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Stormy clouds in seventh heaven

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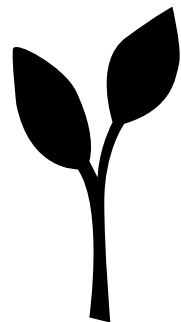
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***What if pregnancy is not seventh heaven?
The influence of specific life events during
pregnancy and delivery on the transition
of antenatal into postpartum anxiety and
depression.***

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chapter 3

Abstract

Objective

Postpartum symptoms of anxiety and depression are known to have a negative impact on mother and child and major life events constitute a major risk factor for these symptoms. We aim to investigate to what extent specific life events during pregnancy, delivery complications and antenatal anxiety or depression independently contribute to the risk of these symptoms in the postpartum period and whether they interact.

Methods

Within a prospective population-based cohort study (n=3,842) in the Netherlands, antenatal symptoms of anxiety or depression were measured at the end of the first trimester and at five months postpartum. Antenatal life events were assessed during the third trimester, information on delivery complications was obtained from midwives and gynecologists. Linear regression analyses were performed to study change in symptoms over time associated with specific events. In addition, modification of these associations by antenatal anxiety and depression levels was tested.

Results

Women with elevated levels of anxiety or depression in their first trimester are at increased risk of these symptoms at five months postpartum. The experience of a life event that was related to health and sickness of self or loved ones, to the relation with the partner or conflicts with loved ones, or to work, finance or housing problems was significantly associated with higher postpartum levels of anxiety ($p < 0.001$) and depression ($p < 0.001$). None of the associations between postpartum levels of anxiety and depression and the experience of an event was modified by antenatal levels of anxiety or depression.

Conclusion

Elevated postpartum levels of anxiety and depression were strongly associated with increased antenatal levels of anxiety and depression. Experiencing life events during pregnancy that were related to the pregnancy, the mode of delivery or the newborn were found not to be associated with an increase in levels of anxiety and depression. This is not different for women with and without antenatal anxiety or depression.

Background

Reproductive age is a period in life in which women are vulnerable to the impact of symptoms of anxiety or depression. During and outside pregnancy alike, prevalence rates of these symptoms range from 8 to 15%^{e.g. 1-12}. Antenatal symptoms of anxiety or depression are the most important risk factor for the occurrence of these symptoms postpartum^{3,13-17}, which in turn has been associated with insecure mother-child attachment^{18,19}. In addition, these symptoms during pregnancy have been associated with several obstetric adverse outcomes in the child, such as preterm birth and low birth weight²⁰⁻²², as well as emotional, cognitive and behavioral problems^{c33,22-25}.

Well-known risk factors for antenatal anxiety or depression are a history of anxiety or depression, low partner support, lower socioeconomic status, specific personality traits and major life events^{e.g. 9,26}. Studies among pregnant women commonly classified recent major life events as general types of events during pregnancy^{e.g. 14,27}, while other studies focused on pregnant women who are facing stress due to specific conditions, i.e. obstetric complications^{28,29}. A few population-based studies however, have shown that specific pregnancy related events are likely to increase symptoms of anxiety or depression during pregnancy^{12,30,31}.

Childbirth itself can also be considered a major life event, especially when the delivery was complicated, for example when the baby was delivered by an emergency caesarean section or the baby was admitted to the neonatal intensive care unit. During the past decade, there is a growing but inconclusive body of literature on the associations between delivery complications and postpartum symptoms of anxiety and depression³²⁻³⁸.

A few large population-based cohort studies ($n > 5,000$) found that experiencing obstetric events during pregnancy or events that were related to the condition of the newborn (i.e. low birth weight, preterm delivery, congenital malformations, admission to the hospital) increased the risk of symptoms of depression in the postpartum period^{31,39}. However, both studies underline the consensual idea that a history of symptoms of depression is the main risk factor for symptoms of depression at a later moment in time. Nevertheless, there is no answer yet to the question to what extent the combination of antenatal symptoms of anxiety or depression and specific life events during pregnancy or delivery is associated with postpartum symptoms of anxiety or depression.

We investigated in a large population based cohort study to what extent specific life events during pregnancy, delivery complications and antenatal anxiety or depression independently contribute to the risk of these symptoms in the postpartum period and

whether they interact.

