si un point fort de cette étude est que les caractéristiques des groupes de répondants et de non répondants étaient connues, ces caractéristiques différaient substantiellement d'un groupe à l'autre. De plus, ce sont les mères elles-mêmes qui rapportaient le recours aux services de santé; cela pourrait avoir engendré des erreurs de mesure.

There is little published research on the effects of maternal psychosocial distress on health services utilization (HSU) for infants. Maternal depressive symptoms have been shown to be associated with both an increased tendency to miss pediatric visits[1] and an increase in overall number of general practitioner or pediatrician visits.[2,3] Specific to well-child visits, 2 studies have reported no association between maternal depression and number of visits,[4,5] and a third study has reported an inverse association.[6] Studies investigating the association between maternal depression and acute or sick-child care have found more consistent results. In studies in the United States, maternal depression has been associated with increased problem-oriented infant health care visits[4] and increased infant emergency department (ED) visits.[1,4,6] Combined maternal and paternal depression has been positively associated with infants' sick visits and ED visits and not associated with infants' well-child care and inpatient visits.[7] A literature search returned only 1 small study (N=31) of maternal anxiety and HSU for infants; prenatal maternal anxiety was significantly associated with an increase in unscheduled acute care visits for infants ($P<.05$) and not associated with well-child visits.[8]

There is limited literature investigating the effect of maternal mood on HSU for infants, and very little of this research has been done in Canada. This study addresses these gaps in the literature. It is important to pursue this question because new mothers a re not only at high risk of depression, but they also require increased health services for both themselves and their new babies. This study aimed to investigate the influence of maternal depressive symptoms and anxiety on HSU for infants. On the basis of the reviewed literature, and after careful consideration of the possible behavioural mechanisms, we hypothesized that maternal depressive symptoms and anxiety would be inversely associated with the number of primary care provider (PCP) visits for infants and positively associated with walk-in clinic (WIC) and ED visits for infants.

METHODS

Study population

A postpartum cross-sectional survey was conducted using a sample of women drawn from a larger longitudinal, population-based cohort study known as the Prenatal Health Project (PHP).[9] The PHP recruited pregnant women from 7 ultrasound clinics in London, Ont, between 2002 and 2005. Eligibility criteria for the PHP cohort required that all study participants be at 10 to 22 weeks' gestation, at least 16 years of age, English speaking, currently living in the London-Middlesex region, and having a singleton pregnancy. All women in the PHP had previously completed a prenatal telephone interview. No intervention was applied in this observational study. Women with high-risk pregnancies were excluded from the PHP. The sample for this postpartum survey included all mothers whose infants were between 2 and 12 months of age between November 2004 and July 2005. Postpartum data were collected through scripted telephone interviews. This study was approved by the Research Ethics Board at the University of Western Ontario.

Measures

The outcome was HSU for infants, measured during the postpartum period using an adapted version of the Health Services Utilization Questionnaire.[10] Main outcomes were number of PCP visits per month and whether WIC visits or ED visits were made for infants. Primary care provider visits were defined as visit to the infants' regular sources of care, whether family physicians or pediatricians. The number of primary care provider visits per month was calculated as the total number of PCP visits made for the infant since birth, divided by age in weeks, multiplied by 4.3. Visits to EDs and WICs since birth were dichotomized as yes or no responses.

Depression and anxiety were assessed during the postpartum telephone survey. Depressive symptoms were assessed using the Center for Epidemiologic Studies Depression Scale (CES-D), a 20-item scale designed for the general population. A CES-D score ≥16 is indicative of depressive symptoms.[11] The reliability and validity of the CES-D have been well established; calculated Cronbach α coefficients range from 0.84 to 0.93.[12-14] Specific to populations of mothers at 2, 3, 6, 12, and 18 months after giving birth, the Cronbach α levels are all greater than 0.80.[15] Maternal anxiety was measured using the State-Trait Anxiety Inventory (STAI), a 12-item scale created by Spielberger et al.[16] This inventory has been widely used and a variety of estimates of its reliability and validity have been reported.[17] For the purpose of this study the results were dichotomized and a STAI score ≥90th percentile was used to classify elevated maternal anxiety.

Table 1 provides a full list of all covariates included in this study. We used the behavioural model of HSU as a conceptual framework for this study, and all variables are classified as predisposing characteristics, enabling resources, or need variables.[18] These variables were identified a priori from the literature as potential confounders to be tested for inclusion in any of the multivariable regression models.

