



## Perinatal factors related to post-traumatic stress disorder symptoms 1–5 years following birth

Antonio Hernández-Martínez<sup>a</sup>, Julian Rodríguez-Almagro<sup>b,\*</sup>, Milagros Molina-Alarcón<sup>c</sup>, Nuria Infante-Torres<sup>d</sup>, Ana Rubio-Álvarez<sup>e</sup>, Juan Miguel Martínez-Galiano<sup>f,g</sup>

<sup>a</sup> Mancha-Centro Hospital, Alcázar de San Juan, Ciudad Real, Spain

<sup>b</sup> Ciudad Real University Hospital, Ciudad Real, Ciudad Real, Spain

<sup>c</sup> Nursing Faculty, Albacete, Albacete, Spain

<sup>d</sup> Gutierrez Ortega Hospital, Valdepeñas, Ciudad Real, Spain

<sup>e</sup> Torrejon de Ardoz Hospital, Madrid, Spain

<sup>f</sup> Department of Nursing of University of Jaen, Spain

<sup>g</sup> CIBER de Epidemiología y Salud Pública, CIBERESP, Spain

### ARTICLE INFO

#### Article history:

Received 7 November 2018

Received in revised form 13 March 2019

Accepted 13 March 2019

#### Keywords:

Postpartum

Perinatal

Mode of birth

Traumatic stress symptoms

Skin-to-Skin contact

### ABSTRACT

**Background:** The relationship between perinatal variables and post-traumatic stress disorder (PTSD) symptoms was studied. However, the role of some variables in PTSD symptoms is unclear.

**Aim:** Determine the prevalence of PTSD symptoms after 1 year postpartum and their relationship with perinatal variables.

**Methods:** A cross-sectional study with 1531 puerperal women in Spain. Data were collected on socio-demographic variables, perinatal variables (maternal characteristics, procedures during labour and birth, birth outcomes and time since birth) and the newborn. An online questionnaire was used, which included the Perinatal Post-traumatic Stress Questionnaire (PPQ). Crude and adjusted odds ratios (OR) were calculated using binary logistic regression.

**Findings:** 7.2% (110) of the women were identified as being at risk for probable PTSD symptoms. Protective factors were having a birth plan respected (aOR 0.44; 95%CI 0.19–0.99), use of epidural analgesia (aOR 0.44; 95%CI 0.24–0.80) and experiencing skin-to-skin contact (aOR 0.33; 95%CI 0.20–0.55). Risk factors were instrumental birth (aOR 3.32; 95%CI 1.73–3.39), caesarean section (aOR 4.80; 95%CI 2.51–9.15), receiving fundal pressure (aOR 1.72; 95%CI 1.08–2.74) and suffering a third/fourth degree perineal tear (aOR 2.73; 95%CI 1.27–5.86). The area under the model's ROC curve was 0.82 (95%CI 0.79–0.83).

**Conclusions:** Women who experience a normal birth, are psychologically prepared for birth (for example, through use of a birth plan), experience skin-to-skin contact with their newborn, and had a sense of physical control through the use of epidural analgesia, are less likely to experience childbirth as traumatic.

© 2019 Australian College of Midwives. Published by Elsevier Ltd. All rights reserved.

### Statement of significance

#### Problem or issue

- Post-traumatic stress disorder symptoms may be a significant mental health concern for pregnant and postpartum women. The influence of obstetric practices during labour and birth on the development of traumatic

stress symptoms is under-investigated. There are very few studies on PTSD symptoms after the first postpartum year.

#### What is already known about the topic?

- A high level of obstetric intervention experienced during childbirth and the perception of inadequate intrapartum care during labour are consistently associated with the development of acute trauma symptoms.

\* Corresponding author at: C/Cuadras nº 8 Bajo, Ciudad Real, Spain.

E-mail address: [julianj.rodriguez@uclm.es](mailto:julianj.rodriguez@uclm.es) (J. Rodríguez-Almagro).

## What this paper adds

- We observed the influence of many perinatal variables in post-traumatic stress disorder symptoms that have not yet been identified (epidural analgesia, fundal pressure and severe perineal tears). A special mention should be made regarding humanisation practices, such as skin-to-skin contact and birth plans, which are considered protective factors.

## 1. Introduction

Post-traumatic stress disorder (PTSD) has been described as "the complex somatic, cognitive, affective, and behavioural effects of psychological trauma".<sup>1</sup> PTSD may be a significant mental health concern for pregnant and postpartum women. Women who experience traumatic childbirth have fewer subsequent children and leave a longer interval before having a second baby,<sup>2</sup> have worse quality of life both in the short and long-term,<sup>3</sup> which negatively affects the relationship with their partners.<sup>4,5</sup> Onset of PTSD can precede pregnancy or occur during the perinatal period.<sup>6</sup>

Postpartum PTSD prevalence can vary considerably depending on the established cut-off point and the studied population type. In 2017, a systematic review and meta-analysis of postpartum PTSD, conducted with 28 studies, reported prevalence rates of 4.0% (95% CI: 2.77–5.71) in the general population, and one of 18.5% (95% CI: 10.6–30.38) for women at risk.<sup>7</sup> Most cut-off points used to evaluate PTSD prevalence have been established at postpartum weeks 4–6, and at postpartum months 3 and 6. Only one study by Giannandrea et al.<sup>8</sup> has estimated PTSD prevalence at 14 months. This study was conducted in the USA with a sample of 198 women. These authors studied several mental health problems associated with gestational loss and found PTSD prevalence to be 8.8%.

