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ORIGINAL ARTICLE

Risk factors for depressive symptoms in early postpartum period and after puerperium – are they the same?

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Abstract

OBJECTIVES: Correlation between the occurrence of postnatal depressive symptoms at 5 days and 6 weeks postpartum is well established. The objective of the study was to determine the influence of psychosocial and perinatal factors on the occurrence of postpartum depressive symptoms 2 to 5 days and 6 weeks after delivery.

METHODS: 373 women in early postpartum (EPG) and 107 women 6 weeks after delivery (late postpartum group – LPG) completed a questionnaire including questions concerning mothers' characteristics, obstetric and neonatal complications during pregnancy, psychiatric factors and Edinburgh Postnatal Depression Scale (EPDS).

RESULTS: 21.6% of mothers from EPG and 14.2% in LPG achieved ≥10 points in EPDS. In both groups patients with ≥10 points reported stressful situations during pregnancy, sedative agents usage and a history of suicidal attempts. In EPG women with ≥10 points significantly more frequent delivered preterm, were hospitalized during pregnancy and their newborns had more health problems. In LPG mothers with ≥10 points more often reported several obstetric complications. Maternal comorbidity or sociodemographic factors did not correlate with the risk of depressive symptoms.

CONCLUSION: The risk factors for depressive symptoms after delivery vary in different time intervals. Therefore screening for PD should not be performed once in a single selected risk group.

INTRODUCTION

The wide spectrum of affective disorders triggered by childbirth occurs without exception in all nations and societies around the world (Gonidakis *et al.* 2008). An affective disorder occurring in the early postpartum period called the baby blues syndrome (BB), first described in 1952 by Moloney as a 'third day depression', is the phenomenon affecting many new mothers (Moloney 1952). It is defined as a specific emotional state of depressed mood beginning within the first 2 to 5 days after delivery and resolving within 10 days (Sakumoto *et al.* 2002; Hirst & Moutier 2010). It is characterized by tearfulness, fatigue, irritability and emotional liability. Brief crying spells, poor sleep but no suicidal ideations are present (Hirst & Moutier 2010; Seyfried & Marcus 2003; Edhborg *et al.* 2005). The prevalence of BB varies between 30 and 75% (Robertson *et al.* 2004).The disorder is mild and does not require treatment.

Postpartum depression (PD) is a non-psychotic depressive illness of moderate severity beginning in or extending into the postnatal period (O'Hara *et al.* 1991). It is characterized by depressed mood and difficulty with coping, especially with the infant, lasting over two weeks and impairing normal function (Robinson and Stewart 1986). Symptoms may include sadness, despondency, tearfulness, fatigue, irritability or changes in sleeping and eating patterns. Suicidal ideations may be present. In *Diagnostic and Statistical Manual of Mental Disorders, 5th ed*., postpartum depression is defined as a state beginning within 4 weeks after delivery (American Psychiatric Association 2013), but it is commonly extended into the first 12 months (O'Hara 2009). *The International Classification of Disease (10th edition)* states that the onset of postpartum depression is restricted to the first 6 months after delivery (World Health Organization 1992). A meta-analysis of 59 studies reported the incidence of PD to be 13% (O'Hara & Swain 1996). According to published data about 5 to 7% of mothers suffer from PD during the first 3 months of puerperium, while 12% have the symptoms of minor depression during the first year(Edhborg *et al.* 2005; Gavin *et al.* 2005).

