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ORIGINAL PAPER

The Relation between Birth with Cesarean Section and Posttraumatic Stress in Postpartum Women

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ABSTRACT

Objective: *The aim of this study was to investigate the relation between cesarean section and postpartum posttraumatic stress disorder as well as the factors that contribute to the development of posttraumatic symptoms in mothers.*

Materials and methods: *A sample of 538 women who gave birth with emergency and elective cesarean section in a University Hospital of Thessaly, Greece, have consented to participate in a two-phase prospective study. A socio-demographic questionnaire, the stressor Criterion A, the Life Events Checklist and the Posttraumatic Checklist of the fifth edition of the* Diagnostic and Statistical Manual *(DSM-5) were used to diagnose posttraumatic symptoms in Greek postpartum mothers.*

Results: *Out of 538 mothers, 37.2% had an emergency cesarean section and the remaining 62.8% an elective one. Posttraumatic stress was seen in 26 (26%) of women with emergency surgery and three (3%) of those with elective surgery. The present study also found that the inclusion of a neonate to the NICU, complications during pregnancy and delivery, lack of breastfeeding and lack of support from the partner were strongly associated with the development of posttraumatic symptoms.*

Conclusions: *The results of the current study indicate the need to take measures to reduce cesarean section rates and promote vaginal delivery. The high posttraumatic stress rates make it imperative to take additional measures for the mental health of women after cesarean section, especially in those with a traumatic birth experience.*

Keywords: birth trauma, mental health, postpartum mental health, cesarean sections.

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INTRODUCTION

Cesarean sections. Epidemiology and causes

A cesarean section (CS) is an important life-saving surgery when complications arise during pregnancy or delivery. However, it is associated with immediate maternal and neonatal complications as well as long-term effects that are still being investigated (1). In the last three decades, however, despite the recommendations of the World Health Organization (WHO) which suggest safe CS rates between 10-15% (2), the global rates of CS increase with a frequency greater than the rate considered safe for the health of both the mother and neonate, especially in high and middle income countries (2). In contrast, in low-income countries with reduced access to health services and a lack of obstetric facilities, rates lower than the WHO recommended range are often observed (3). In 2018, in a report by the Organization for Economic Cooperation and Development (OECD) on the rates of CS among its member countries, Turkey leads with a percentage of 55%, followed by Korea (45.2%), Poland (38.9%), Hungary (38%), Italy (33.2%), the USA (32%), Switzerland (31.6%), Luxembourg (30%), Germany (29.6%), Slovakia (29.3%), Austria (29%), United Kingdom (28.5%), Canada (27.7%), Spain (24.5%), Latvia (24.1%), Slovenia (22%), Belgium (21%), France (19.5%), Lithuania (19%), Estonia (18.6%), Sweden (17%), Finland and Iceland (16%), Norway (15.8) and Israel (14.8%) (4). Greece, along with Iceland, Montenegro, Portugal and Slovakia, is among the countries that do not provide international organisations with official data on the rates of CS (5).

The increase in CSs should not be considered in isolation as it reflects the changes in the development of the profile of each society. Thus, medical, socio-economic and cultural factors, combined with the public perception that cesarean delivery is a safe and short procedure, contribute to the increase in the number of CS (6). According to the WHO, there should be a serious indication to intervene in the normal course of labor (7). Therefore, the decision to carry out a CS must be based on some absolute indications or, in special cases, on relevant ones. Absolute indications usually account for CS rates of less than 10% (cephalopelvic disproportion, chorioamnionitis, pelvic malformations or tumors, eclampsia or HELLP syndrome, fetal asphyxia, protrusion or prolapse of the umbilical cord, abnormal placenta and fetal positions, premature abruption of the placenta, uterine rupture) (7-9), while the majority of CSs appear to be performed for relative indications (failure of labor to progress, breech presentation, myopia, infections such as HIV, herpes, hepatitis, previous CS, twins or multiples, diabetes, long term pregnancy, low placental adhesion, prematurity, abnormal fetal rates, high maternal age, obesity) (6, 8-10).

In 2000, a four-class classification of CSs was proposed by DN Lucas (11): 1) immediate threat to the life of the pregnant woman or that of the fetus; 2) maternal or fetal distress (without directly threatening the mother's or neonate's life); 3) absence of maternal or fetal distress, but clear need for immediate delivery; and 4) synchronization of the CS execution time with the desire of the mother or health professionals. However, categories 1 and 2 concerned emergency cesarean sections (EMCS), while categories 3 and 4, planned or elective ones.

