



Risk factors associated with postpartum depression and PTSD after birth in a sample of Slovak women

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ABSTRACT

Background: Pregnancy, childbirth and the postpartum period represent a unique experience in a woman's life that significantly changes their life.

Methods: The aim of the study is to analyse risk factors of postpartum depression and post-traumatic stress disorder symptoms after birth in a sample of women in Slovakia. Data from the INTERSECT project were collected, including 437 postpartum women (mean age 30.5 ± 4.8). Posttraumatic stress disorder (PTSD) measured through the City BiTS questionnaire, postpartum depression (PPD) symptoms were detected using the Edinburgh Postnatal Depression Scale (EPDS) and birth satisfaction was measured by the Birth Satisfaction Scale- Revised (BSS-R). **Results:** An increased risk for the development of PPD (the EPDS score >12.5) was found in 11.4 % of respondents, PTSD after birth was identified among 2.8 % of respondents. In the linear regression models, birth satisfaction (95%CI: 0,56; -0,19), subjective perception of birth (95%CI: 0,82; 1,63), previous trauma (95%CI: 0,27; 3,74), respect during birth (95%CI: 5,08; -0,45), and health complications of both mother (95%CI: 0,12; 2,81) and child (95%CI: 1,53; 1,84) were found significantly associated with the posttraumatic stress symptoms after birth (total explained variance 37 %). Subjective perception of birth as traumatic (95%CI: 0,82; 1,63), previous trauma in the anamnesis (95%CI: 0,27; 3,74) and respect during birth (95%CI: 5,08; -0,45) were significantly associated with the depression symptoms (total explained variance 15 %).

Conclusion: Subjective perception of birth, birth satisfaction, previous trauma in anamnesis as well as lack of respect during birth were found as crucial risk factors for both PPD and postpartum PTSD.

1. Introduction

The postpartum period is characterized by extraordinary physical, biological, social and emotional changes [1]. The causes of maternal psychological problems are multifactorial and include individual predisposition factors, such as a family history of psychological disorders, psychosocial circumstances that include socioeconomic deprivation, intimate partner violence or other chronic stressors [2].

Postpartum depression (PPD) is considered a serious psychiatric disorder, but it is underestimated, either from a clinical or experimental point of view, and very little emphasis is given to its diagnosis. Onset of symptoms can range from a few days to a few weeks after delivery, but in most cases, it starts within 2–3 months after delivery [1]. The criterion for the classification of PPD is the

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onset of symptoms during pregnancy or within four weeks after delivery [3].

Prevalence estimates in developed countries range from 1.0 % to 5.6 % for a severe form of depression and from 6.5 % to 12.9 % for less severe forms of depression during pregnancy and 12 months after childbirth. Studies focusing on the time period of 3 months after childbirth showed the highest prevalence of PPD, for severe form of depression 7.1 % and 19.2 % for mild form of depression [4].

Only a small number of studies focused on the incidence of postpartum depression in the Slovak Republic. According to a study focusing on the prevalence of postpartum depression in Slovakia with a relatively small sample of female respondents, the incidence of depressive symptoms assessed in the sixth week, in the period of four to six days after childbirth, was 11–20 % [5]. Another study produced similar results, in which the prevalence rate of severe depressive symptoms was 25 % in Slovakia [6]. According to the first study dealing with the adaptation of the Slovak version of the EPDS questionnaire, the incidence of depressive symptoms in women on the 2–4th day after childbirth was 6 %, while in the time period 6–8 weeks after delivery, the prevalence rate of such symptoms was 11.6 % [7]. The global prevalence of PPD found by a review study worldwide was 17 % [8]. Prevalence rates vary across studies and countries depending on the screening tool used. Several discrepancies also appear in the studies due to the inconsistent determination of the time period after delivery, when PPD was determined [3].

Postpartum depression is not a homogeneous disorder [9]. The combination of biological factors such as reproductive hormones, stress hormones and thyroid hormones together with psychological factors, however, plays a key role in the development of postpartum depression [10]. Reproductive and stress hormones rise dramatically during pregnancy and subsequently decline after delivery, leading to systemic dysregulation and thus a possible risk factor for the development of PPD [11].

