Prevalence and Associated Factors of Postpartum Stress in Mothers: A Cross-Sectional Study

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Abstract

Background: Postpartum stress refers to an unpleasant emotional state caused by stressors that arise during the postpartum period, though its prevalence remains unclear. Previous research indicates that up to 30% of mothers experience emotional difficulties, including stress, during this time. However, postpartum stress is often neglected in maternal mental health research, leading to inconclusive findings. Additionally, studies suggest that elevated stress levels persist throughout the first year after childbirth.

Aim: This study aimed to investigate the frequency of postpartum stress in mothers and the effects of sociodemographic and obstetric variables, as well as social support, on perceived postpartum stress.

Methods: Mothers who had given birth within the previous 6-12 weeks participated in an online survey (N=199). Participants completed the Depression, Anxiety, and Stress Scales, the Maternal Postpartum Stress Scale, the Birth Satisfaction Scale-Revised, the Perceived Partner Support Scale, and the Social Support Appraisals Scale.

Results: The findings revealed that mothers reported higher levels of postpartum-specific stress compared to general stress. Significant predictors of postpartum stress included younger maternal age, planned Caesarean section (C-section), varied infant feeding methods, and lower partner support which explained 34% of the total stress variance.

Conclusion: This study offers valuable insights into the factors contributing to postpartum stress and provides guidance for future interventions aimed at preventing and reducing postpartum stress. This, in turn, can facilitate smoother maternal adjustment to parenthood and promote better child development.

Keywords: psychological stress, postpartum, mothers, birth, social support

Introduction

The birth of a child is a significant event, but the first year postpartum can also be challenging, with an increased risk of stress and mental health issues (1,2). Postpartum stress is an unpleasant emotional state caused by postpartum stressors, occurring during the six weeks after childbirth or up to a year after childbirth (3,4). These stressors can be any events, situations, or challenges that mothers perceive as sources of discomfort during the postpartum period (5). These are often not major life events but daily difficulties (6), such as infant feeding, sleep deprivation, childcare, and adjusting to a new routine (5).

Studies suggest that 10% to 30% of women face psychological difficulties, including depression, anxiety, and stress (7,8,9). Research from Croatia indicates that mothers experience low to moderate stress during the first year postpartum (10,11). However, these studies assessed general rather than specific stress, so the prevalence of postpartum-specific stress remains uncertain.

Risk factors for stress in the postpartum period encompass different sociodemographic, obstetric and psychosocial factors. *Sociodemographic factors* related to postpartum stress have yielded mixed results. Delaying parenthood to late twenties or early thirties facilitates the transition to parenthood (12), but age does not consistently predict postpartum stress (13,14). Younger maternal age is associated with depression and anxiety after childbirth (14,15), indicating the need for further research to clarify this relationship. The effect of maternal education on postpartum stress is also inconsistent. Some studies suggest lower education predicts reduced stress (16), while others find it associated with higher stress (17), and some report no effect (13). Similarly, the role of socioeconomic status (SES) on postpartum stress varies, with some studies finding no effect (13), while others associate lower SES with increased postpartum stress (18).

Concerning *obstetric factors*, research indicates that primiparas are at higher risk for postpartum stress (4,16,19), though some studies suggest multiparas may also experience elevated stress levels (20). Pregnancy planning impacts postpartum stress; unplanned pregnancies are typically linked to higher stress (20), although some studies find no clear association (13).

Childbirth satisfaction, influenced by personal beliefs, care quality, and delivery stress (21), is another predictor of postpartum stress (22,23). Lower satisfaction with childbirth, particularly after assisted vaginal birth or emergency Caesarean section (C-sections) (4,23), is associated with higher stress and depression.

The relationship between gestational age and postpartum stress remains unclear; some studies find that lower gestational age correlates with higher stress (13), while others do not (16). Feeding methods also affect postpartum stress, with breastfeeding being particularly stressful for some mothers (4,24). Mixed feeding methods are sometimes associated with higher stress levels (16,25), but not consistently (11).

Current research underscores the importance of *social support* during the peripartum period, which aids in developing maternal behaviours and caring for their newborns, benefiting the entire family (26). Both primiparas and multiparas in fulfilling romantic relationships experience lower postpartum stress (27). Research on postpartum stress concerning social support is limited, often focusing on support within the context of postpartum depression.

