

Prenatal Depression, Mode of Delivery and Perinatal Dissociation as Predictors of Postpartum Posttraumatic Stress: An Empirical Study

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This longitudinal study evaluated the validity of earlier established predictors for postpartum posttraumatic stress (postpartum PTS) in a community sample of women ($n = 248$) in the Netherlands. Data was collected at 32 weeks gestation and at 3, 6 and 12 months postpartum by means of structured interviews. On the basis of the literature, an etiological model was defined with two pathways for the prediction of postpartum PTS. The model encompassed prepartum factors (e.g. depression in family, depression during life and depression during gestation), peripartum factors (e.g. type of delivery, experienced pain, social support by medical staff, supply of information and perinatal dissociation), and postpartum factors (e.g. postpartum depression). The model was evaluated by LISREL. Two pathways for postpartum PTS were confirmed: (1) delivery-related stressors predict postpartum PTS and (2) previous depression predicts postpartum PTS. Implications for mental health care during and after delivery are discussed. Copyright © 2005 John Wiley & Sons, Ltd.

Giving birth may be considered a major and sometimes extreme stressful event in the lives of many women (Arizmendi & Affonzo, 1987; Ayers & Pickering, 2001; Ballard, Stanley, & Brockington,

1995; Beech & Robinson, 1985; Bennet & Slade, 1991; Bydlowski & Raoul-Duval, 1978; Cohen, Ansara, Schei, Stuckless, & Steward (2004); Creedy, Shochet, & Horsfall, 2000; Czarnocka & Slade, 2000; Fones, 1996; Ichida, 1996; Moleman, Van der Hart, & Van der Kolk, 1992; Rand, 1986; Reynolds, 1997; Ryding, Wijma, & Wijma, 1997; Skari et al., 2002; Söderquist, Wijma, & Wijma, 2002; Soet, Brack, & Dilorio, 2003; Wijma, Söderquist, & Wijma, 1997). Various reports indicate that the partus may be experienced as traumatic by some women, even in normal vaginal hospital delivery and may result in subsequent post-traumatic stress

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(PTS) or even post-traumatic stress disorder (PTSD); studies suggest that about 2–6% of women will experience a PTSD reaction at some point in the early period after childbirth (cf. Cohen et al., 2004).

Both empirical and clinical literature describes several factors contributing to the experience of delivery as traumatic and to postpartum PTS or PTSD (Bailham & Joseph, 2003; Soet et al., 2003). Identified risk factors are: (1) *prenatal factors*, e.g. previous traumatic deliveries, history of primary infertility and complicated pregnancies, delivery of an ill or stillborn baby, pre-existing depression, a history of childhood sexual abuse, nulliparity, and a history of psychiatric/psychological counselling; (2) *nature and circumstances of delivery*, e.g. long, hard and extremely painful labour, forceps delivery, emergency caesarean section, lack of control; and (3) *subjective factors during childbirth*, e.g. feelings of powerlessness, staff experienced as unsympathetic, lack of social support during the delivery and afterwards, feelings of fear about harming the baby, fear of harm to self, and fear of dying oneself or death of the baby during labour.

Formerly, studies on postpartum PTS were rooted in obstetrical clinical practice (e.g. Arizmendi & Affonzo, 1987; Beech & Robinson, 1985; Bydlowsky & Raoul-Duval, 1978) with little or no connection with developments in the general post-traumatic stress field. Thus, it remained unclear whether specific findings regarding etiology of postpartum PTS in postpartum women correspond with findings in other populations experiencing potentially traumatizing events. Subsequent postpartum PTS studies have become more empirically oriented, but attempts at integrating their findings within the general field are scarce. As a result, findings in this area are not part of reviews or meta-analyses in the area of general PTSD (cf. Brewin, Andrews, & Valentine, 2000; Brewin & Holmes, 2003).

DELIVERY-RELATED RISK FACTORS FOR POSTPARTUM PTS

Stressor severity is a predictor for post-traumatic stress in a number of studies in the general post-traumatic stress field (see Brewin et al., 2000, for a review). McNally (2003), however, suggested that the dose–response connection between severity and subsequent PTSD is not generally found to be linear and might be quite complex.

Pain

In childbirth-related PTS studies, stressor severity is often defined in terms of intensity of the experience of pain (Beech & Robinson, 1985; Czarnocka & Slade, 2000; Goldbeck-Wood, 1996; Menage, 1993; Reynolds, 1997; Ryding et al., 1997; Soet et al., 2003). However, Söderquist et al. (2002) did not find a relation between experienced pain and high levels of postpartum PTS. In contrast, they established a relation between deliveries that are more technical (or intrusive) and high levels of postpartum PTS. As more technical delivery often goes with more pain, these findings leave the question unanswered of whether pain or type of delivery is the factor responsible for subsequent PTS. Trauma severity might be reinforced by complications during delivery or with the neonate, and there might be an interaction between pain and type of delivery.

Social Support

In his review, McNally (2003) mentioned the association between low social support and the occurrence of PTSD, while Brewin and Holmes (2003) stressed that negative social support and negative perception of social support may constitute a better predictor of PTSD than lack of social support. Both McNally and Brewin and Holmes based their conclusions upon PTS studies pertaining to other extreme stress situations than delivery. With regard to postpartum PTS, Bailham and Joseph (2003) stated that the role of social support as a protective factor remains unclear. This may be related to the fact that social support is a multidimensional concept with both moderating and mediating effects on mental status under stressful circumstances. However, in order to be effective, social support must be attuned to the situation or situation specific needs of the recipient (see, e.g., Cutrona, 1990). According to Shumaker and Brownell (1984), a distinction should be made between health-sustaining and stress-reducing types of social support: Emotional support constitutes the former type of social support, while informational as well as instrumental support constitute the latter type. These recommendations fit into Jacobson's (1986) stress-or-support specificity idea: An individual under stress needs information and guidance from others for dealing with the threats.

A few studies reported associations between types of social support and postpartum PTS. Creedy et al. (2000) found relationships between

emotional support from partner or family and perinatal dissociation, postpartum depression and postpartum stress. Czarnocka and Slade (2000) found associations between postpartum mental status and the stress reducing types of support: support from the medical team during delivery and information from the medical team during delivery.