Posttraumatic stress disorder is generally considered to be a reaction to a traumatic event. There is a popular perception of PTSD as a disorder linked to traumatic events other than childbirth [12]. The existence of PTSD after childbirth as well as its symptoms were unknown to experts for a long time, precisely because of society's general belief that childbirth is and should be a positive experience [13]. There is increasing evidence that some women develop PTSD as a reaction to birth events [2]. Up to 45 % of women evaluated their birth as traumatic, while an estimated 3.1 % of women met the criteria for post-traumatic stress disorder in the period of 12 weeks after giving birth [14].

Research results show that up to 43 % of women meet at least one diagnostic criterium for PTSD. 3.6 % of these women met all criteria for PTSD diagnosis [15]. According to the results of a review study of postpartum PTSD, 24–34 % of women show symptoms of PTSD and 2.8–5.6 % of them develop PTSD fully within 6 weeks after delivery [16].

A traumatic childbirth experience refers to a woman's experience of interactions and/or events directly related to childbirth that caused overwhelming distressing emotions and reactions; leading to short and/or long-term negative impacts on a woman's health and wellbeing [17]. The traumatic experience of childbirth can cause the development of postpartum PTSD. Predisposing events include insufficient help and support during birth as well as quality of interaction with medical staff [15]. Unlike other postpartum psychopathology, this is an area where there is obvious potential to prevent or even minimize postpartum PTSD by altering maternal care during labour and the early postpartum period to improve women's subjective experiences of childbirth [2].

The main goal of our study was to analyse potential perinatal and anamnestic factors for postpartum depression and PTSD after childbirth in a sample of women in Slovakia. In order to be able to clarify our main goal, we chose several sub-steps. Our main goals as well as sub-goals were supported by the study of the literature of the given issue. In the research, we focused primarily on the influence of sociodemographic factors on the development of either postpartum depression or PTSD. The next step was to find out the occurrence of mother or child health complications, the mother's general health and pregnancy anamnesis. We compared all the mentioned circumstances and determined their influence on the psychological experience of a woman after childbirth. Subsequently, we investigated in more depth the circumstances during childbirth that affect a woman's overall satisfaction with childbirth and may have an impact on her psychological health after childbirth.

We set this goal on the basis of the fact, that the topic of the traumatic experience of childbirth, postpartum depression and especially PTSD after childbirth is very little researched and clarified in Slovak republic. Therefore, we want to bring knowledge about the individual risk factors contributing to this issue so that we can improve the care of women and thereby improve the quality of life of women during and after childbirth.

2. Methods

2.1. Participants and data collection

The study was carried out as part of the international INTERSECT project aiming at research of traumatic childbirth and PTSD after birth in an international context. The research took place in four hospitals in Martin, Čadca, Ružomberok and Spišská Nová Ves, in Slovakia. A cross-sectional study design was used in the present research. Prior to the study, an informed consent was obtained from research participants. Respondents were approached personally by the researchers on the 2nd to 4th day after giving birth for the purpose to participate in the research. Online questionnaire was sent to each female respondent 6–8 weeks after giving birth to the e-mail address provided in the informed consent. After sending the e-mail, the female respondents were notified by SMS that they had received the questionnaire. Data collection took place from July 2021 to November 2022.

A total of 437 female respondents participated in the study (mean age 30.5 ± 4.8 ; range 18–45). We were not able to determine a study response rate: 805 informed consents were distributed, 455 questionnaires were filled in, however, we did not record the number of women who were approached to participate in the research but declined. 18 questionnaires were excluded as they did not match the 6–8 week postpartum criterion. Table 1 shows the basic sociodemographic and perinatal characteristics of the research sample. Majority (58,1 %) of female respondents finished university, 40 % completed secondary education, and 1.8 % primary education. More

than half of the respondents (53.9 %) were primiparas and 46.1 % respondents were multiparas. While 75.9 % of respondents had vaginal delivery, 13.1 % underwent acute cesarean section, and 7.6 % of them had planned C-section. 3.4% of respondents underwent assisted vaginal delivery, either using obstetric forceps or vacuum extraction. Most of the births (70.2 %) were spontaneous and 29.8 % were induced births.

We asked respondents whether they felt they had received enough information about childbirth (study of literature, prenatal preparation courses, information from health-care professionals, etc.). The majority of women (79.8 %) were satisfied with their childbirth preparation and 20.2 % of respondents expressed a subjective lack of birth preparedness. Furthermore, we focused on the issue of health complications during pregnancy and childbirth, whether on the part of the mother or the child. Minor complications during pregnancy and birth were confirmed by 35 % of women. Severe complications occurred in 5.9 % of respondents. 59.1 % of respondents did not have any complications during pregnancy or birth. Concerning the child's health, minor complications occurred in 16.9 % of cases, severe complications were confirmed by 3.4 % of respondents, and 79.7 % of women stated that there were no complications during pregnancy or childbirth affecting the child.