This study aimed to (i) assess the prevalence of stress in postpartum mothers, (ii) evaluate whether postpartum stress can be explained by sociodemographic and obstetrical variables, birth satisfaction, and social support, and (iii) investigate whether social support moderates the relationship between birth satisfaction and general and postpartum-specific stress. We hypothesised a prevalence of around 10% and expected that younger age, lower SES and education level, primiparity, unplanned pregnancy, lower gestational age, assisted vaginal birth, or emergency (C-section), lower birth satisfaction, and lower social support would contribute to higher levels of general and

postpartum-specific stress. Additionally, we hypothesised that perceived social support would moderate the relationship between birth satisfaction and both general and postpartum-specific stress.

Materials and Methods

Study design

This was a cross-sectional study.

Ethics

The study protocol was approved by the Ethics Committees of the Catholic University of Croatia (Class: 641-03/21-03/21; No: 498-16/2-22-04) and the University Hospital "Sveti Duh" (No: 012-1539). Participation was voluntary, and all participants provided their consent. They could withdraw at any time without consequences.

Participants

The study was part of a longitudinal project at the maternity ward of "Sveti Duh" Clinical Hospital (Zagreb, Croatia). Participants were recruited during a routine pregnancy check-up, providing general data and contact information. Six to twelve weeks postpartum, participants received a link to complete a follow-up, with reminders sent once a week until 12 weeks postpartum. The study was conducted from September 2022 to May 2023.

Instruments

Depression, Anxiety, Stress Scales (DASS-21) (28) consist of 21 items with three subscales (depression, anxiety, and stress), each with seven items. For this study, only the stress subscale was utilised. Participants rated items on a 0 to 3 scale, with total scores multiplied by two to be comparable to the full version, thus ranging from 0 to 42. Higher scores indicate greater symptom presence. For the stress subscale, cut-off values are 0-14 (normal stress), 15-18 (mild stress), 19-25 (moderate stress), 26-33 (severe stress), and above 34 (extreme stress). The reliability, measured by McDonald's ω was .92.

Birth Satisfaction Scale–Revised (BSS-R) (21) consists of 10 items measuring satisfaction with childbirth across three aspects: stress during labour, personal characteristics of the woman, and quality of care. Participants rate their responses on a 0 to 4 scale. The total score ranges from 0 to 40, with a higher score indicating greater satisfaction. The scale was previously validated in Croatian postpartum women (29). McDonald's ω was .78.

Maternal Postpartum Stress Scale (MPSS) (4) consists of 22 items measuring stress caused by stressors during the first year postpartum with three subscales: personal needs and fatigue, childcare, and physical changes and sexuality. Participants rate their responses on a 0 to 4 scale. A higher total score indicates greater perceived postpartum stress. McDonald's ω was .91.

Perceived Partner Support Scale (PPS) (30) consists of 5 items measuring overall relationship satisfaction, emotional and instrumental support, and confiding and trust in the partner. Participants rate their responses on a 1 to 5 scale, with the total score ranging from 5 to 25, where a higher score indicates greater perceived support. The McDonald's ω was .91.

Social Support Appraisals Scale (SS-A) (31) measures perceived social support from family, friends, and others. For this study, only the family and friends subscales were used. Participants rated their responses on a 1 to 5 scale, with the total score for each subscale ranging from 7 to 35. A higher total score indicates greater perceived social support. McDonald's ω was .95 and .97 for friends and family support subscale, respectively.

The general data questionnaire included demographics such as age, education level, financial status, place of residence, marital status, and employment status. Psychiatric history, including hereditary conditions, psychiatric illnesses, and treatment were addressed. Participants were asked about the number of children, gestational age at birth, the infant's age and gender, pregnancy planning, multiple pregnancies, pregnancy and birth complications, and infant feeding methods. Other questions concerned the type of delivery (vaginal, instrumental vaginal, emergency or planned C-section) and pre-term birth.

Statistical analysis

Data were analysed using IBM SPSS Statistics 23. Descriptive analyses, Pearson's or Spearman's correlation coefficients and a backward regression analysis were conducted. Additionally, the moderating effect of social support on the relationship between birth satisfaction and both general and specific postpartum stress was analysed using *PROCESS Macro* (32).