Methods

Sample

Data was drawn from the prospective population-based Pregnancy, Anxiety and Depression (PAD) Study²², which has been designed to investigate symptoms of and risk factors for antenatal and postpartum symptoms of anxiety or depression. Midwives of the collaborating primary obstetric care centers (n=109) or hospitals (n=7) invited pregnant women at the first or second visit to participate. Due to logistic reasons it has been impossible to establish how many women were actually invited to the study. The number of included women was however considerably lower than we expected based on the number of participating centers. A survey among participating midwives indicated that time pressure caused the vast majority to not hand out the invitations to all visiting women, and that women who were under suspicion of having symptoms of either anxiety or depression were not specifically invited. Therefore, we have no reason to believe that, with respect to characteristics relevant to the study, responders and non-responders differed in any considerable way. After written informed consent was obtained, women were requested to fill out online baseline questionnaires at the end of the first trimester, and online follow-up assessments at the end of the second and third trimesters of pregnancy, as well as at five months postpartum. The medical ethical board of the University Medical Center Groningen approved the PAD-study.

Data used for the current study was collected between May 2010 and March 2015. Women who were at least four months postpartum were eligible to be included, as participants had the opportunity to fill out the follow-up questionnaire online between four and seven months postpartum. Women who indicated that they wanted to withdraw from the study (n=676) or who did not give consent for retrieving information from their midwives (n=1,669), were excluded. This resulted in a sample of 3,842 women (52.8%). Of these women, 2,729 filled out the follow-up anxiety and depression questionnaires at five months postpartum, yielding a response rate of 72.1%.

For postpartum measures of anxiety and depression, responders differed from non-responders on the following baseline characteristics; they generally completed a higher education ($p < 0.02$) and they were more often multiparous ($p < 0.04$). In addition, non-responders scored higher on antenatal measures of anxiety and depression compared to

women who did respond to the postpartum follow-up questionnaire, although mean scores on antenatal anxiety and depression measures were below the prevailing cut-offs for both responders and non-responders. Women who did not respond to the follow-up questionnaire, had experienced more general life events during pregnancy compared to women who did respond ($p < 0.05$), although the means differed less than one event for all categories.

Measurements

Baseline symptom levels of anxiety and depression measured at 12 weeks of estimated gestational age (range 5-19) and at five months postpartum (range 4-7) were analyzed. Life events during pregnancy were assessed during the third trimester. Maternal age and educational level were assessed at baseline. Educational attainment level was defined as the highest completed education, and divided into four categories; elementary or lower tracts of secondary education, higher tracts of secondary education, higher vocational education and university education. Socio-economic position was calculated as the equally weighted average of the educational attainment level of the respondent, her partner, and their total income.

Antenatal and postpartum symptoms of anxiety were measured using the six-item state measuring version of the State and Trait Anxiety Inventory (STAI)⁴⁰. Scores are on a scale from 20 to 80, with scores of ≥ 42 indicating an increased risk on anxiety⁴⁰.

To measure antenatal and postpartum symptoms of depression, we used the Dutch version of the ten-item Edinburgh Postnatal Depression Scale (EPDS)⁴¹. Scores range from 0-30. In line with Matthey⁴², we considered antenatal scores of 13 or above and postpartum scores of 10 and above to indicate risk of minor or major depression.

Data on life events during pregnancy was collected with a 46-item questionnaire, developed in the Avon Longitudinal Study of Parents And Children (ALSPAC)⁴³. We divided the events into four categories; A) work, finance or housing problems, B) partner relation and conflicts with loved ones, C) health, and sickness of self or loved ones and D) pregnancy related. The first three comprise a total of 26 items on employment, illness or death of loved ones and marital problems. The latter category includes seven items that are related to the current pregnancy, e.g. undergoing tests on potential congenital anomalies of the fetus, being told that it is a twin pregnancy, finding out that the partner does not want to have the baby, or finding out that something that happened that might be harmful for the fetus.

Information on mode of delivery and events that were related to the newborn was

retrieved from the midwives' or gynecologists' reports. We divided mode of delivery into A) unassisted vaginal delivery, B) instrumental vaginal delivery (i.e. forceps or vacuum extraction) and C) cesarean section, either elective or emergency. Events that relate to the newborn included preterm delivery (<37 weeks gestational age) and small for gestational age (i.e. >37 weeks gestational age but <2,500 grams).