2.2. Measuring instruments

Questions focused on basic sociodemographic (age, education), perinatal and anamnestic (parity, type of delivery, health complications of mother and child, induction of labour, previous trauma in anamnesis) factors were included in the research.

As first, from the standardized questionnaires we want to mention The City Birth Trauma Scale (City BiTS). It is a specially designed 29-item questionnaire, of which all items correspond to the diagnostic criteria for PTSD according to DSM-V (The Diagnostic and Statistical Manual of Mental Disorders, Fifth Edition), including intrusion, avoidance, negative cognitions and hyperarousal. Questionnaire items are divided into categories specifically developed to measure childbirth-related PTSD. Items assess PTSD symptoms from four subscales, which are symptoms of re-experiencing (B), avoidance (C), negative cognitions and mood (D), and hyperarousal (E). These items are rated on a 4-point scale according to frequency of symptoms over the past week (0-not at all, 1-once, 2-two-four times, and 3-five or more times). The total PTSD symptom score of the questionnaire ranges from 0 to 60, and a higher score indicates higher severity of post-traumatic symptoms [18]. Reliability (Cronbach's alpha) in present research was 0.91.

The Edinburgh Postnatal Depression Scale (EPDS) was used to determine the increased risk of postpartum depression after childbirth. It is a simple 10-item questionnaire identifying symptoms of depression present in the previous seven days. The questions have 4 different answers to be chosen from Ref. [19]. Each question is rated on a scale of 0–3, and the total score can range from 0 to 30. The questionnaire is evaluated by calculating a raw score, with a higher score suggesting a higher level of depression symptoms. A cut-off score of 12.5 or higher indicates increased level of depression and anxiety, as well as a high probability for postpartum depression [19]. The EPDS also contains questions that may reveal suicidal thoughts in a woman. If these questions are answered positively, immediate consultation with an expert is recommended [20]. The scale intentionally excludes somatic symptoms, which

Table 1
Basic sociodemographic, anamnestic and perinatal characteristics of the sample.

Variable	N (%) (total sample n = 437)	EPDS score (SD)	p-level	City BiTS score (SD)	p-level
Education					
University	253 (58.1 %)	6.5 (±4.2)		10.9 (±8.2)	
Secondary	174 (40.0 %)	6.7 (±4.7)		8.9 (±10.4)	
Primary	8 (1.8 %)	6.7 (±5.0)	0.951	9.2 (±10.2)	0.476
Parity					
Primiparas	234 (53.9 %)	7.5 (±5.2)		10.4 (±10.9)	
Multiparas	200 (46.1 %)	5.6 (±4.3)	0.001	7.8 (±9.3)	0.004
Mode of delivery					
Vaginal delivery	332 (75.9 %)	6.6 (±4.8)		8.7 (±10.1)	
Assisted vaginal delivery (VEX, forceps)	15 (3.4 %)	9.0 (±5.0)		15.6 (±14.3)	
Acute cesarean section	57 (13.1 %)	6.3 (±4.6)		9.6 (±8.9)	
Planned cesarean section	33 (7.6 %)	7.3 (±5.80)	0.196	9.3 (±10.6)	0.079
Induction of the birth					
No	299 (70.2 %)	6.6 (±4.9)		8.9 (±10.2)	
Yes	127 (29.8 %)	6.8 (±4.6)	0.465	9.9 (±10.1)	0.247
Health complications of the mother					
Minor complications	153 (35.0 %)	7.4 (±5.1)		11.4 (±11.2)	
Severe complications	26 (5.9 %)	8.1 (±5.2)		12.9 (±10.3)	
No	258 (59.1 %)	6.1 (±4.6)	0.001	7.4 (±9.2)	0.001
Health complications of the child					
Minor complications	74 (16.9 %)	7.0 (±4.7)		11.1 (±11.1)	
Severe complications	15 (3.4 %)	10.1 (±5.1)		13.3 (±10.9)	
No	348 (79.7 %)	6.5 (±6.4)	0.047	8.5 (±9.9)	0.037
Previous trauma in anamnesis					
Yes	181 (41.4 %)	7.5 (±4.7)		10.9 (±10.6)	
No	256 (58.6 %)	6.1 (±4.9)	0.001	7.9 (±9.8)	0.001
Feeling prepared for birth					
Yes	347 (79.8 %)	6.5 (±4.7)		8.7 (±9.9)	
No	88 (20.2 %)	7.5 (±5.4)	0.177	10.9 (±11.3)	0.052