Results

Characteristics of participants

Mothers (N=199) of average age 32 years (SD=5.2) participated when their infant was, on average, 7.93 weeks old (SD=1.9; range 6-15 weeks). They mainly were married or cohabiting, had high education levels, lived in urban areas, and had average- to high-income levels (Table 1). Regarding obstetric variables, 52.8% were primiparas, 62.8% had planned pregnancies, most had a vaginal birth (76.9%), and most breastfed exclusively (56.8%) (Table 1).

Table 1. *Demographic and obstetric data (N=199)*

	M (SD)
Mother's age (years)	*32 (5.2)*
Baby's age (weeks)	7.93 (1.9)
	n (%)
Marital status	
Married	151 (75.9%)
Cohabiting	48 (24.1%)
Education level	
Completed primary school	1 (0.5%)
Completed secondary school	51 (25.6%)
Completed college or university	147 (73.9%)
Perceived financial status	
Below average	4 (2.0%)
Average	122 (61.3%)
Above average	73 (36.7%)
Place of residence	
Urban area	161 (80.9%)
Suburban area	20 (10.1%)
Rural area	18 (9.0%)
Parity	
One child	105 (52.8%)
Two or more children	94 (47.2%)
Last pregnancy – Multiple births*	2 (1%)
Child's gender	
Girl	104 (52.3%)
Boy	95 (47.7%)
Pregnancy	
Planned	125 (62.8%)
Unplanned but desired	73 (36.7%)
Unplanned and undesired	1 (0.5%)
Type of birth	
Vaginal birth	153 (76.9%)
Planned C-section	17 (8.5%)
Emergency C-section	28 (14.1%)
Instrumental vaginal birth	1 (0.5%)
Type of infant feeding	
Breastfeeding	113 (56.8%)
Formula feeding	36 (18.1%)
Mixed (breastfeeding, pumping, and formula feeding combination)	50 (25.1%)
Birth complications for the child*	18 (9%)
Birth complications for the mother*	49 (24.6%)
Previous mental health disorders*	11 (5.5%)
Current mental health disorders *	6 (3%)

*Note: * - Percentage of responses "Yes"*

Stress prevalence

Concerning general stress, average levels were low (Table 2). Among the sample, 82.4% of women reported general stress within the normal range, 6.1% reported mild stress, 8.5% reported moderate stress, 1.0% reported significant stress, and 2.0% reported extreme stress. For postpartum-specific stress, participants reported moderate levels.

Associations between variables

General and postpartum-specific stress are in a moderate positive correlation (r=.54, p<.01). Regarding socioeconomic variables, only the mother's age and level of education were associated with stress (Table 2). Younger mothers reported higher total postpartum-specific stress, while mothers with lower levels of education reported higher stress related to personal needs and fatigue, as well as bodily changes and sexuality.

Obstetric variables were not associated with general stress but with postpartum-specific stress. Lower gestational age and planned

Table 2. *Correlations between general and postpartum-specific stress with sociodemographic variables, obstetric variables, and social support (N=199)*

	General stress	Postpartum-specific stress			
		Total score	Child-care	Personal Needs and Fatigue	Physical Changes and Sexuality
M	7.90	29.61	13.66	10.11	7.54
SD	0.60	17.93	8.61	7.68	6.49
Observed range	0 – 40	0 – 81	0 – 36	0 – 28	0 – 24
Possible range	0 – 42	0 – 88	0 – 36	0 – 28	0 – 24
Mother's Age	.01	**-.19***	-.11	-.09	-.03
Socioeconomic Status	-.10	.09	-.01	.02	.06
Level of Education	-.07	-.18	-.10	**-.20****	**-.18***
Parity	.10	-.04	-.06	.11	.01
Pregnancy Planning [a]	-.01	.09	.05	.11	.11
Gestational Age at Birth	-.01	**-.18***	-.12	-.14	-.05
Vaginal Birth vs. Planned C-Section [b]	.06	**.22***	.05	**.21****	.15
Vaginal Birth vs. Emergency C-Section [b]	-.08	.01	.04	-.02	.05
Breastfeeding vs. Formula Feeding [c]	-.01	.09	.15	-.04	.08
Breastfeeding vs. Mixed Feeding [c]	.05	**.20***	**.40****	.13	.03
Birth Satisfaction	**-.31****	**-.34****	**-.29****	**-.29****	**-.31****
Partner Support	**-.33****	**-.23****	.05	**-.23****	**-.26****
Family Support	**-.31****	**-.23****	.05	**-.23****	**-.26****
Friend Support	**-.31****	**-.24****	.04	**-.30****	**-.22****