Statistical analyses

Descriptive statistics for demographic variables, number of life events and levels of anxiety or depressive symptoms were calculated. To allow for valid comparison of effect sizes, we created Z-scores for the antenatal symptoms of anxiety and depression. Subsequently, we performed a series of multivariable linear regression analyses to quantify the associations under study. In a separate analysis, potential confounders were added (i.e. socioeconomic position and nulliparity). To investigate associations with anxiety or depression specifically, analyses were additionally adjusted for depressive symptoms in the analysis of anxiety, and vice versa.

Lastly, we assessed whether associations of specific life events and delivery complications with postpartum symptoms of anxiety or depression were modified by antenatal anxiety or depression.

Results

General descriptives

Mean levels for anxiety and depression were rather stable from the antenatal to the postpartum period (table 1), although symptoms of depression significantly increased between the antenatal and postpartum period (mean difference = 0.33, $p < 0.001$).

Table 1 Characteristics of the study population (N=3,842)

Age at inclusion, mean (min-max)	31 (17-45)
Nulliparity, n (%)	972 (40,7%)
Educational level	
Elementary or lower tracts secondary, n (%)	243 (8,5%)
Higher tracts secondary, n (%)	860 (30,0%)
Higher vocational , n (%)	1142 (39,8%)
University , n (%)	626 (21,8%)
No events related to the pregnancy ^a, n (%)	1551 (48,7%)
median (min-max)	1 (0-7)
No events related to health/sickness of self or loved ones ^a, n (%)	1950 (62,4%)
median (min-max)	0 (0-8)
No events related to partner relation/conflicts with loved ones ^a, n (%)	2445 (75,9%)
median (min-max)	0 (0-4)
No events related to work/finance/housing problems ^a, n (%)	1441 (45,2%)
median (min-max)	1 (0-10)
Mode of delivery, n (%)	
spontaneous vaginal delivery	1768 (74,8%)
vacuum or forceps extraction	240 (10,2%)
sectio	356 (15,1%)
Newborn is preterm or has low birth weight, n(%)	148 (6,2%)
Baseline level anxiety (STAI) ^b, mean (SD)	32 (9,06)
Postpartum level anxiety (STAI) ^c, mean (SD)	32 (10,32)
Baseline level depression (EPDS) ^b, mean (SD)	4 (3,70)
Postpartum level depression (EPDS) ^c, mean (SD)	5 (4,06)

STAI – Spielberger State Trait Anxiety Inventory (min-max 20-80)

EPDS – Edinburgh Postnatal Depression Scale (min-max 0-30)

^a experienced during pregnancy

^b pregnancy duration of 12 weeks

^c 5 months postpartum

Table 2 Associations of postpartum levels of anxiety and depression with antenatal symptoms, specific life events and delivery complications

	Postpartum anxiety (STAI)		Postpartum depression (EPDS)	
	Mean change (95%CI)	p-value	Mean change (95% CI)	p-value
Anxiety baseline	5.673 (5.305; 6.041)	<0.001	0.540 (0.327; -0.753)	<0.001
Depression baseline	2.750 (2.199; -3.300)	<0.001	2.444 (2.306; 2.582)	<0.001
Number of events related to the pregnancy^a	0.240 (-0.248; 0.728)	0.335	-0.015 (-0.199; 0.170)	0.877
Number of events related to health/sickness of self or loved ones^a	0.916 (0.492; 1.341)	<0.001	0.354 (0.197; 0.512)	<0.001
No events related to partner relation/conflicts with loved ones^a	1.951 (1.352; 2.550)	<0.001	0.544 (0.313; 0.775)	<0.001
Events - work/finance/housing problems	0.834 (0.565; 1.104)	<0.001	0.199 (0.096; 0.302)	<0.001
No events related to work/finance/housing problems^a				
spontaneous vaginal delivery vs. vacuum/forceps	-0.033 (-1.203; 1.137)	0.956	0.221 (-0.216; 0.657)	0.222
spontaneous vaginal delivery vs. sectio	-0.759 (-2.162; 0.643)	0.288	0.31 (-0.202; 0.869)	0.321
Newborn is preterm or has low birth weight	0.414 (-1.365; 1.193)	0.648	0.316 (-0.343; 0.976)	0.347

Multivariable linear regression analyses.