can be misleading as indicators of depression due to physiological changes after childbirth [21]. The Slovak translation of EPDS questionnaire [7] demonstrated good consistency, convergent validity and good model characteristics of the EPDS on a sample of postpartum women in Slovakia. Reliability of the EPDS in present research was 0.86.

The Birth Satisfaction Scale – Revised (BSS-R) is a valid and reliable instrument for measuring postnatal women's birth satisfaction. It consists of 3 subscales that measure different but interrelated domains such as (1) the quality of care provision (environment during childbirth, support and relationship with health workers) (2) women's personal attributes (reflecting women's predisposition to cope with childbirth, feeling in control, childbirth preparation and relationship with the child) (3) perceived subjective stress during childbirth (perceived fear, occurrence of birth injuries, pain, length of childbirth, sufficient medical care, health status of the child). Four items measure the quality of care provision, four items stress during childbirth, and two items focus on women's personal attributes [21,22]. The BSS-R is a Likert-type scale, women rate their answers on a scale from 0 to 4 (0 - strongly disagree, 1 - disagree, 2 - neither agree or disagree; 3 - agree; 4 - strongly agree), while four of its items are reverse coded [22]. The final score ranges from 0 to 40 (0-lowest satisfaction, 40-highest). Reliability (Cronbach's alpha) in present research was 0.83.

Subjective perception of the birth as traumatic was assessed on a scale ranging from 0 to 10 (0-not at all traumatic, 5-moderately traumatic, 10-extremely traumatic). We divided the answers into two categories: answers 0–5 indicated that the respondents do not perceive childbirth as a traumatic event. Answers 6–10 indicated the subjective perception of childbirth as a traumatic event. Respect during childbirth was measured with two questions: 1. "Did the medical staff in the delivery room treat you with respect and dignity?" and 2. "Did you feel that your privacy and intimacy were respected in the delivery room?" Respondents had a choice of 5 answers to which we assigned a point assessment (Yes - 5, Rather yes -4, I don't know/cannot be assessed -3, Rather not -2, No -1). We also asked respondents whether they felt they had feeling that they are prepared for the birth (whether they had received enough information about childbirth, study of literature, prenatal preparation courses, information from health-care professionals, etc.).

2.3. Statistical procedures

The statistical analysis was carried out using the Microsoft Office Excel program and the freely available jamovi statistical software [23,24]. Since normality testing showed that the dependent variables (raw scores of the used questionnaires) do not have a normal distribution, non-parametric statistical were used to verify all established hypotheses. We have used non-parametric analysis of variance - ANOVA, non-parametric version of the *t*-test for independent variables - Man-Whitney test. The Shapiro-Wilk test was used to test the normality of the distribution of variables. As shown in Table 2, results of the Shapiro-Wilk test have shown, that both key variables in our study (City BiTS total score and EPDS total score) don't have a normal distribution ($p \leq 0.001$). We also used basic descriptive statistics to verify the determined variables. Linear regression models were used, when analysing risk factors of the PTSD after birth and postpartum depression. EPDS scores and City BiTS scores were treated as dependent variables, while potential risk factors (sociodemographic and anamnestic characteristics, birth satisfaction, perception of birth) as independent variables.

3. Results

As shown in Table 1, significant difference in EPDS levels were found based on parity ($p = 0.001$), health complications of the mother ($p = 0.001$) and child ($p = 0.047$), and previous trauma in anamnesis ($p = 0.001$). Higher scores in depressive symptomatology were found among primiparas, women who reported health complications of themselves or their child, and also women who reported previous trauma in their anamnesis. Significant difference regarding posttraumatic symptoms after birth were found as well. These results were comparable to the results in the EPDS scale. A higher predisposition for the development of posttraumatic stress disorder after childbirth was shown by primiparas ($p = 0.004$), also if woman ($p = 0.001$) or her child ($p = 0.037$) experienced health complications, either during pregnancy or childbirth. Previous trauma in anamnesis ($p = 0.001$) was another factor which increased the potential risk for PTSD development.