Dissociation during Labour and Post-Traumatic Stress

The concept of peritraumatic dissociation, coined by Marmar et al. (1994), pertains to psychological reactions to extreme stress involving one or more of the following phenomena: depersonalization, derealization, feeling of detachment from the body, altered passage of time, numbing, absence of emotional reactions, reduced consciousness of environment. In various traumatized populations, peritraumatic dissociation has been found to be an important factor in predicting PTSD: survivors of a North Sea oil rig disaster (Holen, 1993), Vietnam veterans with PTSD (Kaufman et al., 2002; Marmar et al., 1994; Tichenor, Marmar, Weiss, Metzler, & Ronfeldt, 1996), survivors of the Oakland/Berkeley firestorm (Koopman, Classen, & Spiegel, 1996), emergency services personnel exposed to traumatic critical incidents (Marmar, Weiss, Metzler, & Delucchi, 1996; Weiss, Marmar, Metzler, & Ronfeldt, 1995; Ursano et al., 1999), and injured trauma survivors of motor accidents and terrorist attacks (Delahanty, Royer, Raimonde, & Spoonster, 2003; Freedman, Brandes, Peri, & Shalev, 1999; Fullerton et al., 2001; Shalev, Peri, Canetti, & Schreiber, 1996). Based on their study of assault victims, Birnes et al. (2003) recently concluded that peritraumatic dissociation is one of the robust predictors of PTSD.

In the area of childbirth-related trauma, Moleman et al. (1992) were the first to suggest that peritraumatic dissociation, which we denote as *perinatal dissociation*, is related to subsequent PTS. They presented three case reports of women traumatized during delivery, who responded with perinatal dissociation to the panic they experienced during labor. Panic ceased when these women dissociated from both their subjective physical experience and from contact with their surroundings. Two of them eventually developed PTSD. However, so far the question of whether perinatal dissociation predicts postpartum PTS has not been a subject for empirical study.

PREVIOUS DEPRESSION, AND POSTPARTUM POST-TRAUMATIC STRESS

Janet (1928, 1932), one of the pioneers in the post-traumatic stress field, stated that depression implies a lowering of the integrative capacity. Thus, pre-existing depression would affect one's capacity to master and integrate potentially traumatizing or highly stressful life events. Following this assumption, one could expect that, as a direct manifestation of integrative failure, depression or a high level of depressive symptoms before and during gestation predict perinatal dissociation (Van der Hart, Nijenhuis, & Steele, in press). Support for this idea was found for a history of previous stressful life-events and a history of psychiatric illness (Breslau, Davis, Andreski, & Peterson, 1991; Brewin et al., 2000; Bromet, Sonnega, & Kessler, 1998; Kessler, Sonnega, Bromet, Hughes, & Nelson, 1995). Freedman et al. (1999) found that depression during first months following trauma were the best predictors for PTSD at 4 and 12 months in civilian trauma survivors.

In their review on postpartum PTS, Bailham and Joseph (2003) did not refer to studies on the relationship between prenatal depression and postpartum PTS. More recently, however, Cohen et al. (2004) concluded from their retrospective study among 200 women that 'women who had depression during pregnancy [...] were more likely to have a higher number of PTSD-symptoms' (pp. 323, 324).

TOWARDS A MODEL OF POSTPARTUM PTS AND POSTPARTUM DEPRESSION

On the basis of the studies mentioned above, we developed an etiological path model of postpartum PTS. The core assumption of this path model involves the hypothesis that there are associations between prenatal and perinatal circumstances and PTS; including type of delivery, perinatal pain, perinatal dissociation, social support, previous and concurrent depressive status.

Type of Delivery and Pain

We specified *pain* and *type of delivery* as objective indicators of the aversive experience of the delivery in the model. We assumed that *pain* was a function of the *type of delivery*, and, based upon the literature, we hypothesized that the two aversive

experiences were related to perinatal *dissociation* and *postpartum stress*.

Prepartum and Postpartum Depression

In this model, we did not specify hierarchal or sequential unilateral relationships relationships between the different measures of pre-existing depression: *depression in family*, *depression during life* and *depression in pregnancy*. As we assumed that the variables were strongly correlated, we specified all covariances between these variables in the model. In addition we specified relationships between the measure of pre-existing depression and *postpartum depression* and *postpartum PTS*.

Social Support

As different types of social support play an important role in the perception and experience of an

event and mediate subsequent reactions on the event we specified social support from family (e.g. emotional support) and staff (e.g. informative support) in the model.

Figure 1 shows the basic multidimensional model of postpartum morbidity. The model was formulated on the basis of the literature on the relationships of the variables as discussed above. The hypothesized stress-reducing effect of the specified social support is represented with an arrow with a minus sign in the model.

METHOD

Design and Procedure

The present study was part of a research project followed from from 32 weeks pregnancy until one year postpartum (Verkerk, Pop, Van Son, & Van Heck, 2003), which in its turn was part of a larger research program in the Netherlands, i.e. the