Note: *p<0.05; **p<0.01 (significant correlations are highlighted in bold); [a] 1 = planned and desired, 2 = unplanned but desired, 3 = unplanned and undesired; [b] 0 – Vaginal birth, 1 – Planned C-Section/ Emergency C-Section; [c] 0 – Breastfeeding, 1 – Formula Feeding/Mixed Feeding

C-section were associated with higher postpartum-specific stress. Mixed feeding, as opposed to exclusive breastfeeding, was associated with postpartum-specific stress related to childcare.

Lower levels of birth satisfaction were associated with higher levels of both general and postpartum-specific stress. Lower levels of perceived social support from the partner, family and friends were related to all stress domains, except for no correlation with childcare-related stress.

Prediction of Postpartum-Specific Stress

Only variables significantly correlated with stress were included in the regression analyses (Table 3). This set of predictors explained 28% of general stress and 19%-34% of postpartum-specific stress variance.

General stress was explained by emergency C-section and lower birth satisfaction and support from partners and family. Postpartum-specific stress was explained by younger maternal age, planned C-sections, formula or mixed feeding (compared to breastfeeding), lower birth satisfaction and partner support.

Somewhat different predictors were established for different aspects of postpartum-specific stress. Childcare-specific stress was explained by planned C-sections, formula and mixed feeding, and lower birth satisfaction. Stress related to personal needs and fatigue was associated with younger maternal age, lower education level, planned C-sections, mixed feeding methods, lower birth satisfaction and partner support. Stress related to physical changes and sexuality was linked to lower education levels, birth satisfaction and support from the partner and family.

Social support was further examined as a possible moderation between birth satisfaction and general (Table 4) and postpartum-specific stress (Table 5). Although all models were significant, indicating that birth satisfaction and social support explain stress variance, the moderation effect was not established.

Table 3. *Regression analysis with sociodemographic variables, obstetric variables and social support as predictors of general and postpartum-specific stress (N=199)*

	General Stress			Postpartum-specific stress											
				Total score			Childcare			Personal needs and fatigue			Physical changes and sexuality		
Predictor	*β*	*B*	*SE(B)*	*β*	*B*	*SE(B)*	*β*	*B*	*SE(B)*	*β*	*B*	*SE(B)*	*β*	*B*	*SE(B)*
Constant		45.44	4.43		107.49	14.45		15.91	2.32		54.52	7.00		36.65	5.86
Mother's age				-.25	-0.95	0.30				-.13	-0.22	0.12			
Education level										-.13	-2.35	1.28	-.14	-2.02	1.09
Gestational age															
Vaginal Birth vs. Planned C-Section [a]				.24	16.54	5.32	.12	3.50	2.05	.21	6.51	2.11			
Vaginal Birth vs. Emergency C-Section [a]	-.16	-3.78	1.56												
Breastfeeding vs. Formula Feeding [b]				.17	8.15	3.85	.28	6.25	1.57						
Breastfeeding vs. Mixed Feeding [b]				.28	11.91	3.39	.45	8.08	1.26	.16	3.32	1.40			
Birth satisfaction	-.32	-0.41	0.08	-.33	-0.94	0.22	-.27	-0.33	0.08	-.29	-0.40	0.10	-.28	-0.29	0.08
Partner support	-.27	-0.59	0.14	-.27	-1.23	0.35				-.33	-0.73	0.15	-.16	-0.27	0.14
Family support	-.24	-0.42	0.11										-.18	-0.27	0.12
Friend support															
	R^2 = .28 $F(4, 194)$ = 18.85**			R^2 = .34 $F(6, 192)$ = 9.69**			R^2 = .31 $F(4, 194)$ = 16.81**			R^2 = .28 $F(6, 192)$ = 10.09**			R^2 = .19 $F(4, 192)$ = 8.07**		