The means scores of the EPDS, BSS-R and City BiTS questionnaires are presented in Table 3. In the City Birth Trauma Scale (City BiTS), the highest values were 52 and the lowest 0 (Mean = 9.1, SD \pm 10.3, Median = 6, Mode = 0). Prevalence of PTSD symptoms based on City BiTS questionnaire was 2.8 %.

Out of the total number of respondents in our sample, 11.4 % of respondents had an identified risk of depression measured by EPDS questionnaire (cut-off score >12.5). The highest values were 28, lowest 0 (Mean = 6.6, SD = 4.9, Median = 6, Modus = 4). Subjective perception of birth was measured by Birth Satisfaction Scale – Revised. The highest values were 40, means the highest possible birth satisfaction. The lowest values were 5 (Mean = 27.1, Median = 27, Modus = 24).

In the correlation analysis (Table 4), significant relationships between depression scores (EPDS), posttraumatic stress symptoms (City BiTS), and levels of birth satisfaction (BSS-R) were found. EPDS scores were significantly associated with the City BiTS scores ($p = 0.001$, $r = 0.63$), which means that elevated depression levels were associated with higher levels of posttraumatic symptoms. Both EPDS scores and City BiTS scores correlated negatively with the BSS-R scores ($p = 0.001$, $r = -0.31$; $p = 0.001$, $r = -0.54$): higher

Table 2

Test of normality of distribution of depend variables.

Variable	N (total sample = 437)	Shapiro-Wilk test	p- level
City BiTS total score	424	0,827	0.001
EPDS total score	432	0,931	0.001

Table 3

Basic characteristics of the EPDS, City BiTS and BSS-R scores.

	% of PTSD/depression cases	Mean (SD)	Median	Modus	Maximum	Minimum
EPDS	11.4 %	6.6 ± 4.9	6	4	28	0
City BiTS	2.8 %	9.1 ± 10.3	6	0	52	0
BSS-R	–	27.1 ± 6.8	27	24	40	5

Table 4

Pearson correlation coefficients showing the relationship between key variables.

Variable	EPDS	City BiTS	BSS-R
EPDS	1.00	0.63 ***	–0.31 ***
City BiTS	0.63 ***	1.00	–0.54 ***
BSS-R	–0.31 ***	–0.54 ***	1.00

*p-value significant at < 0.05, ** p-value significant at < 0.01, *** p-value significant at < 0.001.

levels of depression and posttraumatic symptoms were associated with lower levels of birth satisfaction.

In the linear regression model adjusted for the effect of basic sociodemographic data (age, education) some of the analyzed perinatal and anamnestic data has been shown as significantly associated with the posttraumatic stress symptoms: birth satisfaction ($\beta = -0.25$; 95%CI: 0,56; –0,19), subjective perception of birth as traumatic ($\beta = 0.33$; 95%CI: 0,82; 1,63), previous trauma in the anamnesis ($\beta = 0.10$; 95%CI: 0,27; 3,74), respect during birth ($\beta = -0.10$; 95%CI: 5,08; –0,45), and health complications of both mother ($\beta = 0.08$; 95%CI: 0,12; 2,81) and child ($\beta = 0.01$; 95%CI: 1,53; 1,84). The total explained variance of the linear regression model was 37.0 % (Table 5).

In the linear regression model with the depression symptoms as dependent variable, subjective perception of birth as traumatic ($\beta = 0.33$; 95%CI: 0,82; 1,63), previous trauma in the anamnesis ($\beta = 0.10$; 95%CI: 0,27; 3,74) and respect during birth ($\beta = -0.10$; 95% CI: 5,08; –0,45) were significantly associated with the depression symptoms. Analysis was adjusted for the effect of basic socio-demographic data (age, education), and total explained variance of this regression model was 15.0 % (Table 6).

4. Discussion

In our study, we focused on perinatal and anamnestic factors that could be a predictor for the development of postpartum depression and posttraumatic stress disorder after childbirth.

