

MULTIVARIATE ANALYSIS OF PREDICTORS OF DEPRESSION SYMPTOMATOLOGY AFTER CHILDBIRTH

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SUMMARY

Background: Risk factors of postpartum depression, although relatively well investigated, remain largely unclear.

The aim of this study was to identify the most relevant predictors of postpartum depressive symptomatology that are of clinical importance using the Edinburgh Postnatal Depression Scale (EPDS) 3-5 days and 6 to 9 weeks after childbirth.

Subject and methods: In order to explore predictors of depression, 3-5 days after childbirth, 372 participants fulfilled several questionnaires: Edinburgh Postnatal Depression Scale (EPDS), Impact of Events Scale Revised (IES-R), Big Five Inventory, and questions regarding breastfeeding practice as well as social and demographic factors. Six to nine weeks after childbirth, the same participants fulfilled the following questionnaires: IES-R, EPDS and breastfeeding practice questions.

Results: On a multivariate level of analysis, the predictors that increased the odds for postnatal depression symptomatology at the first study point were: unsuccessful breast feeding initiation (odds ratio (OR) 2.58; confidence interval (CI) 1.35-4.91) and personality traits neuroticism (OR 1.16; CI 1.07-1.25.). The predictors that increased the odds for depression symptomatology at the second study phase were: fear for labor outcome (OR 2.44; CI 1.03-5.80) and the baseline EPDS score (OR 3.32; CI 1.31-8.40). The predictor that decreased the odds at the second study phase was the personality trait Openness (OR 0.9; CI 0.86-0.99).

Conclusions: Immediately after childbirth biological and psychological factors seem to be predictive for postpartum symptomatology while later only psychological factors are of greater importance.

Key words: delivery – postpartum – depression - predictors

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INTRODUCTION

According to results of one of the largest meta-analysis published regarding the prediction of postpartum depression, published in the 1990s, and included 84 studies, none of the following factors were significantly associated with the development of postpartum depression in Western society: maternal age, level of education, parity, length of relationship with partner and sex of child. Thirteen significant predictors of postpartum depression were revealed: prenatal depression, self-esteem, childcare stress, prenatal anxiety, life stress, social support, marital relationship, history of previous depression, infant temperament, maternity blues, marital status, socioeconomic status, and unplanned/unwanted pregnancy (Becks 2001).

Findings suggest that various obstetrical complications (e.g. prolonged labor, stillbirth) may increase likelihood of postpartum psychosis and depression (Nonacs & Cohen 2009).

More symptoms of prenatal depression had been found in women who have been physically abused, sexual abused, institutionalized or placed in a foster family, or felt rejected by at least one parent (parental rejection) (Dayan et al. 2010). Influence of prolactin and oxytocin in the etiology of postpartum psychiatric disorders is not clear, but women that are exposed to stress postpartum or depressed, often do not breastfeed or

breastfeed for a shorter period. (Henderson et al. 2003). In a recent study on 42 225 Norwegian women, results indicate that breastfeeding cessation is a risk factor for increased anxiety and depression (Ystrom 2012).

There is evidence of a connection between previous depression or other psychiatric illness with postpartum depression (Nonacs & Cohen 2009). Low extraversion and high neuroticism has been found to be connected with the development of postpartum depression (Martin-Santos et al. 2012).

The aim of this study was to find the most relevant predictors of postpartum depression symptomatology in the population of new mothers in Croatia. Data about posttraumatic stress disorder symptomatology and correlation between depression and PTSD symptomatology are presented in separate publication (in process of publishing).

SUBJECTS AND METHODS

Statistical methods

Univariate and multivariate prediction of postnatal depression were carried out by means of logistic regression, and odds ratios with 95% confidence intervals were given for each variable. Variables that, at univariate level differentiated participants by a statistical significance of less than $p=0.05$, were included into the

multivariate model. Differences in the prevalence of clinically relevant scores at two times the measurement were tested with the McNemar test for dependent proportions. Analyses were carried out using the SPSS 17.0 (SPSS Inc., Chicago, IL, USA) statistical software package.

Subjects

The study was performed at the Department of Gynecology and Obstetrics, School of Medicine University of Zagreb, University Hospital Centre Zagreb, Croatia.

In order to be eligible to participate in the study, the woman had to be literate, willing to fulfill the questionnaire, and have a mailing address and telephone number. Exclusion criteria included illiteracy and a known active psychiatric illness treated with psychotropic medications (affective disorders, psychosis, anxiety disorders, addiction).

In order to explore predictors of depression, a total of 372 participants fulfilled several questionnaires 3-5 days after childbirth (first phase), while 262 fulfilled the questionnaires 6-9 weeks after childbirth as described below (second phase).