The etiology of PD remains unclear. Potentially, such situation may be caused by hypothalamus-pituitary-gonadal and -adrenal axes, which are involved in significant changes in human body during pregnancy and after delivery (Robinson and Stewart 1986; Perani & Slattery 2014; Klier *et al.* 2007; Zonana & Gorman 2005). PD is considered to be the most unrecognized disorder during puerperium and a risk factor for suicidal attempts, which are currently one of the leading causes of new mothers' death (Hirst & Moutier 2010; Cantwell & Cox 2006; Mander & Smith 2008; Clare & Yeh 2012). It has been well studied and established that women who experience BB significantly more often suffer from PD later (Gonidakis *et al.* 2008; Yamashita *et al.* 2000; Henshaw *et al.* 2004; Bloch *et al.* 2006). A study by Hannah *et al.* confirmed a correlation between the occurrence of postnatal depressive symptoms at 5 days and 6 weeks postpartum (Hannah *et al.* 1992). Although the prevalence of BB in early postpartum period exceeds PD, PD screening tools are used for detection of depressive symptoms as early as 2 or 3 days after childbirth (Teissedre *et al.* 2004). In view of the correlation of depression-like symptoms occurrence during the first week and 6 weeks after delivery, our hypothesis was that the risk factors of depressive symptoms in both time intervals are the same.

The objective of the study was to determine the influence of demographic and psychosocial factors, as well as obstetric and neonatal complications, on the occurrence of postpartum depressive symptoms 2 to 5 days postpartum and 6 weeks after delivery.

MATERIAL AND METHODS

Study population

Between November 2014 and April 2015 women who delivered at the 1st Department of Obstetrics and Gynecology, Medical University of Warsaw (tertiary medical centre), were approached twice a week by two research assistants and asked to complete a questionnaire. The adequate knowledge of Polish language and informed consent to participate in the study were the inclusion criteria. Patients were asked to complete the anonymous form by themselves, due to personal nature of some questions. During the study period 373 women were approached and included to "early postpartum group" (EPG).

The patients were followed up six weeks after the delivery during the postpartum appointment at the Outpatient Clinic of the same Department. Out of 373 initially included women only 107 attended the Outpatient Clinic at the end of puerperium. They all agreed to anonymously complete the same questionnaire again. They were assigned as the "late postpartum group" (LPG).

Instrument

The questionnaire used in the study was created by the authors using the Edinburgh Postnatal Depression Scale (EPDS) (Cox *et al.* 1987). Women answered it anonymously. It consisted of 3 parts divided into sections by different topics.

The first part contained mothers' baseline characteristics and most popular obstetric and neonatal complications during the last pregnancy, using open and structured questions. Women answered queries about: age, parity, duration of pregnancy, newborns' birthweight, use of assisted reproductive techniques, antenatal labour classes attendance or mode of delivery. The questionnaire included questions concerning obstetric complications (antepartum bleeding, cervical incompetence, persistent emesis during pregnancy, oligo-/

polyhydramnios, fetal intrauterine growth restriction, pregnancy hypertension, gestational diabetes mellitus, placenta previa or any hospital admission during pregnancy) and other maternal health problems (cardiovascular/ kidney/ liver diseases). Questions concerning newborns' health (birth defects, jaundice requiring phototherapy, infections requiring intravenous antibiotic therapy or Neonatal Intensive Care Unit (NICU) admission) were also included.

The second part contained questions concerning factors described in the literature as possible predictors of postpartum depression development. In this section women were asked about: stressful situations during pregnancy (e.g. death of a close person, divorce, job loss), antidepressant drugs, sedative agents and narcotics usage during pregnancy or in the past, psychiatric illnesses (also in the family), self-harm episodes or suicidal attempts. Patients also filled out the forms with the following questions: satisfaction with perinatal care, relationship with patient's mother and child's father, social support, employment and material status.

The last part was the Polish version of Edinburgh Postnatal Depression Scale, a self-reported questionnaire. It is the most common validated tool for screening PD with a positive predictive value as high as 76% (Milgrom *et al.* 2005). EPDS consists of 10 questions with 4 various answers graduating the level of daily life disturbance. Patients were asked to choose one of them, closest to the truth. For each response they received from 0 to 3 points. EPDS has been widely used because of its practical utility and high sensitivity and specificity for diagnosis of PD. The score of 10 points or more indicates a high risk for PD with sensitivity between 65% and 100% and specificity of 49% to 100% (Edhborg *et al.* 2005; Bloch *et al.* 2006; Petrozzi & Gagliardi 2013; Eberhard-Gran *et al.* 2001). For this study we used the cut-off point of 10 as recommended in the literature (Edhborg *et al.* 2005; Bloch *et al.* 2006; Cox *et al.* 1987). EPDS has been used also in early postpartum period for detection of the blues (Henshaw *et al.* 2004; Bloch *et al.* 2006; Teissedre & Chabriol 2004). It has been translated to and validated in many languages, including Polish (Kosakowska 2012).

