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Posttraumatic stress following childbirth in homelike- and hospital settings

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Abstract

Objective. To assess the prevalence of posttraumatic stress disorder (PTSD) following childbirth in homelike versus hospital settings and to determine risk factors for the development of posttraumatic stress symptoms.

Methods. Multi-center cross-sectional study at midwifery practices, general hospitals and a tertiary (university) referral center. An unselected population of 907 women was invited to complete questionnaires on PTSD, demographic, psychosocial, and obstetric characteristics 2 to 6 months after delivery. Prevalence of PTSD was based on women who met all criteria of the diagnostic and statistical manual of mental disorders, 4th edition (DSM-IV), whereas risk factors were determined using the severity (sum-score) of posttraumatic stress symptoms.

Results. PTSD following childbirth was found in 1.2% of the respondents (5/428 women, response rate 47%), while 9.1% of women (39/428) had experienced the delivery as traumatic. Posttraumatic stress symptoms were associated with unplanned cesarean section, low sense of coherence (coping skills), and high intensity of pain. Initial differences in posttraumatic stress symptoms between home and hospital deliveries disappeared after taking into account the (by definition) uncomplicated nature of home births.

Conclusion. In this Dutch study, 1 in 100 women had PTSD following childbirth, with no differences between home- and hospital deliveries after controlling for complications and interventions. Emergency cesarean section, severe labor pain, and poor coping skills were associated with more posttraumatic stress symptoms.

Keywords: *Posttraumatic stress syndrome, childbirth, obstetrics, perinatal mental health, postpartum*

Introduction

Posttraumatic stress disorder (PTSD) is an anxiety disorder that can develop following confrontation with a traumatic stressor. The most characteristic symptoms are re-experiencing the event, avoidance of stimuli associated with the event, and hyperarousal [1]. Over the past decade, increasing attention has been devoted to childbirth as a possible traumatic event [2,3].

Studies performed between 1 and 6 months postpartum estimated that the prevalence of PTSD following childbirth ranged from 0.0 to 5.9% [2–13], although according to experts, 1–2% is a realistic estimate in developed countries [14]. Comparison of the findings in different studies should be done with the utmost caution, due to variations in operationalization (e.g. use of a selection of DSM-IV criteria versus all of them, different questionnaires and scoring methods), timing of measurements, and sample composition [15].

Previous studies have identified many obstetric, personality, and psychosocial factors that contribute to the development of PTSD following childbirth,

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whereas demographic factors, such as age, marital status, and educational level, were consistently found to be unrelated to PTSD following childbirth [2,5,9,10]. Additionally, no associations were observed between parity and PTSD [5,6,8–10], especially after other variables had been taken into account, such as mode of delivery [4]. Obstetric interventions (e.g. emergency caesarean section and instrumental vaginal delivery) increased the risk of posttraumatic stress symptoms, which suggests a dose-response relationship between the intensity of the event and the risk of developing PTSD [6,16]. In contrast, other studies have shown that vulnerability to mental problems is a stronger predictor than the objective severity of the event. While the possible influence of personality characteristics such as more general state anxiety, trait anxiety, and coping strategies is controversial [6,8,10,17], strong associations were consistently found between anxiety/depression during pregnancy and PTSD after childbirth [8,9,13]. The perceived degree of support, care, and communication from the staff who assisted in the birth played crucial roles in how women reflected on the experience [10]. Moreover, (subjective) experience and appraisals of childbirth were reported to be chief determinants in the development of PTSD [2].

Obstetric health care in The Netherlands comprises a fairly unique echelon system. All healthy women with uncomplicated medical and obstetrical histories enter the primary care system, where pregnancy and delivery are monitored by independent midwives. Only in case of (an increased risk for) complications or interventions during pregnancy or delivery (as defined by national guidelines [18]), women are referred to a gynecologist/obstetrician in a general hospital (secondary care) or university referral center (tertiary care). The majority of women (66%) eventually deliver in a hospital under supervision of a gynecologist [19]. In primary care, women can choose to deliver at home (23%) or in a homelike setting in a hospital or birth center (11%) [20]. Referral during labor is not uncommon: 26% of women who start labor in primary care are referred to secondary care during the course of labor. Delivery settings greatly influence women's appraisals of childbirth: a large Cochrane review concluded that, compared to conventional hospital settings, women who delivered in a homelike setting reported higher satisfaction and had lower intervention rates [21]. In a recent Dutch study, women who had received prenatal and/or perinatal care from midwives in primary care settings described their childbirth experience as more negative after (a) hospital deliveries (compared to home births), (b) referral during labor, (c) emergency cesarean sections, and (d) instrumental vaginal deliveries [22]. It is not yet known whether these women are more likely to develop posttraumatic stress symptoms after hospital births.