Statistical analysis

All statistical analyses were performed using SAS 9.1 for Windows. Infants were excluded from analysis if they did not currently have PCPs. In consideration of the fact that infants are expected to have a high number of PCP visits in the first 6 months of life, analyses regarding

Table 1. Potential operational and classical confounders tested for inclusion in the multivariable models

POTENTIAL CONFOUNDERS		
PREDISPOSING CHARACTERISTICS	ENABLING RESOURCES	NEED VARIABLES
• Mother's age in years* • Previous children in the home (≥ 1 vs 0) • Infant age in months* • Infant sex • Mother's highest level of education (less than college vs completed college or university) • Mother born in Canada (yes vs no) • English is the primary language spoken at home (yes vs no) • Mother drinks alcohol (yes vs no) • Mother smokes cigarettes (yes vs no)	• Household income (< $60 000 vs ≥ $60 000) • Access to a car (yes vs no) • Access to bus (yes vs no) • Any access difficulties (yes vs no) • Social support (score < 10th percentile vs ≥ 10th percentile) • Financial strain (score < 90th percentile vs ≥ 90th percentile) • Mother is working full-time (yes vs no) • Marital status	• Preterm infant < 37 weeks' gestation (yes vs no) • SGA defined as birth weight < 10th percentile for gestational age (yes vs no) • Colic[+] (Ames score ≥ 3 vs < 3)

SGA—small for gestational age.
*Continuous variable.
[+]Colic measure to be included in analysis only for infants younger than 6 months of age.

infant PCP visits were stratified into 2 groups: infants younger than 6 months of age and infants 6 months of age or older. In anticipation of high correlation between CES-D scores and STAI scores,[19] separate models were constructed for depression and anxiety.

Modeling was based on multivariable regression. For the 2 PCP outcomes, linear regression was conducted. For WIC and ED use, unconditional logistic regression was conducted. The analysis was performed for both hypothesized risk factors (maternal depressive symptoms and maternal anxiety) and all 4 infant HSU outcomes (PCP visits for infants < 6 months of age, PCP visits for infants ≥ 6 months of age, ED use, and WIC use), resulting in a total of 8 hypothesis-testing models. Any variable that resulted in a change > 10% when removed from the full model was defined as a confounder and included in the final multivariable model. This study did not test for any interactions because the literature did not provide evidence of any a priori, and upon initial analyses the main effect was found to be modest.

RESULTS

Attempts were made to contact 880 mothers with infants between the ages of 2 and 12 months. Three mothers were subsequently found to be not eligible for the study. The remaining 877 mothers were presumed eligible for this postpartum study and 655 (75%) completed the interview; 90 (10%) refused to participate; and 132 (15%) were not contacted after repeated attempts.

At the time of the postpartum interview, 651 (> 99%) infants had PCPs; 596 received their primary care from family physicians, and 55 received their primary care from pediatricians. Four infants did not have PCPs and were therefore excluded from this analysis. The mean number of PCP visits per month for infants < 6 months of age (n = 216) was 1.27 (SD 0.70). For infants aged 6 to 12 months (n = 435), the mean number of PCP visits per month decreased to 0.77 (SD 0.42). Of all 651 infants with PCPs, 165 (25%) had visited EDs since birth. Nearly as many infants, 155 (24%), had visited WICs.

Table 2 provides prenatal characteristics of the 655 mothers who completed the postpartum interview and the 222 mothers who did not complete the interview. Postpartum depressive symptoms were indicated in 70 (11%) of the 651 mothers of infants with PCPs. Anxiety was indicated in 57 (8.8%) mothers. Thirty-four (5%) infants in the study were born preterm.

Table 3 presents findings from univariable and multivariable analyses of the relationships between maternal depressive symptoms and the 4 dependent infant HSU variables. No significant univariable associations were found. After controlling for 17 identified confounders, the association between depressive symptoms and PCP visits for infants < 6 months remained nonsignificant ($P = .85$, adjusted $R^2 = 13\%$). Likewise, no significant multivariable association was observed between maternal depressive symptoms and PCP visits per month for infants ≥ 6 months of age ($P = .99$, adjusted $R^2 < 1\%$). Findings from the multivariable logistic regression models with ED and WIC use for infants also revealed no significant associations after adjustment confounders.

Table 4 presents findings from univariable and multivariable analyses of the relationships between maternal anxiety and the HSU outcomes. No statistically significant multivariable associations with PCP were observed. Logistic regression analysis indicated no statistically significant relationship between anxiety and ED or WIC use for infants, after adjustment for confounders.