The third part of the questionnaire was signed with the logo of The British Journal of Psychiatry, the owner of copyright laws of EPDS, which is the requirement for legal use of described scale.

All procedures performed in studies involving human participants were in accordance with the ethical standards of the institutional and/or national research committee and with the 1964 Helsinki declaration and its later amendments or comparable ethical standards.

Ethic committee approval was not required in authors' country – the manuscript is an analysis of anonymous survey for which patients' oral agreement each time was obtained before. The clinical decisions concerning the treatment were not influenced by the purpose of this paper.

Statistical analysis:

Statistical analysis was performed with Mann-Whitney U-test for continuous variables and chi-squared test for categorical variables. Logistic regression models were constructed for each variable as potential risk factor for depressive symptoms and univariate odds ratios (ORs) with 95% confidence limits were calculated. Multiple logistic regression model was used to estimate the influence of factors having impact on exceeding the threshold of 10 points in EPDS (adjusted odds ratios, aOR). Statistica 10.0 software was used for statistical analyses. A p-value <0.05 was considered significant and all tests were two-tailed.

RESULTS

From the group of 373 women approached by researchers during the first 5 days after delivery, 12 refused to complete the questionnaire and 1 was excluded due to insufficient knowledge of Polish. 4 questionnaires were filled incompletely and therefore also excluded. Finally EPG consisted of 356 women.

Six weeks after the delivery all 107 women agreed to complete the questionnaire, however 1 form was filled incompletely and excluded from further analysis. Therefore LPG consisted of 106 women.

Baseline characteristics of both groups are presented in Table 1. The mean EPDS score in EPG was 5.8 (0–23; median 11, SD ± 10.8), while in LPG 5.3 (0–20; median 4; SD ±4.3; p=0.6). 77 mothers from EPG (21.6%) and 15 from LPG (14.2%) achieved 10 or more points in EPDS. In EPG women with ≥10 points significantly more often delivered preterm, while in LPG mothers with ≥10 points had significantly smaller newborns. Other variables were similar in both groups.

The prevalence of analysed maternal and neonatal health issues with regard to the EPDS scores in both groups is presented in Table 2. Women from EPG who achieved ≥10 points in EPDS were hospitalized during pregnancy significantly more often (41.6% vs. 28.3%, p=0.03) and their newborns more often had health problems (infections 19.5% vs. 10.8%, p=0.045, jaundice 28.6% vs. 13.6%, p=0.01 or NICU admission 28.6% vs. 12.9%, p=0.01). Neither obstetric complications nor maternal chronic diseases had any association with the depressive symptoms in EPG.

Of all analysed obstetric and neonatal factors among women from LPG antepartum bleeding (40% vs. 4.3%, p=0.03), pregnancy hypertension (26.7% vs. 5.5%; p=0.02) and oligo/polyhydramnios (26.7% vs. 4.4%, p=0.01) were significantly more often reported by those who achieved ≥10 points in EPDS. In comparison to mothers with depressive symptoms in EPG, those in LPG more often suffered from obstetric complications (antenatal bleeding 40% vs. 14.3%, p=0.02; pregnancy hypertension 26.7% vs. 7.8%, p=0.03; oligo/polihydramnios 26.7% vs. 7.8%, p=0.03; hospitalisation during pregnancy 73.3% vs. 41.6%, p=0.02). Maternal

chronic diseases or neonatal complications did not correlate with the risk of PD in LPG.