Cesarean sections and PTSD

Posttraumatic stress disorder is defined as a trauma disorder that can occur after experiencing different forms of exposure to a life-threatening event. More specifically, PTSD is a disorder that may occur in response to individuals who have experienced a traumatic event, such as a natural disaster, serious accident, war, terrorist act, rape or other sexual violence or threat of death (12). According to DSM-5 (13), PTSD belongs to the disorders associated with trauma and stressors. More specifically, there are eight criteria that must be met in order to be diagnosed with PTSD in adults and children older than six years: 1) *Criterion A* – exposed (directly witnessed or informed) to a traumatic event of actual or threatened death or threat to physical integrity; 2) *Criterion B* – symptoms of re-experiencing the traumatic event; 3) *Criterion C* – symptoms of avoidance of thoughts or feelings of the traumatic event; 4) *Criterion D* – negative change in mood and cognitive functions; 5) *Criterion E* – hyperstimulation and irritability; 6) *Criterion F* – the duration of the above symptoms (criteria B, C, D, E) must be longer than one month; 7) *Criterion G* – the disorder must cause a significant impairment in the person's functioning; and 8) *Criteri-*

on H – the above symptoms are not due to the action of any medication, substance or physical condition. To be diagnosed with PTSD, Criterion A, at least one element of Criterion B, at least one element of Criterion C, two elements of Criterion D and also two elements of Criterion E must be met (13).

On the other hand, the type of delivery can cause a traumatic experience for a woman, capable of causing PTSD and affecting 4-17% of postpartum mothers (14). In 1993, Menage (15) was the first who used the term PTSD in obstetrics, referring to women undergoing obstetric procedures. Until then, PTSD mainly referred to the mental reactions of soldiers in war zones (16). In 1995, a study by Ballard (17) analyzed the symptoms of four postpartum women 48 hours after a stressful birth and reported symptoms of PTSD with difficulty in developing the mother-infant bond.

The relationship between EMCS and PTSD appears to be particularly strong. The fact that EMCS can cause PTSD symptoms is known from Lena Ryding's study conducted in 1997 (18), in which 1/3 of women showed significant PTSD symptoms and reactions, while in a second study carried out by the same author in 1998 (19), EMCS accounted for traumatic birth experiences for more than half of the study sample. Many subsequent studies investigated postpartum PTSD after cesarean delivery, especially, after EMCS (20-25), and now it is well known that women who gave birth by EMCS experienced more traumatic symptoms than those who had vaginal delivery or ELCS. The presence of criterion A (exposure of a woman or the fetus/neonate to life-threatening danger) treated with emergency surgery seems to be the main prerequisite for the development of posttraumatic symptoms according to DSM-5 (26).

The aim of the present study was to investigate the relation between CS and postpartum PTSD as well as the factors that contribute to the development of posttraumatic symptoms in mothers.

MATERIALS AND METHODS

Study participants

Our sample consisted of 538 women who underwent EMCS and ELCS, whose pregnancy follow-up had been performed in the specific hospital. Postpartum women with difficulties in understanding the Greek language, those with difficulties at a cognitive level or those who used psychotropic substances were excluded from the study (Figure 1).

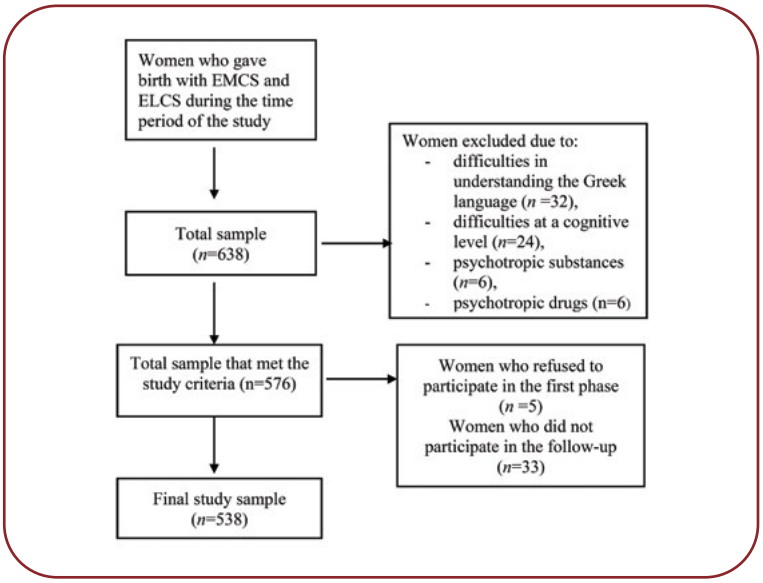

FIGURE 1. Selection process of the final study sample

Data and measures

The data was collected in two stages. On the second day after a CS, self-administered questionnaires were given to all women, who were asked to respond spontaneously and honestly to two measurement scales: Criterion A and Life Events Checklist for DSM-5 (LEC-5) (27) and a medical/demographic questionnaire, knowing that in the sixth week there would be a telephone follow-up with the researcher to determine the presence or absence of PTSD.