Table 2. Prenatal characteristics of postpartum study respondents and nonrespondents: *Mean age of mothers who responded was 30.45 (SE 0.19) years vs 29.29 (SE 0.36) years for nonrespondents (P = .003); mean STAI score for respondents was 20.57 (SE 0.21) vs 20.92 (SE 0.38) for nonrespondents (P = .41).*

PRENATAL CHARACTERISTICS	RESPONDENTS* (N = 655) FREQUENCY (%)[†]	NONRESPONDENTS[‡] (N = 222) FREQUENCY (%)[†]	P VALUE[§]
Parity			.44
• Parous	315 (48)	114 (51)	
• Nulliparous	340 (52)	108 (49)	
Income, $			< .001
• < 60 000	197 (30)	95 (43)	
• ≥ 60 000	435 (66)	112 (51)	
Education			.009
• Less than college or university	169 (26)	78 (35)	
• College or university	483 (74)	143 (64)	
Employment			.004
• Employed full-time	429 (66)	121 (55)	
• Other	226 (34)	101 (45)	
Marital status			< .001
• Married or common-law	626 (96)	192 (87)	
• Not married	28 (4)	29 (13)	
Depressive symptoms			< .001
• CES-D score ≥ 16	100 (15)	68 (31)	
• CES-D score < 16	554 (85)	153 (69)	

CES-D—Center for Epidemiologic Studies Depression Scale, STAI—State-Trait Anxiety Inventory.

*Respondents include all eligible individuals who completed the survey.

[†]Percentages might not add to 100 owing to missing data. All data were collected prenatally as part of a previous study.

[‡]Nonrespondents include all presumed eligible individuals who did not complete the postpartum survey because of refusal to participate or failure to be contacted.

[§]χ² analysis.

DISCUSSION

These results do not support the hypotheses that maternal depression and anxiety are inversely associated with PCP visits for infants or positively associated with ED and WIC use. This is in contrast to what was expected based on the literature. Evidence in favour of a negative association came from a well-designed American study[6] and was supported by a second American study.[1] In contrast, studies from Canada, Australia, and Israel have reported a positive association between maternal depression and number of infant PCP visits.[2,3,20]

The results of the latter 3 studies are not conclusive by themselves because none of these studies controlled for confounders. Only 1 well-designed American study has previously reported no association between well-child visits and maternal depression.[4] It has also been reported that there is no association between well-child visits and parental depression.[7]

The finding that maternal depressive symptoms are not associated with WIC or ED use has previously been reported in 1 other Canadian study that investigated the effects of depression on mothers' own HSU in the first month postpartum.[21] Elsewhere, a direct association has been reported between mothers' and infants' use of health services.[22] Three American studies, however, have reported increased ED use for infants of mothers with depressive symptoms.[1,4,6]

Limitations and strengths

Design issues might have affected the study findings. First, although this study sample was drawn from a population-based, longitudinal cohort known to be representative of the London-Middlesex population, the sample itself was not representative of that cohort with respect to frequencies of prenatal depressive symptoms, marital status, education, employment status, and income. In general, although participation bias might limit the external validity of the frequencies provided to describe HSU, such bias typically does not influence estimates of the associations between factors.[23] Second, the HSU outcome variables were assessed through maternal reports of infant visits to each health care provider since birth. The recall period ranged from 2 to 12 months and the accuracy of the reports is unknown. Finally, a sample size calculation was not performed before conducting this study, as all eligible mothers in the cohort were approached for participation. However, the large number of confounders identified indicates the study was well powered and the weak parameter estimates and minimal differences in means suggests that there were no underlying effects missed.

An important strength of this study is the known sample characteristics of respondents and nonrespondents. Second, an additional strength of this study design is that women were recruited prenatally, before seeking postnatal care. Third, the comprehensiveness of the survey instrument was also a benefit to this study, allowing for control of many confounders and covariates in the analysis.

Conclusion

This study revealed no evidence of an association between maternal depressive symptoms or anxiety and visits to PCPs, WICs, or EDs for infants. Forthcoming studies should investigate other determinants of the variation in HSU for infants. This study excluded all infants without PCPs; studies investigating health care

Table 3. Univariable and multivariable association between maternal depressive symptoms (CES-D ≥ 16) and HSU for infants: *A) Visits per month; B) ED and WIC use.*

A)

DEPENDENT VARIABLE	UNIVARIABLE ANALYSES *t* TEST (*P* VALUE)*	MULTIVARIABLE ANALYSES β (*P* VALUE)
PCP visits/mo for infants < 6 mo (n = 216)	1.23 (.23)	-0.03 (.85)[†]
PCP visits/mo for infants ≥ 6 mo (n = 435)	-0.35 (.73)	0.00 (.99)[‡]