Among analysed psychiatric factors (presented in Table 3) the same ones were reported significantly more often by women achieving ≥10 points in EPDS in EPG and LPG. Those factors included stressful situations during pregnancy (EPG: 41.6% vs. 25.8%, p=0.01; LPG: 53.3% vs. 25.3%, p=0.04), sedative agents usage (EPG: 23.4% vs. 8.6%, p=0.004; LPG: 33.3% vs. 7.7%, p=0.01) and a history of suicidal attempts (EPG: 5.2% vs. 1.1%, p=0.04; LPG: 20% vs. 1.1%, p=0.009). Significantly more women exceeding the threshold in EPDS in LPG than in EPG admitted to suicidal attempts in the past (20% vs. 5.2%, p=0.04). Having any of the psychiatric risk factors was related to exceeding 10 points in EPDS (EPG: 37.7% vs. 17.9%, p=0.008; LPG: 53.3% vs. 22%, p=0.02). Having a good relationship with the mother or the child's father or satisfying social support did not correlate with EPDS result.

Multiple logistic regression analysis was conducted to isolate the factors influencing the occurrence of depressive symptoms in both groups. In EPG only stressful situations during pregnancy (adjusted OR 1.8, 95% CI: 1–3.2), neonatal complications (aOR 2.3, 95% CI: 1.2–3.9) and psychiatric factors collectively (aOR 2.2, 95% CI: 1.2–3.9) had significant impact on depression-like symptoms. In LPG three factors revealed significant influence on postpartum depressive symptoms – stressful situations during pregnancy (aOR 3.7, 95% CI: 1.1–12.2), antepartum bleeding (aOR 6.3, 95% CI: 1.4–27.8) and the presence of any psychiatric factor (aOR 3.5, 95% CI: 1–12.5). The remaining analysed factors did not demonstrate any statistically significant impact.

DISCUSSION

Childbirth is a great change in the life of the new mother, causing many physiological and emotional disturbances. In our study the incidence of depressive symptoms in women (EPDS ≥10 points) was 21.6% in early postpartum period and 14.2% 6 weeks after the

Tab. 1. Baseline characteristics of EPG and LPG.

	EPG n=356				LPG n=106				
	EPDS ≥10 n=77	EPDS ≤9 n=279			EPDS ≥10 n=15	EPDS ≤9 n=91			
	mean ± SD	mean ± SD	OR 95%CI	*p*–value	mean ± SD	mean ± SD	OR 95%CI	*p*–value	*p*–value**
age (years)	31.7±4.8	31.1±4.9	0.9 0.5–1.4	0.8	29.5±6.5	30.2±5.6	0.9 0.4–1.6	1	0.13
primiparity *	38 (49.4%)	145 (52%)	0.9 0.5–1.5	0.9	7 (46.7%)	43 (47.3%)	1 0.3–3.3	1	0.8
employment*	65 (84.4%)	243 (87.1%)	0.8 0.4–1.7	0.9	13 (86.7%)	67 (73.6%)	2.3 0.4–16.2	0.4	1
material status:* good	21 (27.3%)	106 (38%)	0.6	0.07	4 (26.7%)	32(35.2%)	0.7	0.5	1
average	56 (72.7%)	171(61.3%)	0.3–1.1	0.07	11 (73.3%)	59(64.8%)	0.2–2.5	0.5	1
bad	0	2 (0.7%)		1	0	0		1	1
duration of pregnancy (weeks)	37.8±2.7	38.6±2	0.9 0.8–1.1	0.78	37.5±2.4	38.5±2.4	0.9 0.7–1.2	0.15	1
preterm delivery *	19 (24.7%)	38 (13.6%)	1.8 1.1–3	0.02	3 (20%)	13 (14.3%)	1.5 0.3–6.9	0.7	0.7
newborn's birth weight (g)	3210±763	3286±567	0.9 0.4–1.1	1	2856±617	3346±656	0.7 0.3–0.9	0.008	0.007
ART *	11 (14.3%)	37 (13.3%)	1.1 0.5–2.4	1	2 (13.3%)	5 (5.5%)	2.6 0.3–18.2	0.3	0.9
cesarean delivery *	39 (50.6%)	112 (40.1%)	1.4 0.8–2.4	0.3	7 (46.7%)	53 (58.2%)	1.3 0.4–4.6	0.4	0.8
antenatal course attendance*	24 (31.2%)	74 (26.5%)	1.2 0.7–2.2	0.5	5 (30%)	19 (20.9%)	1.7 0.4–6.7	0.3	0.9