The influence of PTSD on both the mother and newborn, and the relationship between both, have been studied.<sup>9,10</sup> The systematic review by Cook et al.<sup>9</sup> included 21 studies published in 2018, and, among other results, found a relationship between PTSD and low birth weight and low breastfeeding rates. Dikmen-Yildiz et al.<sup>10</sup> conducted a longitudinal study with a sample of 950 women in Turkey: they reported a close association between PTSD and other mental health problems. However, these studies did not consider a period that went beyond 6 months postpartum.

Risk factors associated with traumatic stress symptoms include: prenatal depression and anxiety, and a pre-pregnancy history of psychiatric disorders, sexual trauma, childhood sexual abuse, intimate partner violence, and other psychosocial attributes.<sup>11</sup> Although there are studies that have dealt with the perinatal factors involved in the development of PTSD symptoms, most studies have focused on the influence of mode of birth<sup>12–20</sup> and on newborn-related variables, such as low birth weight,<sup>21</sup> prematurity,<sup>21,22</sup> low Apgar scores,<sup>21,23</sup> newborn hospitalization<sup>14</sup> and feeding type.<sup>12</sup>

One especially interesting study is that of Creedy et al.,<sup>24</sup> conducted on a sample population of 499 women between 4–6 weeks postpartum in Australia. This study concluded that the women who experienced both a high level of obstetric intervention and dissatisfaction with their intrapartum care were more likely to develop traumatic stress symptoms than the women who received a high level of obstetric intervention or those who had perceived their care to be inadequate, but not both.

Presently, the influence of many obstetric practices during labour and birth on the development of traumatic stress symptoms, and efficient primary prevention measures, remain unknown.<sup>25</sup> Potential protective factors have been identified and

predictive models for postnatal PTSD development have been proposed, but have barely been investigated.<sup>26</sup>

The objective of the present study was to investigate the prevalence of traumatic stress symptoms (PTSD symptoms) after the first year postpartum, and the relationship with perinatal practices and obstetric interventions.

## 2. Participants, ethics and methods

### 2.1. Study design and participant recruitment

A cross-sectional study of women between 1 and 5 years postpartum was conducted in Spain. This study received approval from the Ethics Committee in Clinical Research (CEIC) at the Mancha-Centro Hospital (Spain). Before completing the online questionnaire, women were provided with an information sheet and were asked to tick a box indicating their consent.

Women under the age of 18 were excluded.

To estimate sample size, the maximum modelling criterion was used. This involves including 10 events (complications) per independent variable in the multivariate analysis.<sup>27</sup> Considering an incidence of 8.8% for post-traumatic disorder,<sup>8</sup> we needed a minimum of 1136 women to incorporate a minimum of 10 independent variables.

### 2.2. Data sources

Data were collected using an online questionnaire devised by the authors. It contained 35 items (3 open questions and 32 closed ones) on socio-demographic and clinical characteristics, obstetric results, and data on newborns. Severity of PTSD symptoms during the postpartum period was measured using the Perinatal Post-traumatic-stress Questionnaire (PPQ), originally developed by DeMier et al.<sup>21</sup> The PPQ is a 14-item self-rating scale based on the Diagnostic and Statistical Manual of Mental Disorders (4th Edition) criteria. This scale aims to identify mothers suffering from PTSD symptoms at 1–18 months postpartum. Each item scores from zero (not at all) to four (often for more than 1 month). Mothers with scores of 19 or more are considered at risk of clinically significant distress. The scale has excellent reliability in the Modified PPQ version (Cronbach's  $\alpha=0.9$ ;  $r=0.92$ ).<sup>28</sup> (Appendix A: English questionnaire version; Appendix B: Spanish questionnaire version in Supplementary material).

The questionnaire was formally piloted and subsequently distributed to the participating mothers. The main Women Associations, the Spanish Federation of Midwives Associations (FAME), its member associations and midwives, participated in the dissemination of the project and encouraged women to participate. After recruiting the women and documenting their informed consent, they were informed about how to complete the questionnaire in their own time. A telephone number and chat service were made available to assist with any doubts or difficulties they had with the questionnaire.

The following variables were included:

The main dependent variable was the PPQ symptoms score dichotomised into no distress (<19) or distressed ( $\geq 19$ ).