Note: **p*<0.05; ***p*<0.01 (non-significant predictors are not presented): [a] 0 – Vaginal birth, 1 – Planned C-Section/Emergency C-Section; [b] 0 – Breastfeeding, 1 – Formula Feeding/Mixed Feeding

Table 4. *Moderating Effect of Perceived Social Support on the Relationship Between Birth Satisfaction and General Postpartum Stress (N=199)*

	B	***SE (B)***	***t***	***p***	
Perceived partner support					R^2 = 0.22 $F(3, 195)$ = 18.11**
(Constant)	45.26	14.18	3.19	.002	
Perceived partner support	-1.22	0.63	-1.93	.056	
Birth satisfaction	-0.75	0.50	-1.48	.139	
Interaction	0.02	0.02	0.68	.495	
Perceived family support					R^2 = 0.20 $F(3, 195)$ = 15.89**
(Constant)	30.71	15.07	2.04	.043	
Perceived family support	-0.46	0.46	-0.99	.322	
Birth satisfaction	-0.16	0.60	-0.27	.785	
Interaction	-0.01	0.02	-0.25	.803	
Perceived friend support					R^2 = 0.18 $F(3, 195)$ = 14.13**
(Constant)	44.52	14.57	3.06	.003	
Perceived friend support	-0.91	0.48	-1.91	.057	
Birth satisfaction	-0.79	0.57	-1.31	.164	
Interaction	0.01	0.02	0.78	.434	

Note: **p*<0.01

Table 5. *Moderating Effect of Perceived Social Support on the Relationship Between Birth Satisfaction and General Postpartum Stress (N=199)*

	B	*SE(B)*	*t*	*p*	
Perceived partner support					
(Constant)	84.12	37.54	2.24	.027	$R^2 = 0.17$
Perceived partner support	-1.31	1.70	-0.77	.444	$F(3, 195) = 8.25^{**}$
Birth satisfaction	-1.11	1.31	-0.85	.398	
Interaction	0.01	0.06	0.11	.914	
Perceived family support					
(Constant)	105.09	53.37	1.97	.051	$R^2 = 0.15$
Perceived family support	-1.68	1.08	-1.02	.310	$F(3, 195) = 6.75^{**}$
Birth satisfaction	-2.05	2.27	-0.91	.367	
Interaction	0.04	0.07	0.56	.577	
Perceived friend support					
(Constant)	100.99	41.39	2.44	.016	$R^2 = 0.15$
Perceived friend support	-1.59	1.39	-1.15	.253	$F(3, 195) = 6.92^{**}$
Birth satisfaction	-1.85	1.55	-1.19	.237	
Interaction	0.03	0.05	0.62	.536	

Note: $^{**}p<0.01$

Discussion

This study examined the prevalence of postpartum stress among mothers and its predictors regarding sociodemographic, obstetric, and social support variables. The results indicated that mothers report low general stress and moderate postpartum-specific stress. Additionally, birth satisfaction, partner support, and mixed infant feeding emerged as significant predictors of postpartum-specific stress, whereas other sociodemographic and obstetric variables were not important.

As previous research indicates, exposure to stress during the postpartum period can affect a mother's functioning and mental health, potentially making her more vulnerable to depression (33). This study demonstrates that postpartum stress is not to be overlooked. Although, mothers reported low stress levels, 17.6% of postpartum mothers still reported elevated stress, of which most reported moderate to extreme stress.

Among all sociodemographic variables, only younger maternal age was associated with specific postpartum stress. These results contradict previous studies that found no association between maternal age and postpartum stress levels (13,14). Additionally, younger age at first birth is associated with poorer mental health outcomes later in life (34), suggesting a need for further investigation.

Regarding education level, it was found to be a negative predictor of stress related to personal needs and fatigue, as well as stress related to physical changes and sexuality. Highly educated women might have been better prepared for the challenges of newborn care or generally possessed more knowledge to cope. Still, these findings are somewhat contradictory to previous studies, which did not find such associations (13). It is important to note that most participants in this study were highly educated (74%), which may have affected the results.