*- numer (percentage); **- EPG EPDS ≥ 10 vs LPG EPDS ≥10; EPDS - Edinburgh Postnatal Depression Scale; EPG – early postpartum group; LPG – late postpartum group; OR – univariate odds ratio; 95% CI – 95% coefficient interval; ART – assisted reproductive technology

delivery, which was similar to previously published data (Gonidakis *et al.* 2008; Sakumoto *et al.* 2002; Petrozzi & Gagliardi 2013; Gonidakis *et al.* 2007). Like other investigators we found the prevalence of depression-like symptoms to be higher immediately after delivery than 6 weeks postpartum (Petrozzi & Gagliardi 2013). This phenomenon is caused by coexistence of BB. Its symptoms are also considered by EPDS. They are common

Tab. 2. The association between maternal and neonatal health issues and EPDS scores of 10 in EPG and LPG.

	EPG n=356				LPG n=106				
	EPDS ≥10 n=77	EPDS ≤9 n=279			EPDS ≥10 n=15	EPDS ≤9 n=91			
	mean ± SD	mean ± SD	OR 95%CI	*p*–value	mean ± SD	mean ± SD	OR 95%CI	*p*–value	*p*–value**
obstetric complications:									
antepartum bleeding	11 (14.3%)	22 (7.9%)	1.9 0.8–4.5	0.1	6 (40%)	12 (4.3%)	4.4 1.1–17	0.03	0.02
persistent emesis during pregnancy	2 (2.6%)	9 (3.2%)	0.8 0.1–4.1	1	1 (6.7%)	4 (4.4%)	1.5 0.1–16	0.5	0.4
cervical incompetence	8 (10.4%)	38 (13.6%)	0.7 0.3–1.7	0.5	3 (20%)	10 (3.4%)	2 0.4–9.8	0.4	0.3
intrauterine growth restriction of the fetus	6 (7.8%)	21 (7.5%)	1 0.4–2.9	1	3 (20%)	8 (8.8%)	2.6 0.5–13	0.2	0.1
pregnancy hypertension	6 (7.8%)	19 (6.8%)	1.2 0.4–3.2	0.8	4 (26.7%)	5 (5.5%)	4.9 1.2–18.6	0.02	0.03
gestational diabetes mellitus	13 (16.9%)	50 (17.9%)	0.9 0.4–1.9	1	2 (13.3%)	10 (11%)	1.3 0.2–7.2	0.7	0.8
oligo/polihydramnios	6 (7.8%)	12 (4.3%)	1.9 0.6–5.6	0.2	4 (26.7%)	4 (4.4%)	6.1 1.4–26.5	0.01	0.03
placenta previa	1 (1.3%)	6 (2.2%)	0.6 0–5.1	1	0	0		1	1
hospitalisation during pregnancy	32 (41.6%)	79 (28.3%)	1.5 1–2	0.03	11 (73.3%)	46 (50.5%)	2.7 0.7–10.9	0.2	0.02
any obstetric complications	47 (61%)	148 (53%)	1.1 0.6–2	0.5	12 (80%)	57 (62.6%)	0.4 0.1–2	0.2	0.2
maternal health problems:									
cardiovascular diseases	2 (2.6%)	7 (2.5%)	1 0.1–5.6	1	1 (6.7%)	3 (3.3%)	2.7 0.7–10.9	1	0.8
kidney or diseases	4 (5.2%)	11 (3.9%)	1.3 0.3–4.7	0.4	2 (13.3%)	4 (4.4%)	3.3 0.4–24.9	0.1	0.3
maternal health problems collectively	6 (7.8%)	17 (6.1%)	1 0.3–3	0.6	3 (20%)	7 (7.8%)	3 0.5–15.7	0.1	0.1
neonatal complications:									
birth defects	1 (1.3%)	3 (1.1%)	1.2 0–13.3	1	1 (6.7%)	3 (3.3%)	2.7 0.7–10.9	1	0.2
jaundice requiring phototherapy	22 (28.6%)	38 (13.6%)	2.1 1.3–3.4	0.01	4 (26.7%)	16 (17.6%)	1.7 0.4–6.8	0.5	1
infection requiring antibiotic therapy	15 (19.5%)	30 (10.8%)	1.8 1–3.3	0.045	2 (13.3%)	10 (11%)	1.3 0.2–7.2	0.7	0.6
NICU	22 (28.6%)	36 (12.9%)	2.2 1.3–3.6	0.01	2 (13.3%)	5 (5.5%)	2.6 0.3–18.2	0.3	0.2
any neonatal complications	39 (50.6%)	78 (28%)	2.6 1.5–4.6	0.013	4 (26.7%)	25 (27.5%)	1.2 0.3–5.8	1	0.09