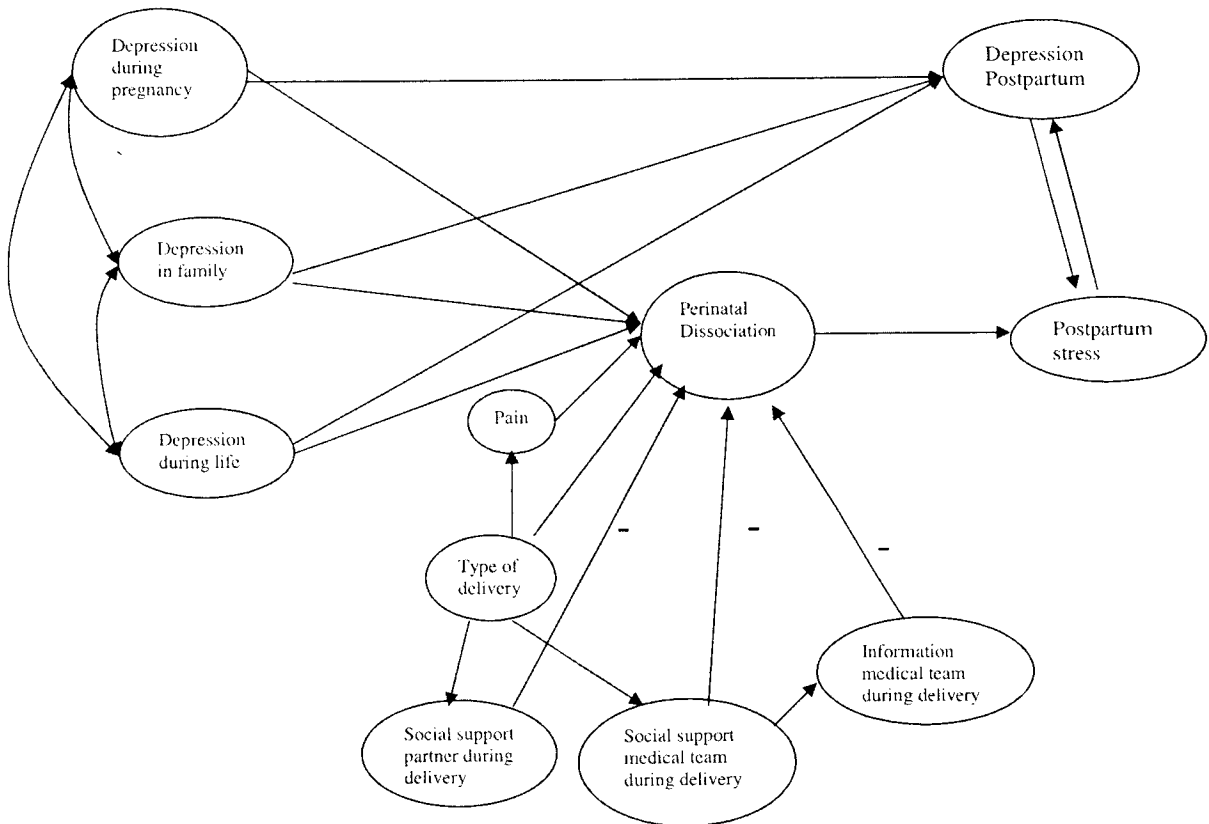


Figure 1. Basic model of relationships between depression, delivery characteristics and postpartum stress

Eindhoven Study on Postpartum Depression (Pop, 1991; Pop et al., 1995). Women who booked in for antenatal control were invited to participate to complete a questionnaire concerning risk factors for postpartum depression at 32 weeks pregnancy; responders were visited for an interview at 34 weeks pregnancy, and at 3, 6 and 12 months postpartum. During the interview depressive symptoms were assessed at 34 weeks pregnancy; dissociation, type of delivery, circumstances and experiences during delivery and were assessed at three months postpartum. PTS and depressive symptoms were assessed at 3, 6 and 12 months postpartum.

Participants

During the second trimester of pregnancy, all 2157 women who visited a midwife or obstetrician for antenatal control were invited to complete a screening questionnaire concerning risk factors for depression. 1618 women (75%) returned the questionnaire; of these, 1162 (72%) were eligible for the study (Dutch speaking, living in the region and

having returned a fully completed questionnaire), and 1031 (89%) consented to participate. From these 1031 women, we randomly selected 320 women and invited them to participate in the study. Seventy-two women (22%) dropped out of the study or had incomplete data. Thus, 248 women were included in the present study (Figure 2). Table 1 shows the characteristics of the participants.

ASSESSMENT

Demographic characteristics and risk factors for postpartum depression were assessed at mid-pregnancy (i.e. at 25 weeks gestation) by a questionnaire. Risk factors included personal history of depression, first grade family history of depression, poor relationship between subject's parents during childhood and severe depressive symptomatology during the second trimester of pregnancy (see Verkerk et al., 2003).

The *Impact of Event Scale (IES)* (Horowitz, Wilner, & Alvarez, 1979; Dutch version, Brom & Kleber, 1985) is a 15-item self-report questionnaire for

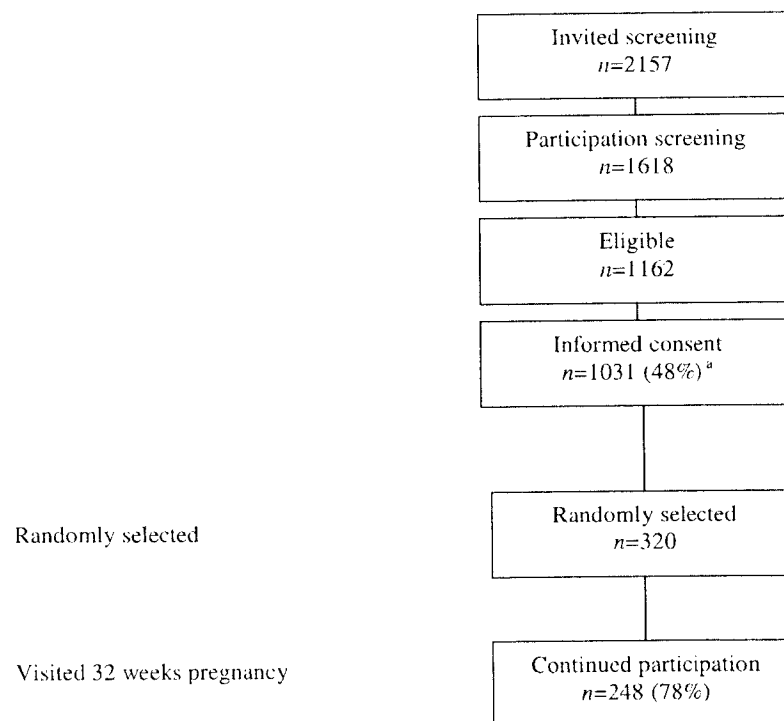


Figure 2. Design of the study and number of women interviewed at each assessment point

Table 1. Characteristics of the study group ($n = 248$)

	N	%
Demographic characteristics		
Age (years), mean (sd), range	31 (4.0) 19–43	
Age category		
>21	2	1
21–25	19	8
26–30	97	39
31–35	99	40
>35	31	12
Marital status (with partner)	233	94
Parity (primipara)	108	43
Educational level		
Low	39	16
Middle	135	54
High	74	30
Obstetrical factors		
Mode of delivery		
Spontaneous at home	64	26
Spontaneous in hospital	87	35
After induction vaginally	48	19
Forceps/vacuum	23	9
Caesarean section	26	11
Complications child during/after delivery	71	29
Subjective experience during delivery, mean (sd)		
Pain ^a	2.9 (1.2)	
Support medical team ^b	1.4 (0.9)	
Support partner ^c	1.3 (0.9)	
Information ^d	1.5 (1.0)	
Depression		
Previous episode of depression	86	35
Family history of depression	57	23
High level depressive symptoms pregnancy	26	11
Stressful life events during first 3 months postpartum	88	36

^a Five-point scale (1 = not at all; 5 = very much). ^{b,c,d} Five-point scale (1 = very good; 5 = not good at all).