The place of approach and communication with the postpartum women was their hospital room, in hours when there were no visitors and no medical or nursing procedures were performed.

On the sixth week after a CS, through a telephone interview, postpartum women answered questions on the Posttraumatic Checklist for DSM-5 (28). The six-week period was selected in order to meet the criterion of symptom duration over a month (28).

The PCL-5, Criterion A and LEC-5 were authored by the staff of the National Center of PTSD (16) and were translated and weighted into the Greek language by the researcher.

Socio-demographic questionnaire

This questionnaire includes items on social, demographics and medical information. It also includes additional information on the CS experience and feelings.

LEC-5 of DSM-V (27) – This measure is used with PCL-5 in order to identify past traumatic life events which can lead to PTSD. In LEC-5, respondents can identify different levels of trauma (happened to me, witnessed it, learned about it, part of my job, not sure, does not apply) without a score or rating.

Criterion A of postpartum PTSD – It is the necessary prerequisite for the development of PTSD. For the needs of our research, Criterion A was divided into Criterion A1 (questions investigating maternal or fetal/neonate life-threatening shortly before or during surgery) and Criterion A2 (questions investigating severe life-threatening maternal-neonate complications after surgery).

PCL-5 of DSM-5 (28) – PCL-5 is a self-reported checklist to evaluate PTSD symptoms after a month from the stressful event. In this study, postpartum women replied via telephone to 20 questions to 20 symptoms of re-experiencing, avoidance, negative thoughts and feelings and arousal and reactivity. PCL-5 is a measure with very good psychometric properties for diagnosing PTSD symptoms in general groups as well as postpartum mothers (Cronbach's alpha .97) (29). ❑

RESULTS

Data from 538 women who underwent a CS were analyzed. Of all subjects, 62.8% (n=338) had an ELCS and the remaining 37.2% (n=200), an EMCS. Age, family and financial status, nationality and medical/gynecological and mental health history were similar in both groups. In the total sample of 538 women subjected to EMCS and ELCS, 11.5% had PTSD, with 26% of them undergoing an EMCS and 3% an ELCS (Figure 1).

In Table 1, the relationships of perinatal factors, which hypothetically may be related to PTSD, are presented. Dichotomous logistic regression analysis and the Mann-WhitneyU test were applied to study the relevant research questions.

The results of dichotomous logistic regression analysis of the relationship between PTSD and criteria A1 and A2 are described.

Statistically significant results were also found in this dichotomous logistic regression analysis. The analysis model explains that anxiety disorder ($p<.001$) increases the probability of developing PTSD by more than four times, while perinatal disorder/depression/psychosis ($p<.050$) by almost two times. The presence of jaundice/Down syndrome/infection ($p<.001$), increases the probability of developing PTSD by almost 17 times, and perinatal stress/respiratory distress ($p<.001$) by almost 12 times, while prematurity/IUGR ($p<.001$), possibly increases the probability of developing PTSD by more than 17 times. With regard to the causes of CS, 32.3% of the total variation of PTSD is explained. The

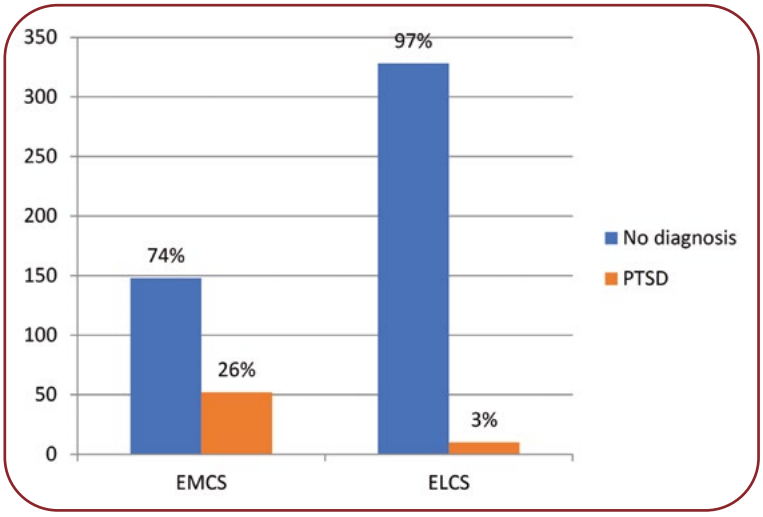

FIGURE 2. Graphic representation of the proportion of women with and without a PTSD diagnosis according to the type of CS