B)

DEPENDENT VARIABLE	UNIVARIABLE ANALYSES OR (95% CI)	MULTIVARIABLE ANALYSES ADJUSTED OR (95% CI)
ED use (n = 651)		
• 0 visits	1.00	1.00
• ≥ 1 visits	1.11 (0.64-1.95)	1.02 (0.54-1.96)[§]
WIC use (n = 651)		
• 0 visits	1.00	1.00
• ≥ 1 visits	1.02 (0.57-1.83)	1.01 (0.50-2.06)[‖]

CI—confidence interval, CES-D—Center for Epidemiologic Studies Depression Scale, ED—emergency department, HSU—health services utilization, OR—odds ratio, PCP—primary care provider, SGA—small for gestational age, WIC—walk-in clinic.
*Univariable *P* values for continuous variables were obtained using *t* tests comparing levels of predictor variables in the 2 outcome categories and for categorical variables using 2 x 2 tests of contingency tables.
[†]Adjusted for maternal age, marital status, previous children, infant age, infant sex, maternal education, country of birth, smoking status, alcohol consumption, income, access to car, access difficulties, social support, financial strain, mother's employment status, SGA, colic.
[‡]Adjusted for maternal age, marital status, previous children, infant age, infant sex, maternal education, country of birth, language spoken at home, smoking status, alcohol consumption, income, access to car, access to bus, social support, financial strain, mother's employment status, preterm birth, SGA.
[§]Adjusted for maternal age, marital status, previous children, infant age, infant sex, maternal education, country of birth, smoking status, alcohol consumption, income, access to bus, access difficulties, social support, financial strain, mother's employment status, preterm birth, SGA.
[‖]Adjusted for maternal age, marital status, previous children, infant age, infant sex, maternal education, country of birth, language spoken at home, smoking status, alcohol consumption, income, access to bus, access difficulties, social support, financial strain, mother's employment status, preterm birth, SGA.

Table 4. Univariable and multivariable association between maternal anxiety (STAI ≥ 90th percentile) and HSU for infants: *A) Visits per month; B) ED and WIC use.*

A)

DEPENDENT VARIABLE	UNIVARIABLE ANALYSES *t* TEST (*P* VALUE)*	MULTIVARIABLE ANALYSES β (*P* VALUE)
PCP visits/mo for infants < 6 mo (n = 216)	0.06 (.95)	0.15 (.43)[†]
PCP visits/mo for infants ≥ 6 mo (n = 435)	1.66 (.10)	-0.09 (.22)[‡]

B)

DEPENDENT VARIABLE	UNIVARIABLE ANALYSES OR (95% CI)	MULTIVARIABLE ANALYSES ADJUSTED OR (95% CI)
ED use (n = 651)		
• 0 visits	1.00	1.00
• ≥ 1 visits	1.39 (0.77-2.51)	1.46 (0.77-2.78)[§]
WIC use (n = 651)		
• 0 visits	1.00	1.00
• ≥ 1 visits	0.94 (0.49-1.80)	1.00 (0.47-2.11)[‖]

CI—confidence interval, ED—emergency department, HSU—health services utilization, OR—odds ratio, PCP—primary care provider, SGA—small for gestational age, STAI—State-Trait Anxiety Inventory, WIC—walk-in clinic.
*Univariable *P* values for continuous variables were obtained by *t* tests comparing levels of predictor variables in the 2 outcome categories and for categorical variables by 2 x 2 tests of contingency tables.
[†]Adjusted for marital status, previous children, infant age, maternal education, smoking status, alcohol consumption, access to car, social support, financial strain, preterm birth, SGA.
[‡]Adjusted for financial strain, mother's employment status, SGA.
[§]Adjusted for marital status, previous children, social support, financial strain, SGA.
[‖]Adjusted for maternal age, marital status, previous children, infant age, infant sex, maternal education, country of birth, language spoken at home, smoking status, alcohol consumption, income, access to car, access to bus, access difficulties, social support, financial strain, mother's employment status, preterm birth, SGA.

seeking behaviour of mothers and infants without PCPs might be warranted. Future studies on maternal and infant HSU might also benefit from investigating the actual decision-making process. 🍁

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Contributors
Ms Anderson and **Drs Campbell, daSilva, Freeman,** and **Xie** contributed to concept and design of the study, data interpretation, and preparing the manuscript for submission. **Ms Anderson** and **Dr Campbell** contributed to data gathering. **Ms Anderson** and **Drs Campbell** and **Xie** contributed to data analysis.

Competing interests
None declared

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