Prevalence rates and socioeconomic characteristics of post-partum depression in Hungary

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ABSTRACT

The rapid socioeconomic transition in post-communist Hungary adversely affected the overall morbidity and mortality rates in the 1990s. Prevalence data on depressive disorders from the region are still scarce, however. This study reports the findings of the first epidemiological survey, using the Edinburgh Postnatal Depression Scale (EPDS) and the Beck Depression Inventory (BDI), on the prevalence of post-partum depression and the associated risk factors in Hungary. A total of 1030 mothers who delivered their babies between May and July 1999 in 16 counties in Hungary were screened for depressive symptoms 3–26 weeks post-partum. The survey found that 10.81% of the sample was above the cut-off score of 13, and the EPDS detected post-partum depressive symptoms with 76% (95% confidence interval (CI) = 60.5–87.1) sensitivity and 92% (95% CI = 90.5–94.1) specificity. In addition, 24 socio-demographic, socio-psychiatric data and personal and obstetric variables were surveyed. Results of a hierarchical logistic regression analysis showed that depression of the mother during pregnancy was the strongest predictor of depressive symptoms post-partum. Depression before pregnancy, housing conditions, marital relationship status and family history of alcohol problems were also identified as predictors for post-partum depressive symptoms.

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1. Introduction

When Hungary, a former Soviet Bloc country, opened the communist borders to the West in 1989, the change failed to bring the expected increase in the quality of life and instead led people into what they perceived as existential uncertainty and disintegration of formal and informal social support and value systems (Goodwin, 2006). In the following years, an unexpected relative increase in the overall morbidity and mortality rates was reported from the region (Weidner, 2000; Kopp et al., 2007). In Hungary, Bulgaria and Romania, life expectancy in the 1990s fell for men and stagnated for women. By 2000, male life expectancy returned to levels of the early 1970s and female life expectancy to 2–4 years higher, but it was still seven (males) and 10 (females) years less than the European Union (EU) average, with Hungary the lowest for men and the third lowest for women, even among the formerly communist EU accession candidates (i.e., Bulgaria, Czech Republic, Estonia, Hungary, Latvia, Lithuania, Poland, Romania and Slovakia; European Communities and World Health Organization, 2002). The Eastern European region became an experimental model on how societal changes can dramatically affect the health of a nation, and the

phenomenon received worldwide attention (Stone, 2000). Even though in national representative surveys from 1983, 1988, 1995 and 2002, an increasing impact of depressive symptoms and psychosocial stress on mortality and morbidity rates was reported (Kopp et al., 2000, 2004, 2007), data on the prevalence of affective disorders in Hungary are still sparse. Szadoczky et al. (1998) reported a 15.1% lifetime and 2.7% 1-month-period prevalence of major depressive disorder, using the Diagnostic Interview Schedule, while Kopp et al. (1997) found that 30.6% of the Hungarian population presented depressive symptomatology in 1995, measured by the shortened version of the Beck Depression Inventory (BDI). Similarly, only one survey was conducted on post-partum depression from southeastern Hungary in 2004–06 (Csatordai et al., 2007, 2009) and none from the entire country.

Post-partum depression is one of the most commonly occurring psychiatric illnesses after childbirth (Gaynes et al., 2005; Halbreich and Karkun, 2006) and affects not only the quality of life and mental health of the mother but also the developing child (Murray et al., 1996). Although the Diagnostic and Statistical Manual of Mental Disorders, Fourth Edition, Text Revision (DSM IV-TR) (APA, 2000) criteria for symptom onset of post-partum depression are limited to the fourth post-partum week, most health professionals and researchers consider symptoms within 12 months after delivery to be related to childbirth (Gaynes et al., 2005). The worldwide estimate for the prevalence of post-partum depression is 5–20% (Eberhard-Gran et al., 2001; Gavin et al., 2005), with data now available from every continent. The actual

prevalence rates, however, may vary as much as 0–60%, measured in different studies, different cultures, by different instruments and analysed using differing statistical methods (Evins et al., 2000; Halbreich and Karkun, 2006). Unfortunately, a large percentage – estimated up to 50% – of all cases of post-partum depression remains undetected (Ramsay, 1993; MacLennan et al., 1996), as depressed women feel guilty for being depressed in a period when they are expected to be happy and hide their problems, frequently not seeking professional help. Although surveys from different studies use different screening instruments, post-partum depression is most commonly screened with the Edinburgh Postnatal Depression Scale (EPDS), a 10-item self-report scale (Cox et al., 1987). In community samples, a cut-off score of 10 is frequently used for screening (Cox et al., 1987), whereas in clinical research a cut-off score of 13 is more suitable (Berle et al., 2003). Meta-analytic reviews of more than 70 studies, involving 12 000 subjects by O'Hara and Swain (1996), Beck (2001) and Robertson et al. (2004), identified that depression during pregnancy, history of depression before pregnancy, life events and social support play a strong role; marital relationship a moderate role; and socioeconomic status (e.g., low education level, poverty, low income and unemployment) plays a small, but significant, role in the development of post-partum depression. The cultural variability in the appearance and development of post-partum depression has been suggested to be related to differences in the socioeconomic environment, such as poverty, the availability of social support, nutrition and perceived stress (Halbreich and Karkun, 2006). Studies from non-Western cultures identified further risk factors, such as the gender of the baby in China (Lee et al., 2000) and India (Patel et al., 2002) and economic factors, financial position, health problems and concerns over the baby's behaviour in post-communist Mongolia (Pollock et al., 2009).