According to Stewart and Vigod [25], more than 50 % of women experience mild and temporary syndromes including bad mood, tearfulness, and irritability in a short time after childbirth. These symptoms are called the postpartum blues and usually disappear within two weeks of giving birth. In some cases, however, these symptoms may develop into PPD [25]. In our study, an increased risk for the development of PPD (EPDS questionnaire score ≥ 12.5) was assessed in 11.4 % of respondents. To compare our results, we used the review study by Shorey et al. [8] where the observed prevalence was lowest in European countries (8 %). Similar prevalence was observed in other countries included in the study as follows: in the United States of America a prevalence of 12 %, Sweden 13 %, Australia 15 %, Canada 8 % and Norway 10 %. Studies also describe a high rate of comorbidity of postpartum depression and PTSD. Approximately 90.4 % of women with PTSD also developed PPD symptoms, and 31.5 % of women with postpartum depression also experienced PTSD symptoms [26,27]. These findings correlate with our results specifically, women with higher rates of postpartum depression symptoms also achieved higher scores on the PTSD scale. The comorbidity of PTSD and depression was also described in a

Table 5

Linear regression models with the effect of the risk factors on the level of posttraumatic stress symptoms in a study sample.

City BiTS score	β coefficient	95 % CI
Previous trauma	0.10	0.27; 3.74
Subjective perception of birth as traumatic	0.33	0.82; 1.63
BSS-R	–0.25	–0.56; –0.19
Respect 1	–0.10	–5.08; –0.45
Respect 2	–0.05	–2.81; 0.69
Feeling prepared for the birth	–0.04	–3.25; 1.01
Health complications of the mother	0.08	–0.12; 2.81
Health complications of the child	0.01	–1.53; 1.84
Induction of the birth	–0.02	–2.34; 1.61
Parity	–0.02	–2.21; 1.42
Mode of birth	–0.05	–1.58; 0.41
Age	–0.01	–0.22; 0.16
Education	0.04	–0.96; 2.32
Total explained variance	37.0 %	

Statistically significant effects are in **bold** ($p \leq 0.01$).

Table 6

Linear regression models with the effect of the risk factors on the level of postpartum depression in a study sample.

EPDS score	β coefficient	95 % CI
Previous trauma	0.10	0.02; 1.92
Subjective perception of birth as traumatic	0.23	0.19; 0.63
BSS-R	-0.08	-0.16; 0.04
Respect 1	0.05	-0.69; 1.84
Respect 2	-0.16	-2.50; -0.59
Feeling prepared for the birth	-0.01	-1.28; 1.05
Health complications of the mother	0.06	-0.34; 1.26
Health complications of the child	0.02	-0.72; 1.12
Induction of the birth	-0.04	-1.52; 0.64
Age	0.01	-0.09; 0.12
Education	0.00	-0.91; 0.88
Parity	-0.11	-2.10; -0.12
Mode of birth	-0.05	-0.83; 0.26
Total explained variance	15.0 %	

Statistically significant effects are in **bold** ($p \leq 0.01$).

review study by Yildiz et al. [28]. The rate of comorbidity of these two disorders was 44.1 % in pregnancy and 17.72 % after birth. However, these results are based on a relatively small number of studies. In the postpartum period, only 3 studies reported comorbidity with a wide range from 6.64 % to 71.54 %. These results should therefore be interpreted with caution.

The prevalence of PTSD symptoms in our research based on results of City BiTS was 2.8 %. The overall PTSD prevalence of 1–3% in non-risk groups of women was confirmed by the study Anderson [29]. Study by Yildiz et al. [28] further emphasizes that perinatal PTSD is a relatively common problem and thus represents a significant public health problem requiring attention, screening and treatment. According to a study conducted in Slovakia on a small sample of postpartum women, the risk of posttraumatic stress disorder was found in 3.56 % of women [30].

Childbirth is one of the most challenging psychological events in a mother's life, as 10–34 % of all childbearing women are faced with traumatic birth experiences. A negative experience in childbirth is associated with PTSD, disruption to interpersonal relationships, dysfunctional maternal-infancy bonding, reduction in rates of exclusive breastfeeding, inappropriate utilization of maternal and newborn care services, fear of childbirth and increased desire for an elective caesarean section in future pregnancies [31]. As we have described in our study, both EPDS scores and City BiTS scores correlated negatively with the BSS-R scores, which means that higher levels of depression and posttraumatic symptoms were associated with lower levels of birth satisfaction. Many research studies have confirmed that birth satisfaction can be a significant predictor of the increased risk of postpartum depression [32]. Similar results are also presented in a study by Urbanová et al. [33], where the authors confirmed that lower level of satisfaction with childbirth was a significant predictor of a higher risk of PPD. Studies show that a traumatic birth experience plays a major role in the development of PPD. Events during childbirth that significantly affect satisfaction with childbirth in a negative way and are also predictors for PPD are mainly obstetric violence and medical interventions. Obstetric violence includes inappropriate and disrespectful treatment of the mother, while medical interventions include emergency caesarean section, routine administration of synthetic oxytocin or performing an episiotomy [34]. A positive birth experience is accompanied by a woman's feeling of control, satisfaction and trust. It affects the health and emotional state of the mother and the child as well as the intimate life of the woman for the purpose of further pregnancy [35].