The independent variables were: mother's age, level of education, nationality, parity (primiparous or multiparous), health problems while pregnant, previous caesarean section, twin pregnancy, gestational age (preterm/term), birth plan respected, induced birth, use of epidural/rachianaesthesia analgesia, use of general anaesthesia, mode of birth (normal birth, instrumental birth, caesarean section), presenting with third/fourth degree perineal tears), undergoing episiotomy while giving birth, manual removal of placenta, mother admitted to an intensive care unit (ICU) after giving birth, mother hospitalised after being discharged,

**Table 1**  
Study population characteristics.

Variable	National total 2015 420,290	Total 1531 n (%)	1–3 years 916 n (%)	4–5 years 615 n (%)
Mother's age				
< 35 years	262,052 (62.3)	649 (42.4)	495 (54.0)	154 (25.0)
≥ 35 years	158,238 (37.6)	882 (57.6)	421 (46.0)	461 (75.0)
Level of education				
No qualifications/primary ed.		56 (3.7)	32 (3.5)	24 (3.9)
Secondary education		551 (36.0)	316 (34.5)	235 (38.2)
University education		924 (60.4)	568 (62.0)	356 (57.9)
Nationality				
Spanish		1448 (97.2)	893 (97.5)	595 (96.7)
Other		43 (2.8)	23 (2.5)	20 (3.3)
Twin pregnancy				
No		1461 (95.4)	877 (95.7)	584 (95.0)
Yes		70 (4.6)	39 (4.3)	31 (4.6)
Gestational age				
Term	329,269 (92.4)	1413 (92.3)	846 (92.4)	567 (92.2)
Preterm	26,935 (7.6)	118 (7.7)	70 (7.6)	48 (7.8)
Pregnancy induced hypertension				
No		1471 (96.1)	881 (96.2)	590 (95.9)
Yes		60 (3.9)	35 (3.8)	25 (4.1)
Health problems during pregnancy				
No		1318 (86.1)	792 (86.5)	526 (85.5)
Yes		213 (13.9)	124 (13.5)	89 (14.5)
Previous caesarean section				
No		1060 (69.2)	652 (71.2)	408 (66.3)
Yes		471 (30.8)	264 (28.8)	406 (33.7)
Parity				
Primiparous	215,239 (51.2)	811 (53.0)	493 (53.8)	318 (51.7)
Multiparous	159,108 (48.8)	720 (47.0)	423 (46.2)	297 (48.3)
Birth plan respected				
No		1241 (81.1)	706 (77.1)	535 (87.0)
Yes		290 (18.9)	210 (22.9)	80 (13.0)
Induced birth				
No		1027 (67.1)	611 (66.7)	416 (66.7)
Yes		504 (32.9)	305 (33.3)	199 (32.4)
Use of epidural/rachianesthesia				
No		351 (22.9)	237 (25.9)	114 (18.5)
Yes		1180 (77.1)	679 (74.1)	501 (81.5)
Use of general anesthesia				
No		1476 (96.4)	887 (96.8)	589 (95.8)
Yes		55 (3.6)	29 (3.2)	26 (4.2)
Fundal pressure				
No		1056 (69.0)	660 (72.1)	396 (64.4)
Yes		475 (31.0)	256 (27.9)	219 (35.6)
Mode of birth				
Normal birth	Vaginal	879 (57.4)	536 (58.5)	343 (55.8)
Instrumental birth	308,224 (73.3)	271 (17.7)	162 (17.7)	109 (17.7)
Caesarean section	112,066 (26.7)	381 (24.9)	218 (23.8)	163 (26.5)
Episiotomy				
No		918 (60.0)	583 (63.6)	335 (54.5)
Yes		613 (40.0)	333 (36.4)	280 (45.5)
Severe tears				
No		1463 (95.6)	880 (96.1)	583 (94.8)
Yes		68 (4.4)	36 (3.9)	32 (5.2)
Manual removal of placenta				
No		1330 (86.9)	802 (87.6)	528 (85.9)
Yes		201 (13.1)	114 (12.4)	87 (14.1)

**Table 1** (Continued)

Variable	National total 2015 420,290	Total 1531 n (%)	1–3 years 916 n (%)	4–5 years 615 n (%)
Mother admitted to an ICU				
No		1502 (98.1)	899 (98.1)	603 (98.0)
Yes		29 (1.9)	5 (1.9)	12 (2.0)
Skin-to-skin contact at birth				
No		544 (35.5)	289 (31.6)	255 (41.5)
Yes		987 (64.5)	627 (68.4)	360 (58.5)
Hospitalised newborn				
No		1391 (90.9)	850 (92.8)	541 (88.0)
Yes		140 (9.1)	66 (7.2)	74 (12.0)
Artificial feeding				
No		1076 (70.3)	659 (71.9)	417 (67.8)
Yes		455 (29.7)	257 (28.1)	198 (32.2)
Traumatic stress symptoms				
No (< 19 PPQ points)		1421 (92.8)	842 (91.9)	579 (94.1)
Yes (≥ 19 PPQ points)		110 (7.2)	74 (8.1)	36 (5.9)

Abbreviations: ICU, intensive care unit; PPQ, perinatal post-traumatic-stress questionnaire.

newborn hospitalised, performing skin-to-skin contact at birth, feeding time and postpartum time (1–3 years/4–5 years).