The Dutch echelon system provides excellent opportunities to compare the occurrence of posttraumatic stress symptoms between homelike settings and hospital settings. Our aim was to evaluate the prevalence of PTSD following childbirth in all three care settings in The Netherlands, especially in relation to differences in obstetric complication and intervention rates between the echelons. In addition to a number of previously reported risk factors for PTSD following childbirth, we examined the possible relation between PTSD and sense of coherence (SOC) and desire for control (DFC). We anticipated that women with high DFC have more PTSD symptoms, because in a previous study, the prevalence of PTSD was higher among women who felt they had lost control during childbirth [10]. SOC refers to the ability to perceive a stressor as comprehensible, manageable, and meaningful [23]. We expected that women with high SOC have fewer PTSD symptoms. High SOC is considered to be synonymous with effective coping mechanisms.

Methods

Design and setting

This cross-sectional multi-center study was conducted on a consecutive sample of puerperal women in The Netherlands. Two general hospitals (Apeldoorn and Breda), one tertiary (university) referral center (Groningen), and four midwifery practices in these cities were involved in data collection. This study was approved by the Medical Ethics Committees of the participating hospitals.

Data were collected from women who had delivered between 1 July 2007 and 1 October 2007. The interval since data collection has enabled us to perform extensive (new) analyses and to explore the steadily increasing array of potential risk factors.

Population

Women who had delivered 2 to 6 months prior to the study were eligible for inclusion. The rationale for this timing was that the DSM-IV criteria require symptoms to be present for at least 1 month, and the researchers wished to minimize the chances that women had experienced a subsequent pregnancy and/or childbirth. In order to obtain an adequately large sample, a written request was sent to all the eligible women, followed by a reminder to non-responders. A maximum of 200 women per hospital and 100 per midwifery practice were applied to ensure ratios of home/hospital and first/second/third echelon births that were comparable with those in the Dutch population of childbearing women. Women who delivered after 16 weeks of gestation or longer were approached, including women with pregnancy terminations and stillbirths.

Measures

Participants were invited to complete a web-based questionnaire on the basis of anonymity in relation to their health care providers, which implied that participants would not be informed or contacted in the case of clinically significant symptoms. Variables and outcome measures (PTSD) were not mentioned explicitly in the invitation letter.

The Traumatic Event Scale-B (TES-B) [2] was used, which has been developed specially to diagnose PTSD following childbirth. In line with the DSM-IV, PTSD was considered to be present when a respondent reported at least one out of five re-experiencing symptoms (criterion B), three out of seven avoidance symptoms (criterion C), and two out of five hyperarousal symptoms (criterion D). Respondents rated the 17 symptoms on a 4-point scale (0–3); a minimum score of 2 ['sometimes'] was considered to reflect the presence of a symptom. In line with previous research [4,17], the sum-score of these 17 symptoms (range 0–51) was calculated to evaluate associations with the possible contributing factors mentioned below. Criterion A (traumatic experience) was met when a woman reported having felt fear, helplessness and/or horror during childbirth, and considered the childbirth *a trying experience*, or a threat to the physical integrity or life of herself and/or the child. The duration of symptoms (E criterion) should be at least 1 month, and women should rate the degree to which their life is influenced by the symptoms (criterion F) as higher than 5 on a 10-point scale. Women should meet all criteria (A–F) for a PTSD diagnosis.

A specially designed 30-item open-question and multiple choice questionnaire was administered to obtain data on demographic factors, obstetric background, logistic features of the delivery, and aspects related to pregnancy and childbirth. The following pregnancy complications were recorded: hypertension, pre-eclampsia/HELLP syndrome, antenatal blood loss, intra-uterine death, congenital defects, preterm premature rupture of membranes (PPROM), and membranes ruptured longer than 24 h. Delivery complications include: unplanned cesarean section, instrumental vaginal delivery, postpartum hemorrhage, manual placenta removal, suturing at operating theater, ICU admittance, meconium-stained amniotic fluid, asphyxia, neonatal infection treated with antibiotics, NICU admittance, and perinatal death. In addition, several questions were included to address the woman's expectations concerning delivery (fear of childbirth (*FoC*) and fear of pain (*FoP*)) and her appraisal of the delivery (delivery as expected, pain as anticipated, intensity of pain).