*- EPG EPDS ≥ 10 vs LPG EPDS ≥ 10; EPDS - Edinburgh Postnatal Depression Scale; EPG – early postpartum group; LPG – late postpartum group; OR – univariate odds ratio; 95% CI – 95% coefficient interval

Tab. 3. The association between analysed risk factors and EPDS scores of 10 in EPG and LPG.

	EPG n=356				LPG n=106				
	EPDS ≥10 n=77	EPDS ≤9 n=279			EPDS ≥10 n=15	EPDS ≤9 n=91			
	mean ± SD	mean ± SD	OR 95%CI	*p*–value	mean ± SD	mean ± SD	OR 95%CI	*p*–value	*p*–value**
psychiatric factors:									
stressful situations during pregnancy	32 (41.6%)	72 (25.8%)	2 1.2–3.6	0.01	8 (53.3%)	23 (25.3%)	3.4 1–11.9	0.04	0.4
antidepressant treatment	7 (9.1%)	18 (6.5%)	1.5 0.5–3.9	0.4	2 (13.3%)	5 (5.5%)	2.6 0.3–18.2	0.3	0.8
sedative agents usage	18 (23.4%)	24 (8.6%)	2.7 1.5–4.9	0.004	5 (33.3%)	7 (7.7%)	4.3 1.3–12.9	0.01	0.4
narcotics usage during pregnancy	1 (1.3%)	1 (0.4%)	3.7 0.1–135	0.4	0	0		1	0.6
narcotics usage at any time	3 (3.9%)	12 (4.3%)	0.9 0.2–3.2	1	0	3 (3.3%)	0	1	0.4
any psychiatric illness	5 (6.5%)	10 (3.6%)	1.9 0.5–6.2	0.3	3 (20%)	4 (4.4%)	5.4 0.8–34	0.057	0.08
any psychiatric illness in the family	6 (7.8%)	21 (7.5%)	1 0.4–2.9	1	2 (13.3%)	9 (9.9%)	1.4 0.2–8.3	0.7	0.6
suicidal attempts	4 (5.2%)	3 (1.1%)	4.8 0.9–26.9	0.04	3 (20%)	1 (1.1%)	18.2 1.7–451	0.009	0.04
self-harm episodes	3 (3.9%)	5 (1.8%)	2.2 0.4–10.7	0.3	2 (13.3%)	3 (3.3%)	4.5 0.5–38.4	0.2	0.3
any psychiatric factor	29 (37.7%)	50 (17.9%)	2.5 1.4–4.6	0.008	8 (53.3%)	20 (22%)	4.1 1.2–12.5	0.02	0.3
satisfaction with perinatal care	72 (93.5%)	268 (96.1%)	0.6 0.2–2	0.9	15 (100%)	82 (90.1%)		0.4	0.8
good relationship with mother	73 (94.8%)	258 (92.5%)	1 0.4–2.6	0.9	14 (93.3%)	82 (90.1%)	0.9 0.2–34.8	1	1
good relationship with child's father	77 (100%)	269 (96.4%)		0.8	14 (93.3%)	88 (96.7%)	0.5 0–12.8	1	0.6
social support	75 (97.4%)	274 (98.2%)	0.7 0.1–5.2	1	13 (86.7%)	87 (95.6%)	0.3 0–2.6	0.2	0.1