TABLE 1. Mann-WhitneyU test with PTSD as dependent variable in relation to perinatal variables

	N	Mean rank	p
Breastfeeding			
No	174	306.52	<.001
Yes	364	251.80	
Complications during delivery			
No	497	260.15	<.001
Yes	41	382.84	
Type of CS			
EMCS	200	308.44	.009
ELCS	338	246.46	
Birth expectations			
No	280	297.10	<.001
Yes	258	239.54	
Support from partner			
No	71	329.43	<.001
Yes	467	260.39	

Criterion A1 **Was your life or your child life in danger?**	**B**	**S.E.**	**p**	**Exp(B)**
Yes, my child's life	2.58	.43	.001	13.161
Yes, my life	2.44	.71	.001	11.522
Yes, both our lives	3.65	.72	.001	38.508
(Constant)	-3.60	.30	.001	.027
Criterion A2 Were there any complications involving you or your child?				
My child had serious complications	2.31	.43	.001	10.091
I had serious complications	1.37	.72	.050	3.933
We both had serious complications	1.68	.88	.050	5.337
(Constant)	-3.97	.33	.001	.019

Estimate of explanatory power of the model $R^2 = .525$; B = logistic regression coefficient; S.E. = standard error of estimation; p = statistical significance of the sample as a whole; Exp(B) = exponential coefficient (odds ratio – probability)

TABLE 2. Dichotomous logistic regression analysis model with PTSD as dependent variable in relation to Criteria A1 and A2

TABLE 3. Dichotomous logistic regression analysis models with PTSD as dependent variable in relation to psychosocial and perinatal variables

Psychiatric history	**B**	**S.E.**	**p**	**Exp(B)**
Anxiety disorders	1.48	.38	<.001	4.377
Depression, psychosis, perinatal mental disorders	.66	.24	.005	1.935
(Constant)	-2.29	.16	<.001	.102
Reasons for inclusion to the NICU	*B*	*S.E.*	*p*	*Exp(B)*
Jaundice/Down syndrome/Infection	2.83	.64	<.001	16.933
Perinatal stress/Respiratory distress	2.47	.39	<.001	11.853
Prematurity/IUGR	2.84	.36	<.001	17.039
(Constant)	-3.17	.25	<.001	.042
Causes of CS	*B*	*S.E.*	*p*	*Exp(B)*
Previous CS/premature rupture of membranes and premature contractions based on history previous CS	2.69	.39	<.001	.068
Abnormal fetal position	2.47	.63	<.001	.085
Twins /IVF pregnancy	-20.76	71.18	*S.I.*	.000
Maternal desire	-1.72	.65	.008	.179
Atomic history/gynecological history	.32	.507	*ns*	1.400
Abnormal heart rate/pathological NST/Doppler/premature rupture of membranes /infection/premature contractions/preeclampsia	20.76	10.78	*ns*	.000
Failure of labor to progress	3.51	1.03	<.001	.030
(Constant)	.44	.21	.039	.643
Type of previous birth	*B*	*S.E.*	*p*	*Exp(B)*
Vaginal delivery	.87	.39	.025	2.395
CS	-.82	.32	.010	.442
Vaginal delivery and CS	-.38	1.07	*ns*	.688
(Constant)	-1.82	.19	<.001	.162
Pathology of gestation	*B*	*S.E.*	*p*	*Exp(B)*
Thrombophilia/Hyperperfusion	.80	1.09	*ns*	2.234
Preeclampsia/HELLP syndrome	1.85	.36	<.001	6.397
Placenta previa (type 4)/abruption/bleeding	1.83	.53	<.001	6.255
Diabetes	.65	.48	*ns*	1.915
Cervical insufficiency	1.36	.82	*ns*	3.909
Infection	2.75	.84	<.001	15.636
Premature contractions	2.34	.68	<.001	10.424
(Constant)	-2.75	.22	<.001	.064

B =logistic regression coefficient; S.E. = standard error of estimation; p = statistical significance of the sample as a whole; Exp(B) = exponential coefficient (odds ratio – probability); ns= non-significant

presence of previous CS/premature rupture of membranes and premature contractions based on history previous CS ($p<.001$) appears to have around a 9% greater risk of developing PTSD.

The same, around 9%, applies to the presence of an abnormal fetal position ($p<.001$) as well as failure of labor to progress ($p<.001$), which probably has around a 7% greater risk of developing PTSD, while when the CS was the mother's wish ($p<.050$) it is deduced to reduce the probability of developing PTSD by over 80%.