The Hospital Anxiety and Depression Scale (HADS) [24,25] is a widely used screening instrument for measuring depression and anxiety. It has been designed especially for the hospital (somatic patient) setting, disregarding all possible somatic components of depression and anxiety, in order to avoid confounding with symptoms of somatic conditions. The HADS contains seven items to measure anxiety and seven to measure depression, which are rated on a 4-point scale (0–3). In order to achieve optimal sensitivity and specificity (approximately 0.80), anxiety and depression were measured as a dichotomy with a cut-off point of 8 or more on both scales [26].

DFC was assessed using a validated 13-item questionnaire (with 7-point Likert scales) to derive a sum-score [27]. The frequently used SOC Questionnaire developed by Antonovsky was administered to measure the SOC construct. It contains 20 statements that can be rated on 7-point Likert scales [23].

Statistical methods

Data were analyzed with SPSS 14.0, using a significance level of 0.05. Exploration of the continuous data revealed that the TES-B sum-scores were not normally distributed. Therefore, Spearman's rho, Kruskal–Wallis, and Mann–Whitney *U* tests were used to make non-parametric group comparisons. A set of interactions was entered into a linear regression model to examine whether SOC and DFC acted as moderators. Hierarchical multiple regression analysis (HMRA) investigated which factors were associated with posttraumatic stress symptoms. TES-B sum-scores were log-transformed to meet the assumptions of normality ($\text{TESlog} = {}^{10}\log(\text{sum-score}+1)$). Variables with a p value of lower than 0.10 in the univariate analyses were included in the HMRA. Three variables were excluded from the HMRA due to multicollinearity; (1) *FoP* overlapped with *FoC*. Since *FoP* is a known component of *FoC* (rather than the other way around), *FoP* was excluded; (2) *pain worse than expected* overlapped with *pain intensity*. Since pain *intensity* is a continuous variable (scale 1–10) that is more detailed than *pain as expected* (i.e. three options: worse, less, 'as expected'), *pain worse than expected* was excluded; (3) *complications delivery* overlapped with some more specific complications (*unplanned cesarean section, instrumental vaginal delivery, preterm delivery)*, *complications delivery* was excluded.

Results

A total of 907 eligible women who had delivered between 1 July 2007 and 1 October 2007 were invited to participate; 428 of them completed the questionnaires. The total response rate was 47%, and the response rates per echelon (primary/secondary/

tertiary) were comparable (43–50%). Owing to strict patient privacy laws, the patient files of the non-responders could not be examined.

Non-parametric binomial tests revealed the following (dis)similarities between our respondents and data from the entire Dutch population of child-bearing women [19]: the proportions of deliveries in primary care and home births were similar (35.3 vs. 33.6% and 20 vs. 23%, respectively); the percentages of multiple pregnancies (2.1 vs. 2.0%), preterm births (gestational age of 37 weeks or less: 9.1 vs. 7.9%), cesarean sections (16.7 vs. 15.1%) and instrumental deliveries (8.7 vs. 9.7%) were comparable; non-western immigrants were underrepresented among our respondents (7.0 vs. 17.3%); at the time of delivery, fewer women were < 25 years (5.6 vs. 11.7%) and more were > 35 years (28.3 vs. 21.9%) than the national average; our sample comprised slightly more primiparous women (49.8%) than the national average (45.1%), while the proportion of women with hypertensive disorders (11.9 vs. 8.3%) was somewhat higher than would be expected from the national data. Table I presents an overview of the characteristics of our participants, including differences between the three echelons. In primary care, women are higher educated than in the second and third echelon. Pregnancy complications are much lower in primary care, as they are an indication [18] for referral to or consultation of a gynecologist (secondary care). In tertiary care, hypertension and congenital defects are quite common (30.6% for both), as well as pre-eclampsia/HELLP syndrome (19.4%), PPROM (13.9%), preterm delivery (58.3%), NICU admittance (55.6%), and perinatal death (16.7%).