### 2.3. Statistical analysis

First, a descriptive analysis was done using absolute and relative frequencies. Next, a bivariate analysis was performed with the various socio-demographic and clinical factors and their relationship with PTSD symptoms present as per the PPQ score ( $\geq 19$  PPQ points). This was followed by a multivariate analysis using binary logistic regression following the SPSS forward and backward procedures by introducing the potential confounder variables into the analysis. The crude odds ratios (OR) and adjusted OR (aOR) were estimated with their respective 95% confidence intervals (95%CI). According to the model's conclusive variables, the area under the ROC curve was estimated with its respective 95%CI.

Significance was considered at  $p < 0.05$ . All the analyses were carried out with the SPSS v24.0 statistical package.

### 3. Results

Of the 1531 women who participated, 60.4% (924) had university education, 86.1% (1318) had a normal pregnancy, 57.4% (879) gave birth vaginally, 60.0% (918) did not undergo episiotomy, and 70.3% (1076) were breastfeeding on discharge. The prevalence of high PPQ scores (indicating traumatic stress symptoms) was 7.2% (110) in our study population (Table 1). Table 1 presents the study population characteristics both globally and according to postpartum time.

Table 2 outlines the factors associated with the risk of PTSD symptoms. After performing the multivariate analysis, the following variables were found to be protective factors against PTSD symptoms: multiparity (aOR: 0.49; 95%CI: 0.30–0.79), having the birth plan respected (aOR: 0.44; 95%CI: 0.24–0.80), use of epidural analgesia (aOR: 0.44; 95%CI: 0.24–0.80), performing skin-to-skin contact (aOR: 0.33; 95%CI: 0.20–0.55) and more than 3 years having passed since giving birth (aOR: 0.60; 95%CI: 0.38–0.95). The identified risk factors were: instrumental birth (aOR: 3.32; 95%CI: 1.73–3.39), caesarean section (aOR: 4.80; 95%CI: 2.51–9.15), receiving fundal pressure (aOR: 1.72; 95%CI: 1.08–2.74) and suffering a third/fourth degree perineal tear (aOR: 2.73; 95%CI: 1.27–5.86). The area under the ROC curve for the model was 0.82 (95%CI: 0.78–0.85).

### 4. Discussion

The presence of traumatic stress symptoms was globally identified in 7.2% of our study population, with the following factors identified as being protective: multiparity, having the birth plan respected, use of epidural analgesia, performing skin-to-skin contact with the newborn and more than 3 years having passed since giving birth. Conversely, the identified risk factors were: instrumental birth, finishing birth by caesarean section, receiving fundal pressure and suffering a third/fourth degree perineal tear.

Our traumatic stress symptoms prevalence figures were higher than those found in the meta-analysis published in 2017, which combined five studies and indicated an overall PTSD prevalence at 6 months postpartum of 6.8% (95%CI: 1.6–24.5).<sup>7</sup> In this same review, PTSD prevalence was 8.8% in the only study to be conducted beyond the first postpartum year.<sup>8</sup> However, it did not represent a general population of postpartum women because it compared women who experienced gestational loss with those women that had not experienced this. Moreover, its sample size included only 198 women.

The risk factors for developing PTSD symptoms included instrumental birth and caesarean section as the main two factors, which was consistent with other previous studies,<sup>12–15</sup> and also with two systematic reviews which concluded that birth type was a highly predisposing risk factor for PTSD.<sup>16,17</sup> However, other authors have not found any relationship between mode of birth and PTSD at postpartum weeks 4–6.<sup>18,19</sup>

Another relevant variable to bear in mind is perceived birth pain and pain control methods. In the systematic review by Andersen et al.,<sup>16</sup> birth pain was considered a highly predisposing risk factor for developing PTSD symptoms. In our study the role of spinal/epidural analgesia showed interesting findings. The univariate analysis presented spinal/epidural analgesia as a risk factor for traumatic stress symptoms, most likely because their use is associated with clinical factors such as induced birth, primiparity, and instrumental birth, among others.<sup>29</sup> However, in the multivariate analysis it was found to be a protective factor for traumatic stress symptoms. This outcome can be explained by the fact that many potentially stressful procedures (instrumental birth, manual removal of placenta, episiotomy repair and tears) become worse when no suitable analgesia is available. This highlights the