Assessment

First study phase

Determination of clinically significant symptoms of depression

The Edinburgh Postnatal Depression Scale (EPDS) is a 10-item postpartum depression screening questionnaire completed by mothers and scored by clinicians (Cox et al. 1987). The score thresholds vary in various populations, and, in response, range from 7 to 16 (Hewitt et al. 2009). A validated Croatian translation was used. At the 8.5 cut-off score, the sensitivity of the scale for determining the presence of postpartum depression was 77.3%, specificity 82.4% and with a PPV of 27.9% (Nakić Radoš et al. 2013). Participants with a score ≥ 9 were considered to have clinically significant symptoms of depression.

Other questioners used for predictors of depression determination were

Social support as a predictor

With the author's permission, we used a 7-question questionnaire. Questions were aimed at marital status, marital problems, undesired or unplanned pregnancies and psychological difficulties from previous pregnancies (Braverman & Roux 1978).

Unfavorable family or other circumstance during participants' childhood as a predictor

The questionnaire, that was used with author's permission (Dayan et al. 2010), assessed the following factors: physical abuse, sexual abuse, institutional or foster family placement, feelings of rejection by at least one parent (parental rejection) and family secrets.

Personality traits as predictors

The Big Five Inventory (BFI) (Benet-Martinez & John 1998) questionnaire was used that consists of 44 items constructed to allow quick and efficient assessment of the 5 personality dimensions – extraversion, agreeableness, conscientiousness, neuroticism, and openness. Self-report ratings for each item were made on a Likert scale from 1 (strongly disagree) to 5 (strongly agree). In the Croatian sample, the coefficients of internal reliability (Cronbach α) were from 0.69 to 0.80 (Hudek-Knežević & Kardum 2009).

Traumatic experience of childbirth as a predictor

To screen for PTSD symptoms, the Impact of Events Scale (revised) – Croatian (convergent validation) version (IES-R) was used. It is a 22-item self-report measure which assesses subjective distress caused by traumatic events (Weiss & Marmar 1997). The IES-R was translated and validated (convergent validation) in Croatian with a reliability of (Cronbach α) 0.91 (Ljubotina & Muslić 2003). Cut-off points of IES-R between 24 and 33 have shown both sensitivity and specificity over 70% (Çorapçioğlu et al. 2006).

The IES-R, EPDS, BFI, Social support questionnaire, Braverman's and Dayan's questionnaires were integrated into a 9 pages questionnaire developed for the purpose of this study. Sociodemographic and health issues (complications during pregnancy, complications during and after childbirth, breastfeeding practice) were additionally addressed in our questionnaire.

Second study phase

Six to nine weeks after childbirth, the responding 262 participants which remained in the study fulfilled the following questionnaires: IES-R, EPDS and breastfeeding practice questions. Data regarding the IES-R in the second study phase is presented in separate paper.

RESULTS

Of the initial 372 women who were recruited into the study and finished the first phase, 262 returned fulfilled questionnaires by mail for the second phase of the study. The youngest mother included was 15 years of age, while the oldest was 45. The median age of the investigated 372 women was 30 (interquartile range 26-34). The sample was more educated than general population (Adamović & Mežnarić 2011): 190 participants (51.1%) had secondary school or less, 182 participants (48.9%) had higher education (bachelor, master or higher education). A total of 281 (75.9%) participants were employed, while the remaining 89 were unemployed. Missing data about employment status involved 2 participants. There were 188 primiparous women (50.5%) and 184 multiparous women (49.5%). The majority of participants, 291 (78.2%), had vaginal birth while 81 participants (21.8%) had Caesarean section. Elective Cesarean section was performed in 38 participants (10.2%) and emergency Cesarean section

(defined as obstetric emergency, where there is sudden onset of pregnancy complications during labor) was performed in 43 participants (11.6%).

Analysis of differences between responders (n=259) and non-responders(n=113) to the EPDS scale 6-9 weeks after delivery found no relevant differences in any demographic data except that responders to EPDS scale were more educated (138/259 or 53.3% university educated) than non-responders (44/113 or 38.9% university educated). Responders to EPDS were also more often employed (209/258 or 81.0%) than non-responders (72/112 or 64.3%).

In cases where patients answered the majority of questions (>80%), imputations were made on IES-R and EPDS data in order to avoid exclusion from the study (Cole 2008). Missing values were replaced by linear regression (Dayan 2010). At baseline, imputation was performed for IES-R and EPDS for 16 and 4 participants, respectively and for the second phase for 11 and 1 participant, respectively.

Phase one and phase two univariate and multivariate prediction of clinically relevant scores on the EPDS were made based on socio-demographic, biological, social and psychological factors. Variables that statistically significantly differentiated participants at the univariate level (p<0.05), were included into the

multivariate model. Results for first and second study phase are presented in Tables 1 and 2.