*- EPG EPDS ≥10 vs LPG EPDS ≥10; psychiatric factors collectively – occurrence of any of the factors (antidepressants, sedative agents and narcotics usage, mental disorders or psychiatric treatment, self-harm episodes or suicidal attempts); EPDS - Edinburgh Postnatal Depression Scale; EPG – early postpartum group; LPG – late postpartum group; OR – univariate odds ratio; 95% CI – 95% coefficient interval;

and transient, therefore it is easier to distinguish the real PD later after childbirth. PD is a severe disorder requiring treatment and early recognition of women with postpartum depressive symptoms allows to detect women vulnerable to PD (Teissedre & Chabriol 2004; Reck *et al.* 2009). In our study the analysed risk factors of depressive symptoms differed in early postpartum period and 6 weeks after delivery, meaning that risk groups in both periods may not be identical.

In the presented study the incidence of depressive symptoms was independent of analysed sociodemographic variables (age, employment, material status, social support) in both groups. So far several studies have investigated the sociodemographic factors with contradictory results. Most of published studies did not find any relation between those factors and PD (O'Hara *et al.* 1996; Klier *et al.* 2007; Bloch *et al.* 2006; Gonidakis *et al.* 2007; Reck *et al.* 2009; Chaudron *et al.* 2001; Nagata *et al.* 2000), while some reported symptomatic women to be both younger or older (Davey *et al.* 2011), unemployed (Gonidakis *et al.* 2008; Rubertsson *et al.* 1998; Rubertsson *et al.* 2005; Jardri *et al.* 2006) and to have lower socio-economic status (Patel *et al.* 2002; Oppo *et al.* 2009). Unemployment and low income have been classified as small risk factors of PD (Robertson *et al.* 2004;). Several studies reported greater vulnerability to PD in primiparous women (Martin *et al.* 1989), while other showed greater risk for multiparous (Gurel

& Gurel 2000) or no relation between parity and PD (Robertson *et al.* 2004; Josefsson *et al.* 2001). In our research parity did not increase the risk of depressive symptoms in any studied group.

Psychological risk factors identified in the study, such as stressful situations during pregnancy, suicidal attempts in the past and sedative drugs usage, were associated with higher risk of developing postpartum depressive symptoms. Those results are in agreement with the literature (Gonidakis *et al.* 2008; O'Hara *et al.* 1996; Gonidakis *et al.* 2007; Rubertsson *et al.* 2005). According to Hirst and Moutier major life events or stressors during pregnancy increase the risk of PD 2.5-times (Hirst & Moutier 2010). In our analysis stressful life events during pregnancy increased the risk of suffering from depressive symptoms 1.8-times in early postpartum period and 3.7-times 6 weeks after the delivery. In meta-analysis by Robertson *et al.* prenatal depression, stressful life events during pregnancy or the early puerperium, low levels of social support and a previous history of depression were reported as the strongest antenatal predictors of PD (Robertson *et al.* 2004). The meta-analysis of 44 studies by Beck proved that prenatal depression (mean r effect size indicator = 0.49 to 0.51) and history of previous depression (r=0.27 to 0.29) had a significant impact on the occurrence of PD (Beck 1996). The history of major depressive disorders is related to a four-fold increase in PD development risk, while the family history of major depression increases the risk over two times (Robertson *et al.* 2004; Milgrom & Holt 2014). Having experienced depressive symptoms at any time and positive family history of any psychiatric illness are proved to be strong predictors of PD (Robertson *et al.* 2004). In our study we did not observe any significant differences in the prevalence of these factors among women with and without postpartum depressive symptoms, however symptomatic women in LPG suffered from any psychiatric disorders more often (with *p*-value close to significance 0.057). The incidence of any psychiatric factor significantly increased the risk of depressive symptoms in both analysed groups.