**Table 2**  
Factors associated with traumatic stress symptoms. Bivariate and multivariate analyses.

Variable	Traumatic stress symptoms		OR 95%CI	<sup>a</sup> aOR 95%CI
	No (N = 1421) n (%)	Yes (N = 110) n (%)		
Mother's age				
<35 years	589 (90.8)	60 (9.2)	1 (ref.)	1 (ref.)
≥35 years	832 (94.3)	50 (5.7)	<b>0.59 (0.40–0.87)</b>	0.68 (0.44–1.06)
Level of education				
No qualifications/primary	55 (98.2)	1 (1.8)	1 (ref.)	
Secondary education	501 (90.9)	50 (9.1)	5.49 (0.74–40.5)	
University education	865 (93.6)	59 (6.4)	3.75 (0.51–27.6)	
Spanish nationality				
No	1381 (92.8)	107 (7.2)	1 (ref.)	
Yes	40 (93.0)	3 (7.0)	0.96 (0.30–3.18)	
Twin pregnancy				
No	1355 (92.7)	106 (7.3)	1 (ref.)	
Yes	66 (94.3)	4 (5.7)	0.78 (0.28–2.17)	
Gestational age				
Term	1317 (93.2)	96 (6.8)	1 (ref.)	
Preterm	104 (88.1)	14 (11.9)	<b>1.85 (1.02–3.35)</b>	
Previous caesarean section				
No	1009 (95.2)	51 (4.8)	1 (ref.)	
Yes	412 (87.5)	59 (12.5)	<b>2.83 (1.92–4.19)</b>	
Problems during pregnancy				
No	1229 (93.2)	89 (6.8)	1 (ref.)	
Yes	192 (90.1)	21 (9.9)	1.51 (0.92–2.49)	
Pregnancy induced hypertension				
No	1364 (92.7)	107 (7.3)	1 (ref.)	
Yes	57 (95.0)	3 (5.0)	0.67 (0.21–2.18)	
Parity				
Primiparous	727 (89.6)	84 (10.4)	1 (ref.)	1 (ref.)
Multiparous	694 (96.4)	26 (3.6)	<b>0.32 (0.21–0.51)</b>	<b>0.49 (0.30–0.79)</b>
Birth plan respected				
No	1138 (91.7)	103 (8.3)	1 (ref.)	1 (ref.)
Yes	283 (97.6)	7 (2.4)	<b>0.27 (0.13–0.59)</b>	<b>0.44 (0.19–0.99)</b>
Induced birth				
No	968 (94.3)	59 (5.7)	1 (ref.)	
Yes	453 (89.9)	51 (10.1)	<b>1.85 (1.25–2.73)</b>	
Epidural/rachianesthesia				
No	332 (94.6)	19 (5.4)	1 (ref.)	1 (ref.)
Yes	1089 (92.3)	91 (7.7)	<b>1.46 (0.88–2.43)</b>	<b>0.44 (0.24–0.80)</b>
General anaesthesia				
No	1378 (93.4)	98 (9.8)	1 (ref.)	
Yes	43 (78.2)	12 (21.8)	<b>3.92 (2.00–7.68)</b>	
Fundal pressure				
No	995 (94.2)	61 (5.8)	1 (ref.)	1 (ref.)
Yes	426 (89.7)	49 (10.3)	<b>1.88 (1.27–2.78)</b>	<b>1.72 (1.08–2.74)</b>
Mode of birth				
Normal birth	859 (97.7)	20 (2.3)	1 (ref.)	1 (ref.)
Instrumental birth	239 (88.2)	32 (11.8)	<b>5.75 (3.23–10.2)</b>	<b>3.32 (1.73–3.39)</b>
Caesarean section	323 (84.8)	58 (15.2)	<b>7.71 (4.57–13.0)</b>	<b>4.80 (2.51–9.15)</b>
Episiotomy				
No	849 (92.5)	69 (7.5)	1 (ref.)	
Yes	572 (93.3)	41 (6.7)	0.88 (0.59–1.32)	
Third/fourth degree perineal tears				
No	1365 (93.3)	98 (6.7)	1 (ref.)	1 (ref.)
Yes	56 (82.4)	12 (17.6)	<b>2.99 (1.55–5.75)</b>	<b>2.73 (1.27–5.86)</b>
Manual removal of placenta				
No	1246 (93.7)	84 (6.3)	1 (ref.)	
Yes	175 (87.1)	26 (12.9)	<b>2.20 (1.38–3.52)</b>	

**Table 2** (Continued)

Variable	Traumatic stress symptoms		OR 95%CI	<sup>a</sup> aOR 95%CI
	No (N = 1421) n (%)	Yes (N = 110) n (%)		
Mother admitted to ICU				
No	1398 (93.1)	104 (6.9)	1 (ref.)	
Yes	23 (79.3)	6 (20.7)	<b>3.51 (1.40–8.80)</b>	
Skin-to-skin				
No	465 (85.5)	79 (14.5)	1 (ref.)	1 (ref.)
Yes	956 (96.9)	31 (3.1)	<b>0.19 (0.12–0.29)</b>	<b>0.33 (0.20–0.55)</b>
Hospitalised newborn				
No	1296 (93.2)	95 (6.8)	1 (ref.)	
Yes	125 (89.3)	15 (10.7)	1.64 (0.92–2.91)	
Artificial feeding				
No	1008 (93.7)	68 (6.3)	1 (ref.)	
Yes	413 (90.8)	42 (9.2)	<b>1.51 (1.01–2.52)</b>	
Postpartum time				
1–3 years	842 (91.9)	74 (8.1)	(ref.)	1 (ref.)
>3 years	579 (94.1)	36 (5.9)	0.71 (0.47–1.07)	<b>0.60 (0.38–0.95)</b>

Note: Bold values indicate statistically significant results.