assessing trauma-related stress symptoms involving symptoms of intrusions and avoidance relating to a specified event, in our case to delivery (cf. Shalev, Freedman, Peri, Brandes, & Sahar, 1997; Sundin & Horowitz, 2003). The IES proved to be a viable instrument in the Czarnocka and Slade (2000) study among women who delivered a healthy baby. Scores ≥ 26 are generally considered to indicate very serious post-traumatic stress; a score ranging from 8 to 26 should warrant serious clinical attention (Van der Velden, Van der Burg, Steinmetz, & Van den Bout, 1992). A suitable Cronbach's alpha has been reported for the Dutch version (Brom & Kleber, 1985; Brom, Kleber, & Defares, 1986). In the current study Cronbach's alpha for IES total score was 0.84, 0.82 and 0.80 at 3, 6 and 12 months postpartum, respectively. There are indications that the IES score may differentiate

between PTSD cases and noncases (Joseph, 2000; Larsson, 2000), despite the fact that the IES does not cover the increased-arousal symptoms that are part of the DSM-IV criteria for PTSD.

Peritraumatic Dissociative Experiences Questionnaire (PDEQ), subject version (Marmar, Weiss, & Metzler, 1997, 1998; Dutch version, Kleber & Van der Hart, 1998), is a 10-item self-report questionnaire covering dissociative experiences that participant recalls having had during a certain event, in our case the recent delivery, with each item describing such an experience including derealization, depersonalization, amnesia, out-of-body experiences, altered time perception, confusion, and disorientation. Subjects were asked, retrospectively, to fill in a 1–5 scale, resulting in a score range from 10 to 50 (maximum level of dissociation). Marmar et al. (1997) reported a Cronbach alpha of

0.81 (comparable with 0.83 at assessment at 3 months in our study). The PDEQ can be characterized as a reliable and valid instrument with a satisfying convergent, discriminative, and predictive validity.

The *Edinburgh Post-Natal Depression Scale (EPDS)* (Cox, Holden, & Sagovsky, 1987; Dutch version, Pop, Komproue, & Van Son, 1992) is a 10-item self report that assesses depressive symptomatology, with scores ranging from 0 to 30 and cut-off scores between 11 and 13 (Harris, Huckle, Thomas, Johns, & Fung, 1989; Murray & Carothers, 1990). The EPDS has been widely used during pregnancy and in the postpartum as well as in non-childbearing women (Cox et al., 1996; Becht et al., 2001). Recently, Dennis (2004) confirmed the adequacy of EPDS in a study among postpartum women. In the present study a cut-off of 12 was used to define high level of depressive symptoms, representing an adequate level of specificity while avoiding the more extreme cut-offs, as suggested by Green and Green (1994).

In the *12 Weeks Postpartum Structured Interview* participants were asked to answer questions about the delivery: experience of pain, experiences of social support from medical staff and partner, and having been adequately informed about the delivery. Moreover, in the structured interview participants were asked to report on the type of delivery, i.e. (1) spontaneous delivery at home or in the hospital, (2) hospital delivery after induction vaginally, (3) hospital forceps/vacuum delivery, or (4) caesarean section. The prevalence of these obstetrical modes is shown in Table 1.

Statistical Approach

We used multiple regression analyses to explore the likelihood of the earlier described associations between the outcome variables (e.g. depression and traumatic stress) and risk factors (e.g. history of depression, delivery characteristics) in the study sample. Both cross-sectional and longitudinal oriented regression models were tested. Significant relationships between study variables were specified in a non-recursive regression model and this model ('risk model,' not shown) was evaluated with LISREL 8 (Jöreskog & Sörbom, 1993).

Effects of the different types of social support on the outcome variables were tested according to the same procedure using multiple regression analyses. The significant relationships were specified in

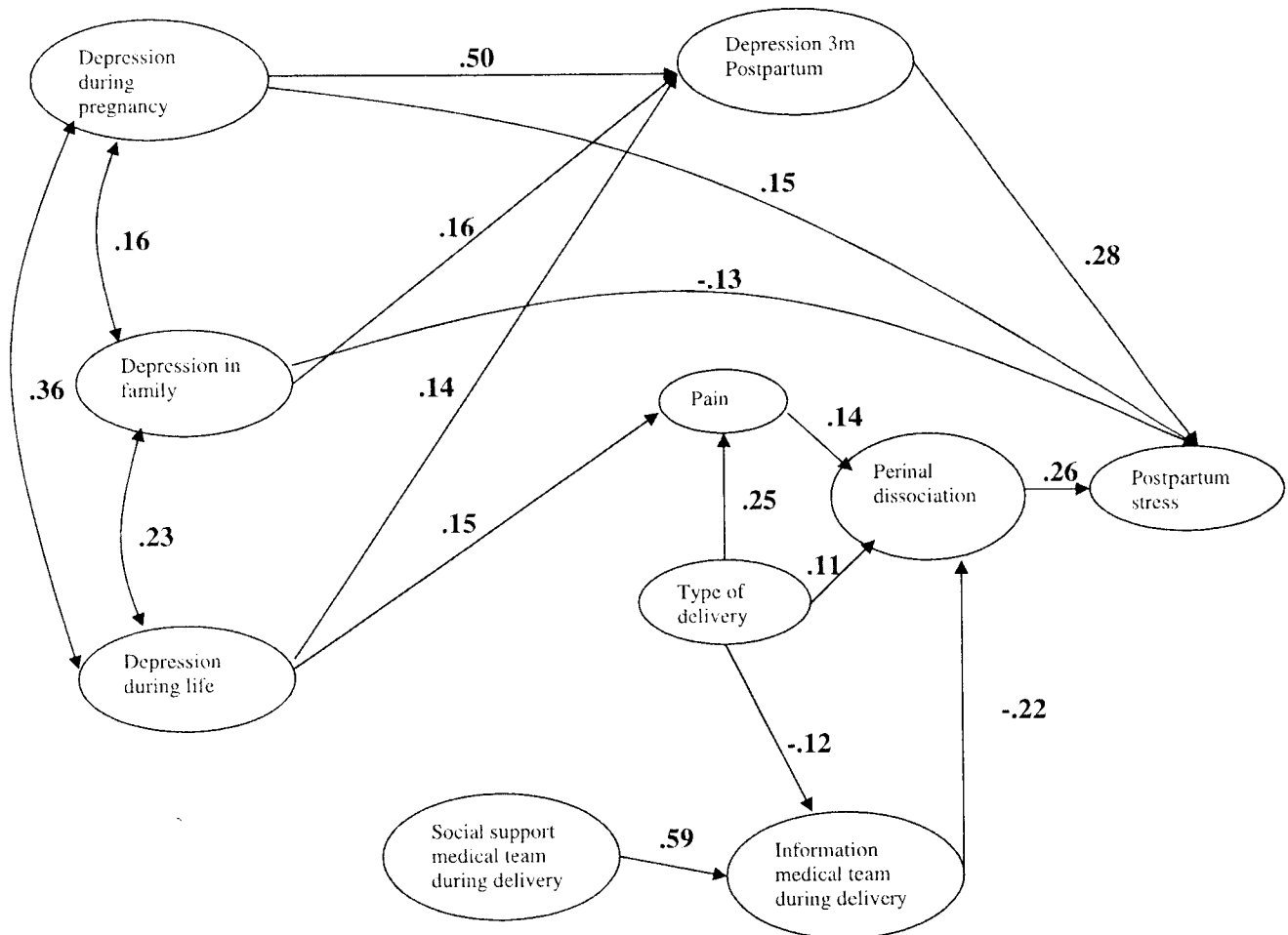
a next model ('support model,' not shown), which was also evaluated with LISREL 8.