Among obstetric variables, only birth satisfaction was significantly associated with both general and specific postpartum stress. No other obstetric variables were significantly related to general stress. On the other hand, higher levels of specific postpartum stress were associated with lower gestational age at delivery, planned C-section, and more frequent use of formula feeding.

Previous research confirms that lower birth satisfaction is linked to higher levels of postpartum stress (22). Interestingly, while an emergency C-section was associated with lower satisfaction, it was not a significant

predictor of specific postpartum stress, unlike a planned C-section. This might be because planned C-sections are performed due to complications such as preeclampsia or placenta previa (35), which may contribute to higher stress levels later. Future research should include measures of stress before childbirth to assess whether they contribute to the relationship between delivery type and postpartum stress.

This study did not find a significant relationship between parity and stress levels. A possible explanation could be that most participants reported planned pregnancies. Previous research suggests that differences in postpartum stress between first-time and experienced mothers are due to levels of confidence and readiness for childcare (36). Thus, first-time mothers may have felt prepared and confident in handling the challenges of motherhood.

Regarding infant feeding types, more frequent use of formula was associated with increased postpartum stress. Regression analysis revealed that mixed feeding methods were a significant predictor of higher postpartum stress. As expected, women who exclusively breastfed reported the lowest levels of stress related to childcare. These findings align with previous research, which has also shown that a mix of feeding methods is associated with higher stress levels in mothers (24,37). Future research should explore the specific reasons why mothers choose different feeding methods and investigate whether these reasons contribute to this association.

In this study, perceived social support was examined both as a predictor of postpartum-specific stress and as a moderator in the relationship between birth satisfaction and postpartum stress. The results indicated that lower partner support was associated both with higher general and postpartum-specific stress, low family support was associated with high general stress only, while friends' support was not associated with either stress type when other variables were considered. However, social support did not significantly moderate the relationship between birth satisfaction and postpartum stress. Previous research has highlighted the importance of family and friend support in adapting to parenthood through instrumental assistance and simple words of encouragement and socialisation experiences (14,38,39). Higher perceived partner support predicts lower levels of postpartum stress, consistent with previous research (16,26,40).

When interpreting the results, several limitations must be considered. The cross-sectional design limits causal inferences, and factors affecting stress during pregnancy or changes in stressors postpartum were not addressed. Future research should employ longitudinal designs covering pregnancy through the first year postpartum to better understand these effects. The sample consisted of women from one maternity ward who were predominantly highly educated with average or above-average incomes, making the sample homogeneous and not generalisable to lower-educated or lower-income women. Additionally, all participants were either married or cohabiting, limiting generalizability to single mothers, who may have less support (41). Future studies should explore which specific forms of social support are most effective in reducing postpartum stress. Additionally, this study did not examine how mothers perceive the social support received from healthcare professionals, which could be a valuable area for future research, given it had a significant role in other postpartum mental health experiences, such as fear of childbirth (42).

Conclusion

The results indicate that 17.6% of mothers report elevated levels of stress. Somewhat different patterns of associations were established for general and postpartum-specific stress. It reveals that general stress measures may not capture the unique challenges postpartum, underscoring the need for targeted research on postpartum stress as a distinct issue, where a recently developed postpartum stress scale (4) can be utilised. Summarising, maternal stress can be explained by younger maternal age and education level, lower gestational age at

birth, C-section, non-exclusive breastfeeding, and lower childbirth satisfaction. Although partner and family support were associated with stress, they did not significantly moderate the relationship between childbirth satisfaction and general or specific postpartum stress. Effective interventions should focus on specific postpartum stress and include psychosocial support with adaptive coping strategies.

Declarations

Aknowledgements

This study was part of Lucija Kolić`s Master of Psychology thesis, which was originally written and defended in Croatian.

Authors' contributions

LK and SNR conceptualised the study, SNR collected the data, LK made the analyses, LK drafted the manuscript and SNR supervised. All authors approved the final version.

Ethics

The study protocol was approved by the Ethics Committees of the Catholic University of Croatia (Class: 641-03/21-03/21; No: 498-16/2-22-04) and the University Hospital "Sveti Duh" (No: 012-1539).