Obstetric issues as risk factors of PD have also been studied and the data are conflicting. Some studies did not find any relation between obstetric complications and PD (Bloch *et al.* 2006; Warner *et al.* 1996), while others did so (Gonidakis *et al.* 2008; O'Hara & Swain 1996). According to Robertson *et al.* pregnancy and delivery related complications are weak risk factors for PD (Robertson *et al.* 2004). These discrepancies result from different study populations, different time intervals of conducting surveys and analyzing complications collectively. To the best of our knowledge, the presented study is the first one which simultaneously evaluated the influence of various obstetric and neonatal complications on the occurrence of postpartum depressive symptoms in 2 time intervals: 2 to 5 days and 6 weeks after delivery. In contrast to psychological risk factors influencing mood in both analysed time intervals, the impact of obstetric and neonatal complications tended to differ depending on the time of survey. We found that women who suffered from depressive symptoms in early postpartum period more often delivered preterm. Preterm delivery was confirmed as a risk factor for developing depression also by other authors (Tamaki *et al.* 1997; Nielsen *et al.* 2000). Women experiencing depression-like symptoms 2 to 5 days after childbirth significantly more often reported neonatal complications. Specific pathologies, as well as neonatal complications collectively, occurred more often in symptomatic women's infants in EPG. Recent studies show that depression and anxiety are more common among mothers whose infants suffer from any illness and require NICU treatment (Segre *et al.* 2014). Childcare stressors were also evaluated by O'Hara *et al.* with the significant influence on BB prevalence (O'Hara *et al.* 1991). Newborn pathologies had more impact on depressive symptoms in early postpartum period than obstetric complications which may suggest that they are risk factors for BB mainly.

On the contrary, postpartum depressive symptoms 6 weeks after childbirth were more dependent on obstetric complications. Symptomatic women significantly more often reported pregnancy hypertension, oligohydramnios or polyhydramnios and antenatal bleeding. Women suffering from depression-like symptoms in both studied time intervals were more often hospitalised during pregnancy, with the highest incidence in LPG. This may implicate that obstetric complications with longer duration during pregnancy may cause higher level of anxiety and more often contribute to depression-like symptoms. In animals the study on pregnant mice showed that among chronically stressed gestating female deep changes in hormonal axes may potentially impact the incidence of affective disorders after the delivery (Misdrahi *et al.* 2005). According to Verdoux *et al.* the occurrence of obstetric complications is associated with more intense depressive symptoms (Verdoux *et al.* 2002).

There are several limitations to our study that should be considered along with the results. First of all, selected study group results from conducting the survey in a single tertiary medical centre. Women giving birth at the clinic are often hospitalized due to pregnancy complications and therefore do not represent general population. Secondly, the number of participants in LPG was small, which could lead to insufficient statistical power to evaluate the effect of all factors. Moreover, the questionnaires were completed anonymously and therefore all patient's medical data were self-reported. Although the survey was conducted in two postpartum time intervals in the same population, it was not possible to determinate the evolution of depressive symptoms in individual patents. On the other hand, anonymous assumption of the study minimalized the risk of women concealing the truth in some personal questions.

PD after childbirth has negative consequences, when it regards mother's health, relationship with the partner and newborn. As the delay of adequate treatment implementation is the most significant factor for the duration of the postpartum depression (Beck *et al.* 2002), screening for depression-like symptoms is crucial. According to the American College of Obstetricians and Gynecologists, screening for postpartum depression should be strongly recommended, although evidence is lacking to support universal screening program (American College of Obstetricians and Gynecologists 2010). Patients with identified risk factors may be selected for screening. According to our results, risk factors for the development of depressive symptoms vary in different time intervals following the delivery. Therefore, the risk groups of depression-like symptoms strictly after the delivery and after puerperium may also vary.

In conclusion, our results prove that risk factors for postpartum depressive symptoms depend on the period of time from childbirth and therefore screening for PD among new mothers should not be performed once in a single selected risk group. A multistage screening for PD should become an integral part of clinical practice during follow-up visits after the delivery.

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