The goodness of fit of the risk model and support model were estimated in the study sample to determine their validity. Goodness of fit measures used in this study were the following. (1) The chi square (χ^2) test as a measure of the discrepancy between the variance-covariance matrix of the variables used in the model and the variance-covariance matrix derived from the specified relationships in the model. A non-significant χ^2 refers to the validity of the specified relationships in a model as interpretations of the (co)variances in the data matrix. (2) Root mean square error of approximation (RMSEA). This estimate refers to the difference between the data variance-covariance matrix and the model-based matrix fit to the data, per degree of freedom. This estimate should be less than 0.05 to indicate close fit (Browne & Cudeck, 1993). (3) Non-normed fit index (NNFI); a value >0.90 indicates a good fit (Jöreskog & Sörbom, 1993; Byrne, 1998).

Figure 1 shows a more complex model, i.e. the basic model mentioned above that was formulated on the base of the 'risk model' and the 'support model.' We defined this model as our basic model for the study and evaluated its validity on the base of the described goodness of fit measures.

Based on the modification indices provided by LISREL, we specified a sequential hierarchically nested model and evaluated the model by means of the goodness of fit measures. In this new improved model we only specified relationships that were supported by references in the literature and improved the χ^2 value of the model by at least 10 units (e.g. modification index > 10). The improved model (Figure 3) only contained estimated paths with t -values > 2.00 , thus only paths with a significance of $p < 0.05$.

In a next step, the improved model (Figure 3) was expanded with longitudinal relationships between of the variables postpartum depression and postpartum PTS (e.g. the relations between different sequential measures at 6 and 12 months postpartum). This model was evaluated following the same procedures as used for the earlier models. The final model (Figure 4) was specified on the base of modification indices provided by LISREL and evaluated on the base of the goodness of fit measures. The models shown in Figures 3 and 4 were 'most likely best fitting models' (MLBF). These MLBF models were obtained from a sequential chi-square difference tests procedure, in which the χ^2 of the model of interest was significantly dif-



Standardized estimates in model have $p < 0.05$; $\chi^2(27) = 27.01$, $p = 0.46$; RSMEA = 0.0014, 90%ci= 0.0–0.05; NNFI = 0.99.

Figure 3. Structural equation model of relationships between depression, delivery characteristics and postpartum stress

ferent from a less saturated model but not significantly different from a more saturated model (e.g. Anderson & Gerbing, 1988). To avoid fully data driven path models, we only defined new paths in sequential nested models that could be (indirectly) derived from the literature and were non-irrational (e.g. backward specified relationship between sequentially measured variables).