In total, 1.2% of the women (5/428) met all the DSM-IV criteria for PTSD. DSM-IV symptom criteria (B, C, and D) were met by 3.7% of the respondents (16/428), while 9.1% of the women (39/428) had experienced the childbirth as traumatic (criterion A). Further details regarding the proportion of women scoring above cut-off scores for each set of items can be found in another article on the same study [15]. Median sum-score on the 17 items was 4, with a mean of 6.3. A sum-score of 0 (i.e. no symptoms) was found in 17.5% of the women (75/428). Sum-scores were higher ($p = 0.001$) at 4–6 months after delivery than at 2 or 3 months after delivery.

As measured with the HADS, the prevalence rates of clinically significant anxiety and depression symptoms were 22.7 and 14.3%, respectively. Anxiety and depression scores did not differ between the three echelons of care (primary/secondary/tertiary). Pearson's correlation between the TES-B and HADS sum-scores was 0.66. Women who met the cut-off point of 8 on the anxiety subscale had significantly higher TES-B sum-scores than those who did not (12.8 vs. 4.4; $p < 0.001$). Similarly, for depression, these sum-scores were 11.1 and 4.4 ($p < 0.001$).

Associations between each of the independent variables and the TES-B sum-score (i.e. posttraumatic stress symptoms) are shown in Table II. Women with deliveries in primary care had significantly lower mean sum-scores (5.0) than those in secondary care (6.7) or tertiary care (9.3). Home deliveries were also associated with fewer PTSD symptoms than hospital deliveries, irrespective of whether the latter had been planned or followed referral during labor (mean TES-B sum-scores: 4.5, 6.8, and 7.0, respectively; $p = 0.015$). Among women delivering in primary care, there was no difference in TES-B sum-scores between women with planned homebirths and those with planned hospital births (4.5 vs. 5.7; $p = 0.273$). However, among women with planned home deliveries, those actually giving birth at home had fewer posttraumatic stress symptoms than those who were referred to the hospital during labor (mean TES-B sum-score 4.5 vs. 7.0; $p = 0.024$). Overall, no difference in posttraumatic stress symptoms was found between women with planned homebirths and women with planned hospital births (mean TES-B sum-scores 4.7 vs. 6.8; $p = 0.353$).

Women who delivered in secondary or tertiary care experienced their childbirth more often as traumatic than those in primary care (12.1 vs. 3.4%). FoC and FoP were strongly correlated (Spearman's rho = 0.78, $p < 0.001$) and higher levels were connected with higher TES-B sum-scores. No difference in the levels of FoC were found between women with planned home deliveries and those with planned hospital deliveries under the supervision of a midwife (average rating 3.2 vs. 3.5; $p = 0.429$). The percentage of women reporting the delivery to be 'worse than expected' was higher among those with hospital deliveries (33%) and referral during labor (39%) than among women with home deliveries (9%; $p < 0.001$). The average rating of pain intensity (on a scale from 1–10) was significantly higher in women who received pain relief during labor (cesarean section excluded) than in those who did not (7.5 vs. 5.9; $p < 0.001$).

The relationship between age and posttraumatic stress symptoms proved to be non-linear; younger and older women reported less symptoms than the women around the age of 30 years. Primiparous women had higher scores than multiparous women, which indicates more posttraumatic stress symptoms. After controlling for the mode of delivery, the association between parity and posttraumatic stress symptoms was no longer significant. Higher sum-scores were found in women with pregnancy complications and/or delivery complications ($p = 0.006$ and $p = 0.027$, respectively). Analysis of the pregnancy complications listed in Table I

Table I. Population characteristics and differences between the three echelons of care.