At a multivariate (adjusted) level of analysis, statistically significant predictors of postnatal depression in the first phase included: unsuccessful breast feeding initiation, and personality traits neuroticism. Unsuccessful breast feeding initiation and the personality trait neuroticism increased odds for a clinically significant depression score (Table 1). The authors did not find a significant connection between clinically relevant depressive symptomatology and the following factors: age, living with other family member beside husband or children, domicile, education level, employment status, satisfaction with the income, newborn baby gender, primiparity, traumatic experience before pregnancy and childbirth, pregnancy complications, complications during and after labor. These factors were not included in the analysis.

At a multivariate (adjusted) level of analysis, statistically significant predictors of postnatal depression in the second phase included: fear of labor outcome, EPDS score at the time of delivery, and the personality trait openness. A significant EPDS score at the time of delivery and fear of labor outcome in pregnancy increased, and the personality trait openness decreased odds for a clinically significant depression score (Table 2).

Table 1. Prediction of clinically significant results on Edinburgh Postnatal Depression Scale EPDS scale 3 to 5 days after delivery (first phase)

	Clinically significant results on EPDS						Univariate		Multivariate	
	yes		no		total		OR	95% CI	OR	95% CI
	n	%	n	%	n	%				
Unfavorable family or other circumstances in childhood										
none	53	19.3	222	80.7	275	100	1		1	
one or more	23	29.9	54	70.1	77	100	1.78	1.01-3.16	1.37	0.66-2.84
Mode of delivery										
vaginal	57	19.8	231	80.2	288	100	1		1	
elective Cesarean	14	36.8	24	63.2	38	100	2.36	1.15-4.86	1.76	0.68-4.57
emergency Cesarean	12	28.6	30	71.4	42	100	1.62	0.78-3.36	1.70	0.71-4.11
Feared for labor outcome almost every day during pregnancy										
no	49	18.4	218	81.6	267	100	1		1	
yes	34	34.0	66	66.0	100	100	2.29	1.37-3.84	1.39	0.71-2.72
Lack of social support – positive responses										
none or one	69	20.8	262	79.2	331	100	1		1	
two or more	13	36.1	23	63.9	36	100	2.15	1.03-4.45	2.09	0.82-5.30
Breast feeding successful initiation										
yes	41	16.7	205	83.3	246	100	1		1	
no	40	37.0	68	63.0	108	100	2.94	1.76-4.92	2.58	1.35-4.91
Extraversion*	28	25-32	31	28-34			0.88	0.84-0.94	0.95	0.88-1.03
Agreeableness*	34	30-37	35	32-39			0.93	0.89-0.98	1.04	0.97-1.12
Conscientiousness*	35	31-38	37	33-41			0.90	0.86-0.95	0.97	0.90-1.04
Neuroticism*	22	19-26	18	15-22			1.18	1.12-1.25	1.16	1.07-1.25
Openness*	34	30-38	36	32-40			0.94	0.90-0.99	0.98	0.93-1.04

OR=odds ratio; 95% CI=95% confidence interval; *Median (interquartile range)

Table 2. Prediction of clinically significant results on EPDS scale 6 to 9 weeks after delivery (second phase)

	Clinically significant results on EPDS						Univariate		Multivariate	
	yes		no		total		OR	(95% CI)	OR	(95% CI)
	n	%	n	%	n	%				
Living with other family members										
yes	19	35.8	34	64.2	53	100	1		1	
no	41	19.8	166	80.2	207	100	0.44	0.23-0.85	0.53	0.22-1.25
Mode of delivery										
vaginal	39	19.7	159	80.3	198	100	1		1	
elective Cesarean	8	27.6	21	72.4	29	100	1.55	0.64-3.77	0.43	0.11-1.67
emergency Cesarean	13	39.4	20	60.6	33	100	2.65	1.21-5.79	1.79	0.58-5.57
Complications during or after labor										
no	19	16.2	98	83.8	117	100	1		1	
one or more	40	28.8	99	71.2	139	100	2.08	1.13-3.85	1.24	0.53-2.90
Feared for labor outcome almost every day during pregnancy										
no	32	17.0	156	83.0	188	100	1		1	
yes	28	38.9	44	61.1	72	100	3.10	1.69-5.70	2.44	1.03-5.80
Lack of social support—positive responses										
none or one	48	20.7	184	79.3	232	100	1		1	
two or more	12	44.4	15	55.6	27	100	3.07	1.35-6.98	1.40	0.40-4.88
Unfavorable family or other circumstances in childhood										
none	40	19.7	163	80.3	203	100	1		1	
one or more	15	34.1	29	65.9	44	100	2.11	1.03-4.30	1.45	0.55-3.85
Breast feeding										
yes exclusive	26	17.2	125	82.8	151	100	1		1	
yes with added formula	16	30.8	36	69.2	52	100	2.14	1.04-4.41	1.31	0.48-3.61
no	17	30.9	38	69.1	55	100	2.15	1.06-4.38	1.09	0.41-2.92
IES-R score 3-5 days after delivery										
not clinically significant	29	15.1	163	84.9	192	100	1		1	
clinically significant	31	45.6	37	54.4	68	100	4.71	2.54-8.75	2.03	0.82-5.06
EPDS score 3-5 days after delivery										
not clinically significant	28	14.1	171	85.9	199	100	1		1	
clinically significant	31	51.7	29	48.3	60	100	6.53	3.43-12.44	3.32	1.31-8.40
Extraversion*	29	27-33	31	28-34			0.92	0.86-0.98	1.05	0.95-1.15
Agreeableness*	33	30-38	36	32-39			0.91	0.86-0.97	0.94	0.86-1.03
Consciousness*	35	32-39	38	34-41			0.93	0.87-0.98	0.97	0.89-1.06
Neuroticism*	22	19-26	18	15-22			1.16	1.09-1.24	1.07	0.96-1.20
Openness*	33	30-38	37	33-41			0.92	0.87-0.97	0.92	0.86-0.99