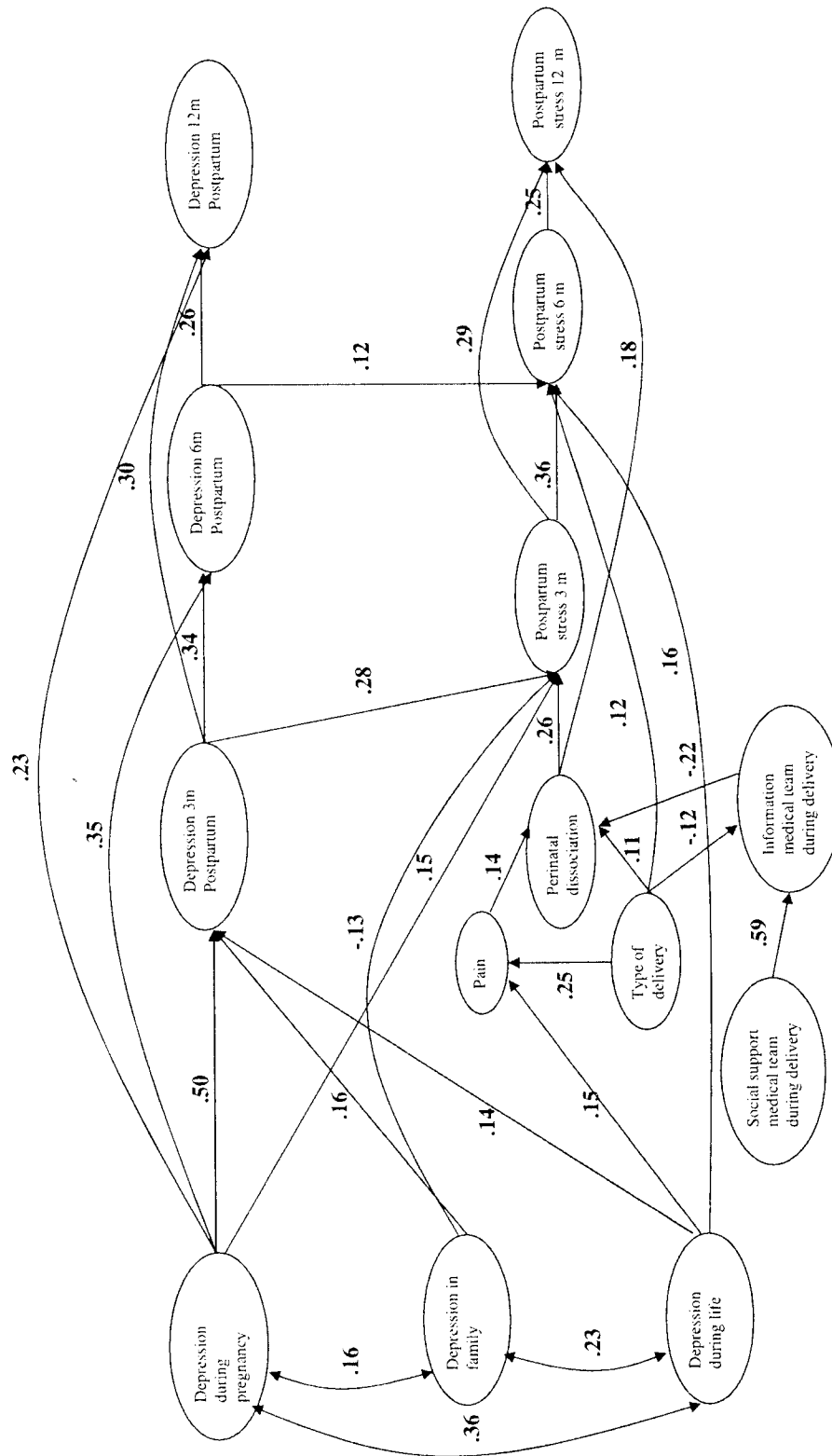
RESULTS

Characteristics of the Participants

The mean IES scores at 3 months and at 12 months postpartum were located within the limits of the

group that 'warrants serious clinical attention' ($8 < \text{IES} < 26$) (Table 2), encompassing 38 and 48% respectively of the women scoring within these limits (Table 3). Another eight and five percent of the women reported 'very serious PTS symptoms' ($\text{IES} > 26$) (Table 3). The mean level of reported perinatal dissociation was below the cut-off (Table 2); however, 19% of the women reported high perinatal dissociation ($\text{PDEQ} > 24$) (Table 3). The percentage of women with high level of depressive symptoms ($\text{EPDS} > 12$) encompassed six percent, a percentage that remained almost stable over the 12 months (Table 3).

Table 4 shows the different mean IES scores categorized along the severity of delivery procedure:



Standardized estimates in model have $p < 0.05$: $\chi^2(61) = 62.14$, $p = 0.44$; $RSMEA = 0.009$; $90\%ci = 0.0 - 0.04$; $NNFI = 0.99$.

Figure 4. Structural equation model of longitudinal relationships between depression, delivery characteristics and postpartum stress. Standardized estimates in model have $p < 0.05$; $\chi^2(61) = 62.14$, $p = 0.44$; $RSMEA = 0.009$; $90\%ci = 0.0 - 0.04$; $NNFI = 0.99$.

Table 2. Mean scores post-traumatic stress, perinatal dissociation and depressive symptoms at 3, 6, 12 months postpartum and dissociation ($n = 248$)

	3 months		6 months		12 months	
	Mean	(sd)	Mean	(sd)	Mean	(sd)
Post-traumatic stress						
IES total	9.6	(9.9)	7.9	(8.0)	9.7	(8.8)
Perinatal dissociation						
PDEQ	18.4	(7.1)				
Depression						
EPDS	5.2	(4.4)	4.4	(4.2)	4.2	(4.2)

Table 3. Prevalence of very serious post-traumatic stress, perinatal dissociation, and depressive symptoms at 3, 6, and 12 months postpartum ($n = 248$)

	3 months		6 months		12 months	
	N	%	N	%	N	%
Posttraumatic stress						
IES-total >26	20	8.1	7	3	12	5
8-25	93	38	104	42	119	48
Perinatal dissociation						
PDEQ > 24	47	19				
Depression						
EPDS > 12	16	6	14	6	13	5

Table 4. Mean scores pain, perinatal dissociation, and post-traumatic stress, at 3, 6, and 12 months postpartum ($n = 248$) in relation to mode of delivery

Mode of delivery	Pain		Perinatal dissociation		Post-traumatic stress		Post-traumatic stress		Post-traumatic stress	
	3 months		3 months		3 months		6 months		12 months	
	Mean	(sd)	Mean	(sd)	Mean	(sd)	Mean	(sd)	Mean	(sd)
Spontaneous at home	2.52	(0.94)	16.97	(6.99)	6.98	(7.85)	6.45	(6.38)	7.63	(7.26)
Spontaneous in hospital	2.75	(1.19)	18.09	(6.96)	10.41	(11.00)	7.47	(8.18)	9.83	(9.54)
After induction vaginally	3.23	(1.15)	18.80	(6.18)	8.75	(9.77)	8.69	(8.13)	10.11	(8.86)
Caesarean section	2.96	(1.40)	19.04	(7.80)	10.00	(9.33)	9.81	(9.81)	9.96	(9.56)
Forceps/vacuum	3.43	(1.31)	21.82	(8.04)	14.78	(10.01)	10.00	(8.89)	13.74	(7.96)

spontaneous at home, spontaneous at hospital, induction at hospital, caesarean section, forceps delivery. Analyses show that there is a linear trend in IES score along the dimension of severity of delivery procedure ($p < 0.05$), but the different mean scores do not differ ($p > 0.05$). Severity of delivery and IES score correlate (0.35; $p < 0.05$); shared variance being 10%. Regression analyses regarding percentage low and high scores on IES in relation to mode of delivery reveal only a difference between spontaneous at home and forceps delivery ($p < 0.05$).

Validity of the Basic Postpartum Post-Traumatic Stress Model

The basic model (Figure 1) had an unacceptable fit ($\chi^2(26) = 47.58$, $p = 0.006$). Social support from the partner had no significant relationship with perinatal dissociation, postpartum PTS, or postpartum depressive symptoms and was deleted from the subsequent models. Therefore, this basic model was changed by the release of non-significant esti-

mates and the definition of new relationships on the base of information (e.g. modification indices) provided by LISREL.

Validity of the Postpartum Post-Traumatic Stress Model, 3 Months Postpartum

The improved model (Figure 3) had a good fit ($\chi^2(27) = 27.01$, $p = 0.46$). Type of delivery, pain, and social support of midwife or medical team/information during delivery all had significant effects on perinatal dissociation; perinatal dissociation had a significant effect on PTS (all $p < 0.05$). Delivery and pain during delivery had no direct effect on PTS ($p > 0.05$). Depression, both during gestation, in family, and at 3 months postpartum, had direct effects on postpartum PTS (all $p < 0.05$) but not on perinatal dissociation ($p > 0.05$).