<sup>a</sup> OR adjusted by mother's age, parity, having a birth plan, use of rachianesthesia/epidural, use of general anesthesia, fundal pressure, mode of birth, episiotomy, severe tears, manual removal of placenta and skin-to-skin contact at birth.

need for professionals to keep in mind the importance of constantly assessing analgesic requirements, and to provide suitable analgesia for painful procedures according to clinical conditions and women's preferences.

Along these lines, we observed a relationship between some obstetric practices or interventions characterised by being painful and traumatic stress symptoms when analgesia was absent. With regards to manual placenta removal, our results are consistent with those of Adewuya et al.,<sup>14</sup> but only in the univariate analysis. We also observed a relationship between suffering a third/fourth degree perineal tear and traumatic stress symptoms which is not found by other authors.<sup>18,23,30</sup> No study has evaluated the influence of receiving fundal pressure and the development of traumatic stress or PTSD symptoms despite it being considered a practice associated with serious maternal and foetal complications.<sup>31</sup> It is possible that other authors have not previously identified this practice as a risk factor for traumatic stress or PTSD symptoms, because it is not performed in many centres and countries.

In terms of the time elapsed after birth, we observed a reduction in the prevalence of traumatic stress symptoms which went from 8.1% to postpartum year to 5.9% at 3 years postpartum. While our study did not include a subsequent follow-up of the women, our results are consistent with those of a systematic review by Ayer et al.<sup>17</sup> According to these authors, traumatic stress symptoms reduce over time, whereas associations with pre-birth vulnerability, such as sexual trauma, and postpartum factors, may increase over time.

Other factors described in the literature as potential predictors of PTSD are related to the newborn, such as low birth weight,<sup>21</sup> prematurity,<sup>21,22</sup> low Apgar scores,<sup>21,23</sup> hospitalisation of the newborn<sup>14</sup> and feeding type.<sup>12</sup> We found no such association between these variables and traumatic stress symptoms in our sample. However, humanising care practices, such as skin-to-skin contact between the mother and her newborn and using birth plans, were identified as protective factors for traumatic stress symptoms. As suggested by Abdollahpour et al.,<sup>32</sup> the relationship between skin-to-skin contact during the first hour of life and PTSD would explain why we found no relationship in our study with other neonatal variables. That is, newborns receiving skin-to-skin contact usually have normal Apgar scores, are more likely to breastfeed successfully, and do not require hospitalisation.

In terms of birth plans, the higher female participation in decision-making throughout the birth process may play a key role in reducing traumatic stress symptoms given the greater control exercised over the situation and increased satisfaction.<sup>33</sup>

Our findings showed that many perinatal factors were associated with the presence of traumatic stress symptoms between 1 and 5 years postpartum, and therefore we believe that prevention and early detection are key to reduce their impact.<sup>9</sup>

Our study had several limitations which need to be considered when interpreting the results. A possible recall bias due to our study design may have influenced women's perceptions, as well as possible selection bias, whereby women who were aware of birth trauma may have been more likely to participate. However, except for age, our sample was representative of the national Spanish population of women giving birth.<sup>34</sup> Our measured prevalence of traumatic stress symptoms also fell within the ranges of other published studies. Another limitation was the use of the PPQ; while it is a tool with good psychometric characteristics that is commonly used in Spain, it has not been validated in a Spanish population. Another limitation is that our study did not differentiate between emergency and elective caesarean sections as women often have problems distinguishing between both types. We believe it would be recommendable for our predictive model to be validated in other populations and with different cut-off points to determine if it could be extrapolated.

Among our study's strong points, we stress its large sample size, its long-term evaluation of traumatic stress symptoms and the fact that it includes many perinatal variables, which has not been done to date. Several authors have developed predictive models of PTSD.<sup>17,19,34–36</sup> However, none have studied the predictive capacity using the area under the ROC curve, nor has any tool been developed for clinical applications.

## 5. Conclusions

Women who experience a normal birth, are psychologically prepared for birth (for example, through use of a birth plan), experience skin-to-skin contact with their newborn and had a sense of physical control through the use of epidural analgesia, are less

likely to experience childbirth as traumatic. Midwives and obstetricians should implement skin-to-skin contact with the newborn in their usual clinical practice and use birth plans in the highest number of births to reduce the likelihood of traumatic stress symptoms.

### Ethical approval

All research with participants was conducted in line with the Helsinki declaration for studies on human subjects. This study received approval from the Ethics Committee in Clinical Research (CEIC) at “Mancha Centro” Hospital (Spain) Act 2017.

### Funding

None declared.

### Conflict of interest

None declared.

### Author contributions

All authors have participated in (a) conception and design, or analysis and interpretation of the data; (b) drafting the article or revising it critically for important intellectual content; and (c) approval of the final version.

### Acknowledgements and disclosure

The authors would like to thank Dr. Ingrid de Ruiter, MBChB, PhD for English language support and editing of the present manuscript.

### Appendix A. Supplementary data

Supplementary material related to this article can be found, in the online version, at doi:<https://doi.org/10.1016/j.wombi.2019.03.008>.