OR=odds ratio; 95% CI=95% confidence interval; *Median (interquartile range)

The authors did not find significant association between depressive symptomatology and the following factors: age, domicile, education level, employment status, satisfaction with income, newborn baby gender, primiparity, previous traumatic experience, pregnancy complications. These factors were not included in the analysis.

DISCUSSION

The limitation of this study is the absence of clinical interviews during the first phase; thus the authors were not able to give the definitive clinical diagnosis of major depression, but only confirm clinically significant symptoms of depression.

Literature has shown that postpartum depression has a significant social and relational impact on mothers, their partners and offspring. Elisei et al (2013) had shown that postpartum depression can occur later than 4 weeks after delivery, contrary to DSM- IV time criteria.

The predictor of significant depression symptomatology development on both study phases, which we have found to be statistically significant on an univariate level included: unsuccessful breast feeding initiation and establishment, lack of social support, unfavorable family or other circumstances in childhood, fear for labor outcome almost every day during pregnancy, and neuroticism (increased odds), extraversion, agreeableness, consciousness and openness (decreased odds).

Lack of social support was repeatedly found to be important for depression development in other studies (Becks 2001). Similar to Dayan's study (2010) the authors found unfavorable family or other circumstances in childhood to be predictive for depressive symptomatology in both study phases.

The significant correlation between clinically significant depressive symptomatology and age, level of education, employment status, primiparity, and newborn baby gender 3-5 days after childbirth (first phase) or in 6-9 weeks after childbirth (second phase), were not found in this study, similar to Beck's (2001) meta-analysis of 84 studies. The authors did not explore other factors of socioeconomic status, such as household income, which was a relevant predictor of depression in the above mentioned meta-analysis.

Fear of labor outcome almost every day during pregnancy was also predictive for depression development on a multivariate level. In the second phase of the study, fear of labor outcome during pregnancy could be connected to anxiety. This could be explained with the Brain Derived Neurotrophic Factor (BDNF) theory of depression. Constant stress causes activation of the hypothalamic-pituitary-adrenal (HPA) axis with a corresponding increase in cortisol secretion and at excessive concentrations cortisol can suppress BDNF production (Kimpton 2012). This effect could be even more pronounced in the puerperal period and breastfeeding initiation in which the brain is influenced by various hormonal changes. Indeed, breast feeding initiation difficulty was also significant not only on an univariate, but also on a multivariate level in the first study phase. Henderson et al. (2003) found that women who were exposed to stress postpartum or depressed, often do not breastfeed or breastfeed for shorter duration. On the other hand, it was found that breastfeeding cessation is a risk factor for increased anxiety and depression (Ystrom 2012). In both study phases personality traits were connected to depression development, similarly to the Martin-Santos study (2012). In this study neuroticism was predictive for depression development on an univariate level in both study phases, but on a multivariate level neuroticism was predictive in the first phase. Additionally, the authors discovered that openness, as a personality trait, reduces the chance for depression development.

The authors discovered that traumatic experience of childbirth in the delivery room measured as IES-R score was predictive on an univariate level for depressive symptomatology development in the second phase of the study. On both a multivariate and an univariate level depressive symptomatology in the first phase was highly predictive for depressive symptomatology in the second phase of the study.

CONCLUSIONS

Immediately after childbirth both biological and psychological factors are predictive for postpartum

symptomatology, respectively. In the period after delivery, psychological factors solely were of greater importance. Early screening for depressive symptomatology in maternity wards could help detect women at risk for development of postpartum depression.

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