Both pathways, i.e. the pathway that involved stressors related to delivery and delivery related perinatal dissociation and the pathway that involved previous depressive conditions, had an independent effect on postpartum PTS (all $p <$

0.05). Previous depression had no direct effect on perinatal dissociation ($p > 0.05$). Depression during life had an effect on pain during delivery ($p < 0.05$). Independently, depression in family, depression during pregnancy, and depressive symptoms on 3 months postpartum had effects on PTS at 3 months postpartum (all $p < 0.05$).

PTS and postpartum depressive symptoms both emerged at three months postpartum, and both seemed to be related to different etiological pathways (all $p < 0.05$). Postpartum PTS had no effect on postpartum depressive symptoms ($p > 0.05$).

Validity of the Postpartum Post-Traumatic Stress Model, 6 and 12 Months Postpartum

The postpartum post-traumatic stress model, 3 months postpartum (Figure 3), was expanded with the PTS and depressive symptoms at 6 and 12 months postpartum (Figure 4). The elaborated new model had a good fit ($\chi^2(61) = 62.14, p = 0.44$). At 12 months PTS was affected ($p < 0.05$) by perinatal dissociation and indirectly by type of delivery, pain, and social support/information during delivery (all $p < 0.05$). PTS at 12 months postpartum was not affected by postpartum depressive symptoms at 6 and 12 months (all $p > 0.05$).

In contrast, PTS at 6 months was not affected by perinatal dissociation ($p > 0.05$), but by earlier PTS, mode of delivery, and depression during life and depressive symptoms at 6 months postpartum (all $p < 0.05$). As was expected, postpartum depression at 6 and 12 months was affected by depression in gestation and earlier in postpartum period (all $p < 0.05$), but not directly by depression in family or by depression during previous lifetime (all $p > 0.05$).

DISCUSSION

This study confirms the findings of previous studies that childbirth may induce PTS in a significant proportion of women. Forty percent of the participants manifested identifiable and clear signs of PTS, and another five percent experienced relatively high levels of postpartum PTS. The mean level of PTS did not level off from 3 months till 12 months, a characteristic which has been observed in at least one other postpartum group as well (cf. Bailham & Joseph, 2003). In our group postpartum PTS appeared to be associated very weakly with severity–intrusiveness of delivery procedure. This is in accordance with McNally's (2003) conclusion, based on his review of the empirical studies in

the general traumatic stress field, that there is no dose–response connection between severity of the event and subsequent PTSD.

The aetiological model of postpartum PTS presented here was based upon earlier studies on childbirth-related PTS and PTSD, as well as on post-traumatic stress studies pertaining to other types of extreme stressor. Our findings confirm the existence of the two pathways to postpartum PTS that we hypothesized: (1) a *perinatal dissociation pathway*, involving stressor-related issues, in particular perinatal dissociation; and (2) a *depression pathway* involving (earlier) depression conditions.

With regard to the perinatal dissociation pathway, we found that pain as well as intrusiveness of delivery procedure were associated with perinatal dissociation. The more intrusiveness or the more pain, the more perinatal dissociation. These findings support our earlier expectation with respect to the interaction between pain and type of delivery, and they are consistent with studies on PTSD after extreme stressful events other than delivery (cf. Brewin et al., 2000). However, Marshall and Schell (2002) suggested that associations between intrusiveness and pain respectively and subsequent PTSD may be an artefact of the studies, as these included delayed retrospective reports of peritraumatic dissociation.

In contrast to our expectation, social support by partner (Creedy et al., 2000) was not associated with either perinatal dissociation or postpartum PTS. However, information given by the medical staff about the procedure during delivery, which we interpreted as social support from the medical staff, acted upon perinatal dissociation. Our findings suggest a moderating role of information on the influence of pain and intrusiveness of delivery on perinatal dissociation. This is in accordance with findings in the general traumatic stress field, i.e. that informational and instrumental support are stress reducing (Jacobson, 1986; Shumaker & Brownell, 1984).

Delivery procedure, pain, and social support/information from medical team during delivery are all associated with perinatal dissociation, but not directly with PTS (with one exception, i.e. at 6 months postpartum). As perinatal dissociation is clearly associated with PTS at all time points, there appears to exist a well defined pathway from perinatal dissociation to PTS. This is a finding consistent with those of other stressor-related studies regarding the role of peritraumatic dissociation in the development of PTS and PTSD (e.g. Brewin et al., 2000; McNally, 2003), which had

not yet been established in the area of delivery-related PTS.

The moderating role of perinatal dissociation between pain and intrusiveness on the one hand and subsequent postpartum PTS on the other may explain conflicting findings in earlier research: Czarnocka and Slade (2000) and Soet et al. (2003), for instance, found a relation between intrusiveness of delivery procedure and pain respectively and postpartum PTS, while Söderquist et al. (2002) did not find any association between pain and postpartum PTS.

Perinatal social support from family did not moderate postpartum PTS, whereas perinatal support from medical staff—instrumental and informational—was found to moderate the relation between type of delivery and PTS. The relation between social support and PTS appeared to be mediated by perinatal dissociation.

The second pathway in our etiological model, i.e. the *depression pathway*, was based upon the notion that pre-existing depression may lower one's integrative capacity and, hence, may predict peritraumatic dissociation, as a direct manifestation of integrative failure, and postpartum PTS. Our data did not confirm the hypothesized association between pre-existing depression and perinatal dissociation. However, a depression pathway directly to PTS was confirmed: Depression during gestation, depression in family, and depression earlier in life all interrelate and act upon postpartum depression; all types of depression act directly upon postpartum PTS, except at 12 months postpartum. This depression pathway is partly compatible with the conclusion by Freedman et al. (1999) that, in civilian trauma survivors, depression during the first months following trauma was the best predictor for PTSD at 4 and 12 months. Our results further indicate that, even in the case of co-occurrence, postpartum PTS and postpartum depression are products of different etiological pathways. Thus, they should be seen as independent mental conditions of distress.

The validation of our etiological model of postpartum PTS included a one-year follow-up period and confirmed the two separate etiological pathways of PTS: the peritraumatic dissociation pathway and the depression pathway. PTS at 12 months postpartum was directly and indirectly associated with perinatal dissociation: directly as there is a direct association between dissociation at birth and PTS 12 months later; indirectly as PTS at 3 months was associated with peritraumatic dissociation and was associated with PTS at 6 months,

which in turn was associated with PTS at 12 months. PTS at 6 months was only indirectly related to perinatal dissociation, and it was also directly predicted by intrusiveness of delivery procedures (which was not found at 3 months and 12 months).