Factor		N or M (±SD)	Percent or range	Primary care (N=151) Percent or M (±SD)	Secondary care (N=241) Percent or M (±SD)	Tertiary care (N=36) Percent or M (±SD)	χ^2 or K-W
Demographics							
Age (years)		32 (±4)	17–45	32 (±4)	32 (±4)	32 (±5)	0.173
Education	Upper level Secondary/ university	235	54.9	74.2	42.7	55.6	<0.001*
Marital status	Married/co-habiting	413	96.5	96.0	96.7	97.2	0.929
Country of origin	The Netherlands	398	93.0	93.4	93.4	88.9	0.602
Obstetric history							
Miscarriage/termination of pregnancy		103	24.1	14.6	28.2	36.1	0.002*
Pregnancy							
Primiparity		213	49.8	43.0	54.4	47.2	0.088
Multiple pregnancy		9	2.1	0.0	2.1	11.1	<0.001*
Pregnancy complications		198	46.3	17.2	58.1	88.9	<0.001*
Delivery – medical							
Preterm delivery	<37 weeks gestation	39	9.1	1.3	6.6	58.3	<0.001*
Postterm delivery	>42 weeks gestation	24	5.6	0.0	9.5	2.8	<0.001*
Onset	Spontaneous	307	72.6	97.3	59.8	52.9	<0.001*
	Induction	82	19.4	2.7	28.9	26.3	
	PCS	34	8.0	0.0	11.3	20.6	
Mode	NVD	316	74.5	100.0	60.3	63.9	<0.001*
	IVD	37	8.7	0.0	15.1	2.8	
	UPCS	37	8.7	0.0	13.4	13.9	
	PCS	34	8.0	0.0	11.3	19.4	
Pain medication		101	23.6	13.2	29.5	27.8	0.001*
Delivery complications		189	44.6	15.2	56.5	88.9	<0.001*
	IVD or UPCS	74	17.5	0.0	28.5	16.7	<0.001*
	Suture at operating theater	12	2.8	2.6	2.5	5.6	0.587
	Manual placenta removal	15	3.5	1.3	4.2	8.3	0.086
	Postpartum hemorrhage (>1 l)	34	8.0	2.0	11.0	13.9	0.003*
	Infection treated with antibiotics	7	1.7	0.7	2.1	2.8	0.469
	Mother admitted to ICU	3	0.7	0.0	0.4	5.6	0.001*
	Meconium-stained amniotic fluid	48	11.3	6.6	14.3	11.1	0.064
	Asphyxia	25	5.9	2.0	8.4	5.6	0.043*
	Infant admitted to N(I)CU	67	15.8	3.3	17.6	55.6	<0.001*
	Perinatal death	6	1.4	0.0	0.0	16.7	<0.001*
Location delivery	Home	86	20.1	57.0	0.0	0.0	<0.001*
	Hospital	298	69.6	43.0	83.0	91.7	
	Referral from home to hospital	44	10.3	0.0	17.0	8.3	
Delivery – psychological							
Fear of childbirth		3 (±2.6)	1–10	2 (±2.5)	4 (±2.7)	4 (±2.5)	0.009*
Fear of pain		3 (±2.5)	1–10	3 (±2.5)	3 (±2.6)	3 (±2.3)	0.132
Delivery worse than expected		122	28.5	14.6	36.5	33.3	0.004*
Pain worse than expected		148	34.6	24.5	41.5	30.6	<0.001*
Intensity of pain		7 (±2.7)	1–10	6 (±2.4)	7 (±2.8)	5 (±2.8)	0.002*
Sense of Coherence		35 (±10)	16–73	33 (±10)	35 (±10)	36 (±13)	0.193
Desire for control		90 (±14)	50–128	91 (±12)	90 (±15)	85 (±15)	0.038*

*$p < 0.05$.
M, median; SD, standard deviation; χ^2, chi-square test; K-W, Kruskal-Wallis one-way analysis of variance; NVD, normal vaginal delivery; IVD, instrumental vaginal delivery; PCS, planned cesarean section; UPCS, unplanned cesarean section; ICU, intensive care unit; N(I)CU, neonatal (intensive) care unit.

revealed that only preeclampsia/HELLP was independently associated with higher sum-scores ($p = 0.044$). TES-B sum-scores were significantly higher in women with induced deliveries than in those with spontaneous onset and planned cesarean sections. Furthermore, mean sum-scores were lower

in women with planned cesarean sections (5.1) or normal vaginal deliveries (5.7) than in those with instrumental vaginal deliveries (8.5) or unplanned cesarean sections (10.7).

There was no significant association between DFC and the PTSD sum-scores (Spearman's rho = 0.04, $p = 0.454$). In contrast, a strong negative correlation (Spearman's rho = −0.59, $p < 0.001$) was found between SOC and the TES-B sum-scores. Linear regression analysis with the inclusion of interaction terms between SOC, DFC, and other independent variables showed that SOC and DFC did not moderate the relationship between the independent variables and the sum-scores on the TES-B (data not shown).

Before performing a HMRA on the variables with p values lower than 0.10 in the univariate analysis, four variables were excluded to prevent multicollinearity. In step one, predisposing factors and pregnancy-related factors were entered into the model, followed by possible components of traumatic childbirth (step two) and psychological factors (expectations and appraisal) in step three. This model explained 41% of the variance in the TES-B sum-scores. In the final model (Table III), significant predictors of high TES-B sum-scores were unplanned cesarean section, high intensity of pain, and low SOC.