### References

- van der Kolk BA, Pelcovitz D, Roth S, Mandel FS, McFarlane A, Herman JL. Dissociation, somatization, and affect dysregulation: the complexity of adaptation of trauma. *Am J Psychiatry* 1996;**153**(7 Suppl)83–93. [Accessed 28 August 2018] <http://www.ncbi.nlm.nih.gov/pubmed/8659645>.
- Gottvall K, Waldenström U. Does a traumatic birth experience have an impact on future reproduction? *BJOG* 2002;**109**(3)254–60. [Accessed 16 December 2018] <http://www.ncbi.nlm.nih.gov/pubmed/11950179>.
- Beck CT, Watson S. Impact of birth trauma on breast-feeding. *Nurs Res* 2008;**57**(4):228–36. doi:<http://dx.doi.org/10.1097/01.NNR.0000313494.87282.90>.
- Ayers S, Eagle A, Waring H. The effects of childbirth-related post-traumatic stress disorder on women and their relationships: a qualitative study. *Psychol Health Med* 2006;**11**(4):389–98. doi:<http://dx.doi.org/10.1080/13548500600708409>.
- McDonald S, Slade P, Spiby H, Iles J. Post-traumatic stress symptoms, parenting stress and mother-child relationships following childbirth and at 2 years postpartum. *J Psychosom Obstet Gynecol* 2011;**32**(3):141–6. doi:<http://dx.doi.org/10.3109/0167482X.2011.596962>.
- Howard LM, Molyneaux E, Dennis C-L, Rochat T, Stein A, Milgrom J. Non-psychotic mental disorders in the perinatal period. *Lancet* 2014;**384**(9956):1775–88. doi:[http://dx.doi.org/10.1016/S0140-6736\(14\)61276-9](http://dx.doi.org/10.1016/S0140-6736(14)61276-9).
- Yildiz PD, Ayers S, Phillips L. The prevalence of posttraumatic stress disorder in pregnancy and after birth: a systematic review and meta-analysis. *J Affect Disord* 2017;**208**:634–45. doi:<http://dx.doi.org/10.1016/j.jad.2016.10.009>.
- Giannandrea SAM, Cerulli C, Anson E, Chaudron LH. Increased risk for postpartum psychiatric disorders among women with past pregnancy loss. *J Womens Health (Larchmt)* 2013;**22**(9):760–8. doi:<http://dx.doi.org/10.1089/jwh.2012.4011>.
- Cook N, Ayers S, Horsch A. Maternal posttraumatic stress disorder during the perinatal period and child outcomes: a systematic review. *J Affect Disord* 2018;**225**:18–31. doi:<http://dx.doi.org/10.1016/j.jad.2017.07.045>.
- Dikmen-Yildiz P, Ayers S, Phillips L. Factors associated with post-traumatic stress symptoms (PTSS) 4–6 weeks and 6 months after birth: a longitudinal population-based study. *J Affect Disord* 2017;**221**:238–45. doi:<http://dx.doi.org/10.1016/j.jad.2017.06.049>.
- Geller PA, Stasko EC. Effect of previous posttraumatic stress in the perinatal period. *J Obstet Gynecol Neonatal Nurs* 2017;**46**(6):912–22. doi:<http://dx.doi.org/10.1016/j.jogn.2017.04.136>.
- Halperin O, Sarid O, Cwikel J. The influence of childbirth experiences on women's postpartum traumatic stress symptoms: a comparison between Israeli Jewish and Arab women. *Midwifery* 2015;**31**(6):625–32. doi:<http://dx.doi.org/10.1016/j.midw.2015.02.011>.
- Söderquist J, Wijma K, Wijma B. Traumatic stress after childbirth: the role of obstetric variables. *J Psychosom Obstet Gynecol* 2002;**23**(1).
- Adewuya AO, Ologun YA, Ibigbami OS. Post-traumatic stress disorder after childbirth in Nigerian women: prevalence and risk factors. *BJOG* 2006;**113**(3):284–8. doi:<http://dx.doi.org/10.1111/j.1471-0528.2006.00861.x>.
- Ayers S, Harris R, Sawyer A, Parfitt Y, Ford E. Posttraumatic stress disorder after childbirth: analysis of symptom presentation and sampling. *J Affect Disord* 2009;**119**(1–3):200–4. doi:<http://dx.doi.org/10.1016/j.jad.2009.02.029>.
- Andersen LB, Melvaer LB, Videbech P, Lamont RF, Joergensen JS. Risk factors for developing post-traumatic stress disorder following childbirth: a systematic review. *Acta Obstet Gynecol Scand* 2012;**91**(11):1261–72. doi:<http://dx.doi.org/10.1111/j.1600-0412.2012.01476.x>.
- Ayers S, Bond R, Bertullies S, Wijma K. The aetiology of post-traumatic stress following childbirth: a meta-analysis and theoretical framework. *Psychol Med* 2016;**46**(6):1121–34. doi:<http://dx.doi.org/10.1017/S0033291715002706>.
- Cohen MM, Ansara D, Schei B, Stuckless N, Stewart DE. Posttraumatic stress disorder after pregnancy, labor, and delivery. *J Womens Health (Larchmt)* 2004;**13**(3):315–24. doi:<http://dx.doi.org/10.1089/154099904323016473>.