Funding

This study was funded and supported by an approved research project of the Catholic University of Croatia: „Determinants, outcomes, and interrelation of mental and physical health during pregnancy and postpartum (MumHealth)".

Competing interests

The authors declare no conflict of interest.

Data sharing statement

Data is available from the authors upon reasonable request.

References

1. Clout D, Brown R. Marital relationship and attachment predictors of postpartum stress, anxiety, and depression symptoms. J Soc Clin Psychol. 2016;35(4):322–41.
2. O'Hara MW, Wisner KL. Perinatal mental illness: Definition, description and aetiology. Best Pract Res Clin Obstet Gynaecol. 2014;28(1):3–12.
3. Hung CH. The construct of postpartum stress: A concept analysis. J Nurs. 2001;48:69–76.
4. Nakić Radoš S, Brekalo M, Matijaš M. Measuring stress after childbirth: Development and validation of the maternal postpartum stress scale. J Reprod Infant Psychol. 2021;1–13.
5. Horowitz JA, Damato EG. Mothers' perceptions of postpartum stress and satisfaction. J Obstet Gynecol Neonatal Nurs. 1999;28(6):595–605.
6. Razurel C, Bruchon-Schweitzer M, Dupanloup A, Irion O, Epiney M. Stressful events, social support and coping strategies of primiparous women during the postpartum period: A qualitative study. Midwifery. 2011;27(2):237–42.
7. Glavin K, Leahy-Warren P. Postnatal depression is a public health nursing issue: Perspectives from Norway and Ireland. Nurs Res Pract. 2013;2013:1–7.
8. Miller RL, Pallant JF, Negri LM. Anxiety and stress in the postpartum: Is there more to postnatal distress than depression? BMC Psychiatry. 2006;6(1).
9. Obrochta CA, Chambers C, Bandoli G. Psychological distress in pregnancy and postpartum. Women Birth. 2020;33(6):583–91.
10. Nakić Radoš S. Parental sensitivity and responsiveness as mediators between postpartum mental health and bonding in mothers and fathers. Front Psychiatry. 2021;12.
11. Vukšić N, Žutić M, Nakić Radoš S. Razlike u percipiranome temperamentu dojenčeta, povezivanju s dojenčetom i mentalnome zdravlju između majki koje doje i onih koje ne doje. Psihol Teme. 2022;31(2):359–81.
12. Berk LE. Development through the lifespan. 7th ed. Pearson; 2018.
13. Clout D, Brown R. Sociodemographic, pregnancy, obstetric, and postnatal predictors of postpartum stress, anxiety and depression in new mothers. J Affect Disord. 2015;188:60–7.
14. Hung C-H. Correlates of first-time mothers' postpartum stress. Kaohsiung J Med Sci. 2006;22(10):500–7.
15. Paul IM, Downs DS, Schaefer EW, Beiler JS, Weisman CS. Postpartum anxiety and maternal-infant health outcomes. Pediatrics. 2013;131(4).
16. Hung C-H, Lin C-J, Stocker J, Yu C-Y. Predictors of postpartum stress. J Clin Nurs. 2011;20(5-6):666–74.
17. Kubo A, Ferrara A, Brown SD, Ehrlich SF, Tsai A-L, Quesenberry CP, Crites Y, Hedderson MM. Perceived psychosocial stress and gestational weight gain among women with gestational diabetes. PLoS One. 2017;12(3).

18. Saur AM, dos Santos MA. Risk factors associated with stress symptoms during pregnancy and postpartum: Integrative literature review. Women Health. 2021;61(7):651–67.

19. Krieg DB. Does motherhood get easier the second-time around? Examining parenting stress and marital quality among mothers having their first or second child. Parenting. 2007;7(2):149–75.

20. Chou F-H, Avant KC, Kuo S-H, Fetzer SJ. Relationships between nausea and vomiting, perceived stress, social support, pregnancy planning, and psychosocial adaptation in a sample of mothers: A questionnaire survey. Int J Nurs Stud. 2008;45(8):1185–91.

22. Hollins Martin CJ, Martin CR. Development and psychometric properties of the Birth Satisfaction Scale-Revised (BSS-R). Midwifery. 2014;30(6):610–9.

22. Hinic K. Understanding and promoting birth satisfaction in new mothers. MCN Am J Matern Child Nurs. 2017;42(4):210–5.