Table II. Associations between independent variables and sum-scores on the TES-B.

Factor	Statistical measure	p value
Demographics		
Age, years (<25; 25–34; ≥35)	Kruskal-Wallis	0.835
Educational level	Kruskal-Wallis	0.693
Marital status (married/co-habiting vs. single)	Mann-Whitney	0.616
Country of origin (The Netherlands vs. other)	Mann-Whitney	0.062
Obstetric history		
Miscarriage/termination of pregnancy	Mann-Whitney	0.306
Pregnancy		
Parity (primiparity vs. multiparity)	Mann-Whitney	<0.001*
Multiple pregnancy	Mann-Whitney	0.366
Complications	Mann-Whitney	0.006*
Delivery – medical		
Complications	Mann-Whitney	<0.001*
Preterm delivery (<37 weeks)	Mann-Whitney	0.008*
Postterm delivery (>42 weeks)	Mann-Whitney	0.250
Onset (spontaneous vs. induction; excl. PCS)	Mann-Whitney	0.031*
Mode (NVD, IVD, PCS, UPCS)	Kruskal-Wallis	<0.001*
Pain medication	Mann-Whitney	0.161
Suture at operating theater	Mann-Whitney	0.853
Manual placenta removal	Mann-Whitney	0.066
Postpartum hemorrhage (>1 l)	Mann-Whitney	0.011*
Infection treated with antibiotics	Mann-Whitney	0.278
Mother admitted to ICU	Mann-Whitney	0.081
Meconium-stained amniotic fluid	Mann-Whitney	0.908
Asphyxia	Mann-Whitney	0.543
Infant admitted to N(I)CU	Mann-Whitney	0.001*
Perinatal death	Mann-Whitney	0.026*
Delivery – logistics		
Echelon (1st vs. 2nd or 3rd)	Mann-Whitney	0.006*
Location delivery (home vs. hospital or home/hospital)	Mann-Whitney	0.013*
Psychological		
Fear of childbirth	Spearman's rho	<0.001*
Fear of pain	Spearman's rho	0.008*
Delivery (worse than expected)	Kruskal-Wallis	<0.001*
Pain (worse than expected)	Kruskal-Wallis	<0.001*
Pain intensity (low – high)	Spearman's rho	<0.001*
Sense of Coherence	Spearman's rho	<0.001*
Desire for Control	Spearman's rho	0.454

*$p < 0.05$.

Spearman's rho, Spearman's rank order coefficient; Mann-Whitney, Mann–Whitney U test; Kruskal-Wallis, Kruskal-Wallis one-way analysis of variance; NVD, normal vaginal delivery; IVD, instrumental vaginal delivery; PCS, planned cesarean section; UPCS, unplanned cesarean section; ICU, intensive care unit; N(I)CU, neonatal (intensive) care unit; MW, midwife; GYN, gynecologist.

Discussion

The aims of this study were two-fold: to assess the prevalence of PTSD following childbirth in homelike versus hospital settings and to determine risk factors

Table III. Hierarchical multiple regression analysis of the TES-B sum-scores† ($n = 428$).

	R^2	ΔR^2	Beta
Model	0.408		
Step 1: Predisposing- and pregnancy-related factors		0.056	
Country of origin			0.004
Primiparity			0.059
Preeclampsia/HELLP syndrome			0.078
Hypertension			0.039
Preterm delivery (<37 wks gestation)			0.044
Step 2: Characteristics of traumatic childbirth		0.058	
Secondary/tertiary care			−0.089
Hospital delivery			0.049
Induction of labor			−0.015
Instrumental vaginal delivery			0.079
Unplanned cesarean section			0.112**
Postpartum hemorrhage (>1l)			0.055
Manual placenta removal			0.036
Perinatal death			0.062
N(I)CU admittance (infant)			0.045
ICU admittance (mother)			0.033
Step 3: Psychological factors		0.294	
Fear of childbirth (high)			0.022
Delivery worse than expected			0.014
Intensity of pain (high)			0.113*
Sense of Coherence (low)			0.531***

*$p < 0.05$.
**$p < 0.01$.
***$p < 0.001$.
†TES-B sum-scores were logarithmically transformed (^{10}log (sum-score+1)); R^2, explained variance. Final step shown.