- Srkalović Imširagić A, Begić D, Šimičević L, Bajić Ž. Prediction of posttraumatic stress disorder symptomatology after childbirth—a Croatian longitudinal study. *Women Birth* 2017;**30**(1):e17–23. doi:<http://dx.doi.org/10.1016/j.wombi.2016.06.007>.
- Gamble J, Creedy D. Psychological trauma symptoms of operative birth. *Br J Midwifery* 2005;**13**(4):218–25.
- DeMier RL, Hynan MT, Harris HB, Manniello RL. Perinatal stressors as predictors of symptoms of posttraumatic stress in mothers of infants at high risk. *J Perinatol* 2018;**16**(4)276–80. [Accessed 24 August] <http://www.ncbi.nlm.nih.gov/pubmed/8866297>.
- Elklit A, Hartvig T, Christiansen M. Stress disorder in parents of premature neonates—secondary publication. *Ugeskr Laeger* 2008;**170**(45)3643–5. [Accessed 21 August 2018] <http://www.ncbi.nlm.nih.gov/pubmed/18988368>.
- Fairbrother N, Woody SR. Fear of childbirth and obstetrical events as predictors of postnatal symptoms of depression and post-traumatic stress disorder. *J Psychosom Obstet Gynecol* 2007;**28**(4):239–42. doi:<http://dx.doi.org/10.1080/01674820701495065>.
- Creedy DK, Shochet IM, Horsfall J. Childbirth and the development of acute trauma symptoms: incidence and contributing factors. *Birth* 2000;**27**(2)104–11. [Accessed 15 December 2018] <http://www.ncbi.nlm.nih.gov/pubmed/11251488>.
- de Graaff LF, Honig A, van Pampus MG, Stramrood CAI. Preventing post-traumatic stress disorder following childbirth and traumatic birth experiences: a systematic review. *Acta Obstet Gynecol Scand* 2018;**97**(6):648–56. doi:<http://dx.doi.org/10.1111/aogs.13291>.
- Simpson M, Schmied V, Dickson C, Dahlen HG. Postnatal post-traumatic stress: an integrative review. *Women Birth* 2018;**31**(5):367–79. doi:<http://dx.doi.org/10.1016/j.wombi.2017.12.003>.
- Peduzzi P, Concato J, Kemper E, Holford TR, Feinstein AR. A simulation study of the number of events per variable in logistic regression analysis. *J Clin Epidemiol* 1996;**49**(12)1373–9. [Accessed 13 September 2017] <http://www.ncbi.nlm.nih.gov/pubmed/8970487>.
- Callahan JL, Borja SE, Hynan MT. Modification of the perinatal PTSD questionnaire to enhance clinical utility. *J Perinatol* 2006;**26**(9):533–9. doi:<http://dx.doi.org/10.1038/sj.jp.7211562>.
- Loewenberg-Weissband Y, Grisar-Granovsky S, Ioscovich A, Samueloff A, Calderon-Margalit R. Epidural analgesia and severe perineal tears: a literature review and large cohort study. *J Matern Neonatal Med* 2014;**27**(18). doi:<http://dx.doi.org/10.3109/14767058.2014.889113>.
- Ford E, Ayers S, Bradley R. Exploration of a cognitive model to predict post-traumatic stress symptoms following childbirth. *J Anxiety Disord* 2010;**24**(3):353–9. doi:<http://dx.doi.org/10.1016/j.janxdis.2010.01.008>.
- Hasegawa J, Sekizawa A, Ishiwata I, Ikeda T, Kinoshita K. Uterine rupture after the uterine fundal pressure maneuver. *J Perinatal Med* 2015;**43**(6):785–8. doi:<http://dx.doi.org/10.1515/jpm-2014-0284>.
- Abdollahpour S, Khosravi A, Bolbolhaghghi N. The effect of the magical hour on post-traumatic stress disorder (PTSD) in traumatic childbirth: a clinical trial. *J Reprod Infant Psychol* 2016;**34**(4):403–12. doi:<http://dx.doi.org/10.1080/02646838.2016.1185773>.
- Mei JY, Afshar Y, Gregory KD, Kilpatrick SJ, Esakoff TF. Birth plans: what matters for birth experience satisfaction. *Birth* 2016;**43**(2):144–50. doi:<http://dx.doi.org/10.1111/birt.12226>.
- Instituto Nacional de Estadística. Resultados detallados. Partos. <http://www.ine.es/dynt3/inebase/index.htm?padre=4254&capsel=4255>. Published 2016.
- Ford E, Ayers S. Support during birth interacts with prior trauma and birth intervention to predict postnatal post-traumatic stress symptoms. *Psychol Health* 2011;**26**(12):1553–70. doi:<http://dx.doi.org/10.1080/08870446.2010.533770>.
- Shlomi Polachek I, Dulitzky M, Margolis-Dorfman L, Simchen MJ. A simple model for prediction postpartum PTSD in high-risk pregnancies. *Arch Womens Ment Health* 2016;**19**(3):483–90. doi:<http://dx.doi.org/10.1007/s00737-015-0582-4>.