There is evidence of unpleasant birth experiences that affect both maternal and infant morbidity and mortality and that can significantly change a woman's birth experience, which was expected to be positive, into a traumatic one [36]. In a study by Gough, Giannouli [37], an association between birth trauma and the development of postpartum PTSD was proven. Up to 45 % of women experience birth trauma. The perception of birth trauma is complex. The use of obstetric forceps or VEX may be considered a traumatic intervention by health-care professionals, nevertheless, the mother may experience her birth as traumatic because it was not completed surgically. Inconsistencies can also be observed if a woman gives birth without any complications but her wishes from the birth plan were not met, which leads to a feeling of failure and sadness [38]. It is not the birth as such that leads a woman to trauma, but her subjective perception of this event. From the point of view of health-care professionals, childbirth may seem perfect and properly medically managed, however, a woman does not necessarily evaluate birth in the same way. In addition to performing the necessary procedures during childbirth, the issues that go beyond traditional clinical parameters towards more personal care and an approach focused on the mother herself have also to be considered [39].

The studies emphasize how birth trauma is strongly influenced by the mother's negative interactions with health-care staff and a dysfunctional health care system [40]. Our study proved similar results, where women who perceived a higher level of respect and dignity during childbirth had a significantly lower score of postpartum PTSD symptoms after childbirth compared to women who experienced a low level of respect and dignity from the medical staff. Also, women who perceived the preservation of privacy and intimacy during childbirth had a significantly lower score of postpartum PTSD symptoms as well as PPD. To promote a positive birth experience, health-care providers should support women's self-confidence during childbirth, approach women with maximum respect, maintain intimacy and privacy, and involve the woman in the decision-making process during childbirth [41].

In the linear regression model adjusted for the effect of basic sociodemographic data (age, education) some of the analyzed perinatal and anamnestic data has been shown as significantly associated with the posttraumatic stress symptoms such as birth

satisfaction, subjective perception of birth as traumatic, previous trauma in the anamnesis, respect during birth, and health complications of both mother and child. The total explained variance of the linear regression model was 37.0 %. Comparable results were also found in the Çapik, Durmaz [42] study, where the authors emphasize the importance of the mother's involvement in decision-making during childbirth. It is proven that, from the mother's side, this is one of the factors contributing to the overall positive experience of childbirth. Women's subjective experiences of childbirth are strongly correlated with the development of postpartum PTSD, as well as the fact that the support of medical staff and respectful communication is a protective factor that reduces the risk of developing PTSD after childbirth. As a part of PTSD prevention, certain factors have been identified in order to prevent the occurrence of PTSD. It was the availability of support from health professionals, their respectful care, the quality of relationships with care providers, the involvement of mothers in decision-making, the support of bonding after birth and the start of breastfeeding in the first hour, reducing the medicalization of the natural birth process and partner support. By implementing these strategies with proper clinical practises based on evidence, the incidence of PTSD and its subsequent consequences on maternal and newborn health could be reduced [43].

In the linear regression model with the depression symptoms as dependent variable, subjective perception of birth as traumatic, previous trauma in the anamnesis and respect during birth were significantly associated with the depression symptoms. Analysis was adjusted for the effect of basic sociodemographic data (age, education), and total explained variance of this regression model was 15.0 %. Considering the total explained variance in this linear regression model we can state that, apparently there are other factors contributing to the development of postnatal depression than those we investigated in our study. In the linear regression model, whether in the case of EPDS or City BiTS, subjective perception of childbirth as a traumatic event and also previous trauma in anamnesis were shown to be statistically significant.