for the development of posttraumatic stress symptoms. The overall prevalence of PTSD following childbirth in The Netherlands was found to be 1.2%, which was higher than the estimated point prevalence (0.37%) in the general population [28]. Compared to several previous studies on PTSD following childbirth [3,6–8 ,10,12], this rate can be considered fairly low, but it was based on the strict application of all the DSM-IV criteria. In contrast, several earlier studies [7–9,13] based their prevalence rates on the percentage of women who met only the DSM-IV symptom criteria B, C, and D (3.7% in the present study) or failed to include the stressor (criterion A) [3,10]. Although the TES-B is childbirth-specific and contains all of the DSM-IV criteria, some critical remarks have been made about the phrasing of its items. It is particularly questionable whether the use of 'a trying experience' is equivalent to traumatic childbirth [15].

After controlling for complications and interventions during delivery, significant differences in PTSD sum-scores between home- and hospital births were no longer observed. The finding that complications and interventions were associated with more posttraumatic stress symptoms does not necessarily imply a causal relationship. In the literature, anxious and depressed women were not only found to be at higher risk of PTSD following childbirth [7–9,13], but psychological distress was also associated with more complications during pregnancy and delivery [29]. Therefore, in addition to complications leading to more posttraumatic stress symptoms, it could also be the other way around: psychological distress might also have been a causal factor in complications during pregnancy and delivery.

Many baseline differences (e.g. instrumental vaginal deliveries, cesarean sections, and preterm deliveries) between women in primary, secondary, and tertiary care can be explained by the fact that pregnancy or delivery complications/interventions are by definition referred to secondary/tertiary care. We found that women with hospital deliveries, tertiary care deliveries and referral during labor reported more PTSD symptoms. This may be due to the institutional nature of a hospital, which could be perceived as more intimidating or impersonal than home (like) settings. However, it is also possible that 'broken expectations' have contributed to a negative or even traumatic birth experience, considering that women with hospital deliveries (including referral during labor) more often qualified the delivery as being 'worse than expected' than those with home deliveries. Additionally, the (by definition) uncomplicated nature of home births and primary care hospital deliveries (and subsequently higher intervention- and complication rates in hospitals) may explain the identified differences, rather than the hospital setting as such. Indeed, when controlling for complications and interventions during delivery, significant differences in PTSD sum-scores between the echelons and between home- and hospital births no longer persisted.

In accordance with the findings reported by Söderquist et al. [4], no significant difference in PTSD scores was observed between primiparity and multiparity after controlling for mode of delivery. Unplanned cesarean sections and (to a lesser extent) instrumental deliveries were identified as risk factors for PTSD in line with the conclusions drawn in previous studies [16,30]. Complications that are often linked to preterm birth (e.g. N(I)CU admission, perinatal death, preeclampsia) were associated with more posttraumatic stress symptoms, which is in accordance with other studies [31,32].

No relationship was found between pain medication and PTSD, which might have been due to the wide range of methods used to reduce pain: from the most effective method (epidural anesthesia) [33,34] to methods with uncertain effects (e.g. acupuncture and transcutaneous electric nerve stimulation). Contrary to Czarnocka and Slade [10], our study revealed a strong association between the intensity of labor pain and the development of posttraumatic stress symptoms. This finding can be attributed to the fact that pain causes stress, leading to both mental and physiological responses [34]. It may seem contradictory that intensity of labor pain is related to posttraumatic stress symptoms, but pain relief is not. Our data showed that women who received (any form of) pain medication reported significantly higher pain intensity scores. We could hypothesize that these women received pain medication exactly because they suffered from a lot of pain, and therefore report high pain intensity retrospectively. It could also be that women requesting pain medication are different (e.g. in personality or coping abilities) from women who managed to deliver without medication and that this difference also plays a role in the development of posttraumatic stress symptoms. However, with the current data, it is not possible to draw such conclusions.

Women with high scores on the FoC scale and/or who described labor (pain) as 'worse than expected' (negative cognitive appraisal) had more posttraumatic stress symptoms. These associations have been reported before [2,8], although others did not find an association between FoC and PTSD [35]. Due to the retrospective nature of our study, these findings should be interpreted with caution. It is possible that when given the choice (i.e. in primary care), women who have high scores on the FoC scale would prefer to give birth in a hospital. This might lead to the conclusion that the nature of hospital deliveries increases women's FoC, whereas the real background of this connection lies in selection bias. This study dismissed the latter explanation, as no differ-

ences were found in FoC levels between women with planned homebirths and those with planned hospital deliveries under the supervision of a midwife. The average FoC rating was higher in the secondary/tertiary care than in primary care (4 vs. 2 on a 1–10 scale). Even when controlling for FoC, differences in posttraumatic stress symptoms between primary vs. secondary/tertiary care maintained, indicating that the differences in PTSD symptoms between the echelons are not merely due to differences in FoC.