From the findings it also emerged that, if the previous birth was vaginal ($p<.050$), the probability of developing PTSD increased by more than two times, while if a woman gave birth last time by CS ($p<.050$), she probably had around a 50% greater risk of developing PTSD. Finally, regarding the pathology of gestation, the variable "Preeclampsia/HELLP syndrome" ($p<.001$) increases the probability of developing PTSD by more than six times, as does the variable "placenta previa (type 4)/abruption/bleeding" ($p<.001$). The variable "infection" ($p<.001$) seems to increase the probability of developing PTSD by more than 15.5 times, as well as the variable "premature contractions" ($p<.001$), which may present a risk of developing PTSD by more than 10 times. ❑

DISCUSSION

The aim of the presence research was to investigate the relation between CS and postpartum PTSD as well as the contributing factors in the development of post-traumatic symptoms, in order for perinatal care professionals to implement the appropriate preventive measures and make the necessary interventions. The results show that 11.5% of the total sample was diagnosed with postpartum PTSD (EMCS = 26%, ELCS=3%). Furthermore, it was found that postpartum PTSD was associated with EMCS, lack of breastfeeding, lack of support from the partner, complications during pregnancy and delivery, birth expectations, psychiatric history, NICU, previous type of birth and the presence of abnormal fetal position or failure of labor to progress. Furthermore, the criteria A1 and A2 were very important factors in the development of PTSD.

There are many studies that indicate EMCS as a determinant factor for the development postpartum PTSD. For example, a study published in 2012 (30) found that women with EMCS had higher levels of PTSD in relation to those with ELCS. Schwab (31) also found that women with PTSD symptoms had undergone rather an emergency surgery than an elective one. More recent studies on postpartum PTSD also indicated that postpartum women are more likely to develop PTSD after EMCS than ELCS and vaginal births (32, 33, 25). However, a paper published by van Heumen (34) found that psychosocial factors were stronger than the type of delivery in the development of post-traumatic symptomatology after birth. In one of the first studies on EMCS trauma, Ryding in 1998 (18) argued that women undergoing emergency surgery were experiencing a range of changing emotions. At first, they feel a sense of relief once the CS decision is made; then, they are gripped by fear as the operation approaches. Women's thoughts are focused on the birth of the child and happiness usually quickly takes over. However, in many cases, negative emotions such as fear, guilt or anger may dominate their memories of the postpartum period.

Our results showed that the admission of a neonate in the NICU (for any reason) was associated with postpartum PTSD. So far, many past and recent studies (35-39) have reported that the admission of a neonate in the NICU was a major risk factor for the development of postpartum PTSD due to the extreme anxiety experienced by the mother for the life of her hospitalized neonate (40, 16). However, mothers with complication during pregnancy and delivery appear to be more likely to develop PTSD than those without complication. This phenomenon can also be explained by the existence of criterion A of PTSD. Therefore, life-threatening anxiety about the pregnancy outcomes and the progress of labor may activate posttraumatic symptomatology (40, 16).

Lack of breastfeeding is another important factor that contributes to the PTSD symptomatology; it is considered to help reduce the intensity of traumatic birth experience, as it increases the mother's self-confidence (41). It was also noticed that the support from the partner during the perinatal period was a protective factor for PTSD. Therefore, postpartum women with lack of support from their partners were more likely to develop PTSD disorder and other studies agree with our results (20, 42, 43).

According to our finding, women who underwent EMCS, the mode of delivery did not meet their expectations of birth compared to those who underwent ELCS. In 2008, Wiklund per-

formed a study (44) on mothers who delivered by EMCS, ELCS and vaginal delivery, which found that the mode of delivery did not meet the expectations of women with EMCS since they expected a normal delivery. ❑

CONCLUSIONS

The present study identified several risk factors in postpartum women who underwent birth after CS. The results of this study indicate the need to take measures to reduce CS rates and promote vaginal delivery. In addition, the high rates of PTSD in our sample make it imperative to take additional measures for mothers after CS especially from the emergency cesarean. Programs to detect vulnerabilities from pregnancy and psychological support interventions and re-evaluation of women's mental state in childbirth are imperative. Furthermore, breastfeeding needs special reinforcement, since it relieves the symptoms of mental trauma and strengthens the mother-infant bond. Finally, the mother's social environment and especially the partner should not be isolated from perinatal care, given the protective effect on maternal psychological trauma after CS.

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Informed consent statement: Informed consent was obtained from all subjects involved in the present study.

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