23. Salari P, Nazari S, Mazlom SR, Ghanbari Hashem Abadi BA. Comparing postpartum stressors and social support level in primiparous and multiparous women. J Midwifery Reprod Health. 2014;2:71–6.

24. Gila-Díaz A, Carrillo GH, López de Pablo ÁL, Arribas SM, Ramiro-Cortijo D. Association between maternal postpartum depression, stress, optimism, and breastfeeding pattern in the first six months. Int J Environ Res Public Health. 2020;17(19):7153.

25. Emmanuel E, St John W, Sun J. Relationship between social support and quality of life in childbearing women during the perinatal period. J Obstet Gynecol Neonatal Nurs. 2012;41(6).

26. Tissera H, Auger E, Séguin L, Kramer MS, Lydon JE. Happy prenatal relationships, healthy postpartum mothers: A prospective study of relationship satisfaction, postpartum stress, and health. Psychol Health. 2020;36(4):461–77.

27. Wang Y, Gao Q, Liu J, Zhang F, Xu X. Maternal postpartum stress scale: Translation and validation study of the Chinese version. medRxiv. 2023.

28. Lovibond PF, Lovibond SH. The structure of negative emotional states: Comparison of the Depression Anxiety Stress Scales (DASS) with the Beck Depression and Anxiety Inventories. Behav Res Ther. 1995;33(3):335-43.

29. Nakić Radoš S, Matijaš M, Brekalo M, Hollins Martin CJ, Martin CR. Further validation of the birth satisfaction scale-revised: Factor structure, validity, and reliability. Curr Psychol. 2022; 42(16):13693-13702. -

30. Nakić S. Prediktori razvoja poslijeporođajne depresije. [unpublished doctoral dissertation]. Zagreb: Sveučilište u Zagrebu; 2011.

31. Vaux A, Phillips J, Holly L, Thomson B, Williams D, Stewart D. The social support appraisals (SS-A) scale: Studies of reliability and validity. Am J Community Psychol. 1986;14(2):195-218.

32. Hayes AF. PROCESS: A versatile computational tool for observed variable mediation, moderation, and conditional process modeling [white paper]. 2012.

33. Zelkowitz P, Milet TH. The course of postpartum psychiatric disorders in women and their partners. J Nerv Ment Dis. 2001;189(9):575–82.

34. Henretta JC, Grundy EMD, Okell LC, Wadsworth MEJ. Early motherhood and mental health in midlife: A study of British and American cohorts. Aging Ment Health. 2008;12(5):605–14.

35. Collins S, Arulkumaran S, Hayes K, Jackson S, Impey L, editors. Oxford Handbook of Obstetrics and Gynaecology. 3rd ed. Oxford University Press; 2013.

36. Kristensen IH, Simonsen M, Trillingsgaard T, Pontoppidan M, Kronborg H. First-time mothers' confidence, mood and stress in the first months postpartum: A cohort study. Sex Reprod Healthc. 2018;17:43–9.

37. Mizuhata K, Taniguchi H, Hikita N, Shimada M, Morokuma S. Effects of breastfeeding on stress measured by saliva cortisol level and perceived stress. Asian/Pac Isl Nurs J. 2020;5(3):128–38.

38. Barkin JL, Bloch JR, Hawkins KC, Thomas TS. Barriers to optimal social support in the postpartum period. J Obstet Gynecol Neonatal Nurs. 2014;43(4):445–54.

39. Thoits PA. Mechanisms linking social ties and support to physical and mental health. J Health Soc Behav. 2011;52(2):145-61.

40. Mollard E, Kupzyk K, Moore T. Postpartum stress and protective factors in women who gave birth in the United States during the COVID-19 pandemic. Womens Health. 2021;17:174550652110421.

41. Cairney J, Boyle M, Offord DR, Racine Y. Stress, social support and depression in single and married mothers. Soc Psychiatry Psychiatr Epidemiol. 2003;38(8):442–9.

42. Nakić Radoš S, Žigić Antić L, Jokić-Begić N. The Role of Personality Traits and Delivery Experience in Fear of Childbirth: A Prospective Study. J Clin Psychol Med Settings. 2022;29(4):750-759.