As is found in other stressor-related studies (cf. Andrews, Roce, & Kink, Brewin, 1999), our follow-up results indicate that there is a significant association between early postpartum PTS and PTS at follow-up and at 6 and 12 months.

The *depression pathway* was also established over a one-year postpartum period. PTS at 6 months postpartum was directly related to depression earlier in life. PTS at 3 and at 6 months was related to postpartum depression, but PTS at 12 months was not. These findings are in line with those of Freedman et al. (1999) in other stressor-related situations and they are partly in line with the notion that pre-existing depression may hinder the integrative capacity.

Taken together, our findings seem to indicate that (1) perinatal dissociation-mediated etiology is characteristic of postpartum PTS, although not at all points in time, and that (2) depression may directly contribute to the occurrence of PTS—however, not at 12 months postpartum. At six months, PTS is directly associated with type of delivery and with depression during life, unlike PTS at 3 and 12 months postpartum. This coincides with the fact that our participants reported a relatively low percentage of high levels of PTS at that time (3% in contrast to 8% at 3 months and 5% at 12 months) and a relatively low mean score of PTS. We do not have an explanation for the former or latter finding.

Theoretical Implications

Peritraumatic dissociation was identified as a major factor in the etiological pathway of postpartum PTS: a finding similar to those of studies that related PTS to other kinds of major stressor (cf. Brewin et al., 2000). A second major finding is that another personal factor, i.e. previous depression and postpartum depressive symptoms, constitutes an etiological factor in the occurrence of postpartum PTS, as is found in PTSD studies involving different types of stressor (cf. McNally, 2003) and in at least one study on partus-related PTSD (Cohen et al., 2004). However, we did not find that previous depression enhances peritraumatic dissociation, as we assumed based on Janet's idea about

the disintegrative capacity of depression during potentially traumatizing or highly stressful life events (Janet, 1928, 1932).

Postpartum PTS shares significant characteristics with PTS related to other types of major stressor in terms of etiology. Thus, theories on PTS linked to other major stressors may be applicable to postpartum PTS. Given these shared characteristics, on the other hand, studies on postpartum PTS may make important contributions to the general traumatic stress field. Childbirth is a highly predictable event. Thus, such studies can be truly prospective.

It should be noted, however, that associations between PTS and the other variables in our model range from 0.12 to 0.36, implying that these elements are only partly predicting PTS. We should, therefore, conclude that other elements not included in the model may also be important in the prediction of postpartum PTS.

Clinical Implications

In harmony with some epidemiological studies (e.g. Czarnocka & Slade, 2000; Skari et al., 2002), in our group postpartum PTS is not uncommon. In addition, our findings show that this is even the case at a one-year follow-up. Even if only a small group of postpartum women with early PTS symptoms develops PTSD, early detection of risk factors seems to be relevant for prevention of PTS (e.g. Freedman et al., 1999). Therefore, the findings of this study could give direction to attention given by health care workers to women in labour and postpartum. With regard to the *perinatal dissociation pathway*, the prevention of, and attention to dissociative responses during delivery seems to be important in the prevention of postpartum PTS. Staying in contact with the woman in labor is essential, and the medical staff's providing adequate information during delivery may reduce perinatal dissociation. This is especially important during intrusive delivery procedures, such as forceps and vacuum delivery.

With regard to the *depression pathway*, health caretakers should be aware of the potential co-occurrence of depression and PTS. Our findings show associations between postpartum depression and postpartum PTS that parallel those of other studies reporting high prevalence of co-morbid depression in patients with PTSD (e.g. Freedman et al., 1999). Treatment of PTS, if necessary, or of PTSD might remain incomplete and partly ineffective if the co-morbid depression is not treated as well.

Limitations

Nearly all participants were Caucasian, living in a semi-urban area, and as such may not be representative of pregnant women living in, for instance, inner cities. Furthermore, our findings may be influenced by typical Dutch health care practice with intensive postpartum health care in combination with a relative high prevalence of home deliveries (26% in the current study). As such, our population may not be representative of populations in other countries.

Moreover, the random selection of participants from the population—especially as they were all consenting to participation in a long-term study—may still have created a special group. However, there is no reason why this could have resulted in a bias affecting the relations between the variables mentioned in the model.

Since no clinical diagnostic procedures were applied, all generalizations to PTSD, however plausible, should be looked upon with care.

The major variables, PTS, perinatal dissociation, and depression, were assessed by standardized self-reports, which may have strengthened associations as a result of a systematic response bias, in particular at 3 month postpartum, when EPDS, PDEQ, and IES were administered during the same session. However, these assessment procedures reportedly have sound psychometric characteristics, because of which this bias may have been moderate. Furthermore, the 3 months postpartum retrospective report of perinatal dissociation may have been affected by memory bias and by the mental condition of the respondents at the time of assessment: a suggestion made by Marshall and Schell (2002), who in their study of community violence survivors found that 3 months assessment of dissociation differed from assessment within days after the extreme event. Reports of severity of pain and intrusiveness of the delivery procedure, as well the evaluation of perinatal support, may also be affected by the retrospective character of the assessment.

We recommend that replications of this study include measurement of perinatal dissociation directly during delivery or during the first week following the delivery. In order to be able to generalize the model to PTSD, structured clinical interviews to establish DSM-IV diagnoses of PTSD and depression should be used.

In short, childbirth may for a minority of women be a traumatic experience resulting in post-traumatic stress symptoms (PTS). Two etiological

pathways for postpartum PTS were confirmed. (1) Delivery-related stressors predict postpartum PTS; in particular, perinatal dissociation proved to be crucial. (2) Previous and co-occurring depression predict postpartum PTS. Our results indicate that etiological factors in other stressor-related-PTS(D) appear to be similar to those in delivery-related PTS, suggesting similarity between these types of PTS as well. From this point of view, delivery-related PTS may be considered an example of 'general' PTS. Therefore, the study of delivery-related PTS may serve as a model for studies on PTS in general. Research on delivery-related PTS has the advantage of certainty about the approximate date of the event and hence prospective studies are more viable in this type of stressor than in most other ones. The restriction is, of course, that only a small minority of women experience giving birth as a traumatic event.

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