Previous studies have demonstrated that women who felt that they had lost control during childbirth had more posttraumatic stress symptoms [10]. Therefore, we analyzed whether women's DFC played a moderating role. However, contrary to expectations, no association was found between DFC and posttraumatic stress symptoms. SOC and DFC did not moderate the relationship between the independent variables and the sum-score on the TES-B. Although SOC did not play a moderating role, it was strongly negatively associated with the TES-B sum-score (Spearman's rho $= -0.59$, $p < 0.001$), which signifies that women with high SOC have fewer posttraumatic stress symptoms. However, the precise nature of this association is not yet clear. Two previous studies have suggested that in specific situations, high SOC may prevent the development of posttraumatic stress symptoms after childbirth [36,37], whereas a third study failed to find a significant association in an unselected population [8]. A recent meta-analysis concluded that SOC is relatively stable over time [38], but evidence has also been put forward that negative life events (such as traumatic delivery) can lower SOC scores [39]. As pre-delivery SOC levels were unknown in our study population, we cannot draw any definite conclusions about the role of SOC in the development of posttraumatic stress symptoms.

To evaluate the course of PTSD, anxiety, depression and also SOC, prospective research is necessary, with baseline measurements prior to delivery. Future studies should focus on early identification of 'vulnerable' women and on the efficacy of interventions aimed at reducing the risk of developing PTSD and posttraumatic stress symptoms. Although complications cannot always be avoided, clear and open communication together with strong (perceived) support from staff appear to be major determinants of how women experience childbirth [10].

The retrospective nature of this study was one of its major limitations, because women with pre-existing PTSD could not be excluded from the analyses. In addition, owing to strict patient privacy laws and the lack of informed consent, the patient files of the non-responders could not be examined. In comparison to the national average, younger mothers, immigrant women and lower educated women were somewhat underrepresented. It could not be determined whether this is due to selection bias within this sample ($n = 907$) or a difference between this sample and the national average. Nonetheless, the responders were well in line with the national averages on a number of crucial variables. Due to the current sample size, the risk factor analyses had to be based on posttraumatic stress symptoms rather than on PTSD. Our analyses did not include some of the previously identified risk factors for PTSD following childbirth, such as anxiety and depression during pregnancy, (perceived lack of) support from the partner and staff during childbirth, intimate partner violence, previous abuse, or previous traumatic deliveries. It could be argued that the inclusion of women with stillbirths and late pregnancy terminations confounded our results, but our aim was to obtain data from an unselected population and these numbers were so small ($n = 4$) that they are not likely to have influenced the results.

In summary, we can conclude that PTSD following childbirth is a serious condition that affects at least 1 in 100 women. Many more women were found to be suffering from one or more PTSD symptoms, although they did not meet all the DSM-IV criteria for PTSD. Rather than the institutional nature of a hospital per se, the higher intervention- and complication rates in hospitals and the broken expectations of women whose delivery did not go as planned may well explain the differences in posttraumatic stress symptoms between the three echelons and between home- and hospital births. Even though the retrospective nature of this study does not allow us to draw definite conclusions about the direction of associations, posttraumatic stress symptoms were related to obstetric complications and interventions (such as unplanned cesarean section), low SOC, and appraising the delivery and labor pain as being 'worse than expected'.

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Current knowledge on this subject

- PTSD following childbirth is a serious condition that affects approximately 1–2% of the parous women in developed countries.
- Compared to conventional hospital deliveries, women who deliver in homelike settings have higher satisfaction and lower intervention rates.
- Obstetric complications/interventions and psychological factors contribute to the development of posttraumatic stress symptoms.

What this study adds

- In The Netherlands, a country with a unique obstetric health care system and a high percentage of home births, the prevalence of PTSD following childbirth is 1.2%.
- Initial differences in PTSD scores between home and hospital births disappear when controlling for complications and interventions.
- Posttraumatic stress symptoms are associated with unplanned cesarean section, poor coping strategies, and high intensity of labor pain.