Antenatal levels of anxiety and depression were standardized by calculating Z-scores.

Analyses on postpartum anxiety were adjusted for baseline anxiety levels.

Analyses on postpartum depression were adjusted for baseline depression levels.

STAI – Spielberger State Trait Anxiety Inventory (min-max 20-80)

EPDS – Edinburgh Postnatal Depression Scale (min-max 0-30)

^a experienced during pregnancy

Regression analyses of associations between experienced life events and postpartum levels of anxiety or depression

Antenatal symptoms of anxiety and depression were statistically significantly associated with postpartum level of anxiety and depression ($p < 0.001$) (table 2).

All categories of number of life events that are not related to the pregnancy, delivery or newborn were significantly associated with higher levels of anxiety and depression in the postpartum period. Adding potential confounders did not notably change the associations. When adjusting for postpartum levels of anxiety, all associations between life events and postpartum depression lost their statistical significance. For anxiety, this was only true for life events that were related to sickness and health of self or loved ones and life events related to the partner relation or a conflict with a love one.

Moderation of the associations between experienced life events and postpartum levels of anxiety or depression by antenatal levels of anxiety and depression.

The associations between number of life events and postpartum symptoms of anxiety was only moderated by antenatal anxiety in case of events related to sickness and health of self or loved one. None of the associations between antenatal life events and postpartum levels of depression were moderated by antenatal levels of depression.

Discussion

The present study confirmed previous research showing that antenatal symptoms of anxiety or depression during pregnancy are strongly associated symptoms in the postpartum period. We showed that experiencing life events that were not related to the pregnancy, the mode of delivery or to the newborn were associated with elevated levels of anxiety and depression in the postpartum period. The association between postpartum levels of anxiety and events related to sickness and health of self or loved ones was found to be moderated by antenatal levels of anxiety.

Standardized effect sizes for levels of antenatal anxiety and depression were the highest of all predictor variables, indicating that antenatal symptomatology is the most important risk factor for having symptoms postpartum. This is in line with previous studies^{3,13-15,17}.

In our study, life events related to the partner relation or a conflict with a loved one, or to work, finance or housing problems increased the postpartum levels of anxiety and depression. In the general population, housing problems have been found to increase feelings of

stress⁴⁴. Also, foreclosure induced a decline in mental health⁴⁵. In addition, involuntary job loss and the past economic recession have been associated with higher suicidal rates^{46,47}. However, this was not studied in specifically in pregnant women and especially found to be more prevalent in men.

Experiencing a major recent life event is widely considered to be an important risk factor for depression. We therefore hypothesized that when maternal and neonatal outcomes were complicated, childbirth could be considered a major life event. Surprisingly neither the events related to delivery nor to the condition of the newborn were associated with change in levels of anxiety and depression symptoms. For mode of delivery, this is in line with most studies^{32,33,36,37}. One study found that mode of delivery increased depression scores in the postpartum period in nulliparous women⁴⁸. Their sample of women who had a caesarean section was however rather small (n=48).

Strengths and limitations

Some limitations have to be borne in mind. First, symptoms of anxiety and depression were based on self-report questionnaires. Although both are commonly used in the identification of symptoms and have shown to have good validity^{40,41}, no clinical diagnostic tools have been used in the present study to establish the severity of symptoms. Second, life events were assessed using a retrospective self-report checklist, which may have been prone to recall bias through its potential link with symptoms at the time of the assessments⁴⁹, although the total sample was large, we had encountered a high percentage of missing data on events during delivery (38.5%) and events related to the newborn (38.1%). As the statistical power to demonstrate associations with a change in levels of anxiety and depression may thus be limited, these analyses should be considered exploratory.

However, a major strength of the present study is the large, prospective, population based cohort (n=3,842). Additionally, to our knowledge, this study was the first to investigate the role of specific life events that are either more general or related to the pregnancy, delivery or newborn, in relation to the specific symptoms of anxiety or depression in the postpartum period.

Concluding

Experiencing life events during pregnancy that were related to the pregnancy, the mode

of delivery or the newborn were found not to be associated with an increase in levels of anxiety and depression. This is not different for women with and without antenatal anxiety or depression.

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