The present study confirmed association between the parity of the mother and a higher risk of developing PPD and PTSD after childbirth. A significantly higher rate of PTSD symptoms and postpartum depression was found in the group of primiparous women compared to the group of multiparas. Parity, specifically the birth of the first child, was also described as a risk factor for the development of PPD in several studies [44] and our findings are consistent with their results. A higher predisposition for the development of PTSD after the birth of the first child is described in women mainly in connection with a traumatic birth experience or unexpected events during childbirth [45].

No association of PPD or PTSD with age was found in our study. Older age of the mother as a risk factor is described in the study by Angelini et al. [39]. According to Harrison et al. [46], age was one of the risk factors, however, the younger age of mothers (≤ 24) was just one of the factors affecting the development of postpartum PTSD. Evidence for an association between maternal age and increased risk for developing PPD is mixed. Some studies have shown that younger maternal age (mothers under the age of 25) were at greater risk for developing PPD. Another study reported a threefold higher risk for developing PPD in mothers younger than 25 years [47]. However, there is a large number of studies where the correlation between age and the risk of developing PPD has not been confirmed [39].

We did not find statistical significance between the level of education and the development of PTSD and PPD after childbirth. Concerning the association of sociodemographic factors and the risk of developing PPD and postpartum PPD, there are ambivalent results from earlier studies. While several of these factors appear to be significant in some studies, in others no associations are described [48].

Also, we did not observe significant differences in the type and method of delivery in relation to a higher risk for the development of PPD and PTSD following childbirth. It was confirmed that women after forceps or VEX had a significantly higher level of PPD and PTSD, but due to the small number of respondents in the given category, the results were not statistically significant.

Acute situations resulting from complications during childbirth or during pregnancy also result in a high risk for the development of postpartum PTSD, since they are often associated with the need for medical intervention and the multiplication of the mother's worries about her child's health [2]. However, health complications during pregnancy and birth, which affected either the mother or the child, were proven to be another risk factor. It has been shown that maternal stress caused by complications during pregnancy or childbirth may contribute to and result from perinatal depression [36].

5. Limitations

We consider the representativeness of the sample to be a limitation of our research (the small number of respondents with forceps/VEX mode of birth, or with low education), as well as the fact, that we did not have the exact study response rate (as we did not record the number of women who were approached for participation in the research but declined). Another limitation of our study is the investigation of partial factors for the development of PPD and postpartum PTSD, while there is a complex interaction of several factors contributing to their development.

6. Conclusion

In the present study, subjective perception of birth, birth satisfaction, previous trauma in anamnesis and lack of respect during birth were shown to be the significant risk factors for PPD as well as postpartum PTSD. Perinatal factors, events during childbirth and the subjective perception of childbirth by the mother seem to play an important role both for the positive birth experience as well as a prevention for the development of mental disorders after childbirth. Mothers consider the preservation of privacy and intimacy during childbirth and the respect from the medical staff as one of the important factors supporting a positive birth experience. The postpartum period is characterized by sudden changes that may have long-term psychological consequences for the woman. Investigating risk factors as well as preventing their occurrence can be beneficial for women, especially for maintaining psychological health after

childbirth and developing the relationship between mother and child. Concerning perinatal factors, we see a lot of room for a closer examination of birth trauma and the birth experience for the development of PPD and postpartum PTSD. In our study, a clear connection between perception of birth as traumatic and the development of PPD and PTSD after childbirth was confirmed, but it would be appropriate to find out more detailed factors that led to the perception of childbirth as a traumatic event and the subsequent development of mental disorders after childbirth. From the point of view of improving mental health in the postpartum period, it would be beneficial to focus on screening of risk factors such as previous trauma in anamnesis of birthing women. Possibility of consultation with mental health professionals following complicated births would be also beneficial.

Ethical statement

Study was approved by the Ethics Committee of Jessenius Faculty of Medicine in Martin, Slovakia, no. 30/2021.

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Data availability statement

The datasets cannot be publicly available because of maximal effort to preserve confidentiality of sensitive data as stated in the informed consent signed by respondents. However, we can make them available on reasonable request upon a personal request.

CRediT authorship contribution statement

Barbora Ďuríčková: Writing – review & editing, Writing – original draft, Methodology, Investigation, Data curation, Conceptualization. **Zuzana Škodová:** Validation, Methodology, Data curation. **Martina Bašková:** Writing – review & editing, Writing – original draft, Funding acquisition, Conceptualization.

Declaration of competing interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

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