The first aim of this study was to measure the prevalence of post-partum depressive symptomatology in Hungary, using the EPDS in a sample that covers the country. According to the stress model of postpartum depression, status loss and diminished coping resources, which are characteristic to the region in this period as sources of increased social stress, are associated with the increase of postpartum depression (Segre et al., 2007). Our hypothesis, therefore, predicts a higher prevalence rate of post-partum depressive symptoms in Hungary than was reported from formerly non-communist Western European countries. The second aim of the study was to learn the factor structure of the EPDS in this Hungarian sample as this was the first use of the questionnaire in Hungarian. The third aim of the study was to investigate socio-demographic and socio-psychiatric risk factors that are commonly identified in the literature for their predictive values for post-partum depressive symptoms in the post-communist Hungary in the 1990s.

2. Method

A national epidemiological survey was carried out in Hungary between May and July 1999 in 16 out of the 20 Hungarian counties, through the Central Midwifery Institute. Chief midwives in every county were visited and informed about the study. Chief midwives then asked all midwives to help deliver the questionnaires to new mothers in their districts. Mothers, who decided to participate in the study, returned the questionnaire anonymously by mail. The participation of the mothers and the help of the midwives were voluntary; they received no incentives or compensation for their time and participation. The study was approved by the Central Midwifery Institute in Hungary, the Ethical Committees of the Semmelweis Medical University in Budapest and the Albert Szent-Gyorgyi Medical University, Szeged.

2.1. Sampling

Altogether, 1800 questionnaires were handed to the midwifery centres of the participating counties. The exact number of questionnaires actually distributed is unknown, but 1030 mothers returned the questionnaire. With a reported 94 645 live births in Hungary in 1999 (Central Statistical Institute, 2004), approximately 1.2% of the mothers of babies born that year participated in the present study.

2.2. Questionnaires

The questionnaire contained the BDI (Beck et al., 1961; validated in Hungarian by Zonda et al., 2000), the EPDS (Cox et al., 1987) and the Spielberger State and Trait Anxiety

Inventories (Spielberger et al., 1970, validated in Hungarian by Sipos and Sipos, 1983). The EPDS was translated into Hungarian and then back translated into English, resulting in a version that was almost identical to the original (see Appendix 1.). Further items on socio-demographic factors (age, education, geographical region, place of living, housing conditions, employment status, income, marital status and parity), maternal socio-psychiatric factors (depression before and during pregnancy, whether the mother received treatment for depression before and during the pregnancy, history of depression, suicide, alcohol problems in the family, smoking before and during pregnancy and attitudes to pregnancy), obstetric factors (high-risk pregnancy, prenatal care, attitudes toward pregnancy and way of delivery) and factors related to the baby (gender and age of the baby, parents' attitude toward the gender of the baby and health of the baby) were included in the questionnaire. To determine socio-psychiatric history, women were asked if they suffered from depression (yes/no) and if they received treatment for depression (yes/no) before and during pregnancy. The history of depression in the family (maternal father, mother, both or neither), suicide in their immediate family (maternal father, mother, both, or neither, attempt and completed) and drinking problems in their family (maternal father, mother, both or neither) were also recorded.

2.3. Statistical analysis

2.3.1. Internal consistency and the factor structure of the EPDS

The threshold for EPDS was analyzed using Receiver Operation Characteristic analysis (ROC) with Hanley and McNeil (1982) method, using MedCalc® version 11.2.1.0 for Windows. Internal consistency of the EPDS was examined with Cronbach's α. Principal components analysis (PCA) with oblique rotation (PROMAX), and multiple regression were performed to identify the factor structure of the EPDS.

2.3.2. Analysis of the socioeconomic and psychiatric risk factors and their relationship with post-partum depressive symptoms

Out of the total of 24 variables, four (way of delivery, education, housing conditions and place of living) were recoded; their categories were combined due to insufficient sample size. One variable (treatment for depression during pregnancy) was dropped due to insufficient sample size. Each risk factor was individually examined with logistic regression on its predictive value for depressive symptoms measured by the EPDS. The impact of the age of the mothers on post-partum depression was examined with independent samples t-test. Variables that were individually predictive for post-partum depression were further analysed with a hierarchical logistic regression (stepwise, forward model). As there were 101 cases with post-partum depressive symptoms, and 10 events per variable ratio is suggested (Peduzzi et al., 1996), the seven individually significant socio-demographic variables were entered in block 1, and the seven socio-psychiatric variables in block 2. Variables that reached the $P < 0.1$ probability were brought forward to the next step of the analysis. SPSS 15.0 for Windows statistical software (SPSS, Inc., Chicago, IL, USA) was used, and $P < 0.05$ was accepted as significant.

3. Results

3.1. Descriptive statistics of the sample

In total, 988 questionnaires were included in the analysis. Forty-two questionnaires were excluded from the sample. Twenty questionnaires were returned after the babies reached 26 weeks of age (spanning from 27–84 weeks) and 12 before the third week of age of the baby. A further 10 questionnaires had no information on the age of the baby; therefore, these 42 data were excluded from the 1030 returned data. Hence, in total, 988 questionnaires were included in the analysis. The mean age of the respondents was 27.09 years, (S.D. = 4.28, age range 16–43 weeks). The mean age of the babies was 12.07 weeks (S.D. = 4.21, age range 3–26 weeks, 54.25% males; see Table 1 for the descriptive statistics of the main variables examined).

3.2. Internal consistency of the EPDS

The individual items showed medium-to-high correlations with the EPDS total score, ranging from 0.50 to 0.73, and the internal consistency of the scale was high (Cronbach's α = 0.83).

A PCA with oblique (Promax) rotation extracted two factors: Factor 1 (questions 1, 2, 7, 8, 9 and 10) accounted for 42.25% of the variance and Factor 2 (questions 3, 4, 5 and 6) accounted for 11.31% of the variance (Table 2). As the pattern matrix on Table 2 shows, questions 1, 2, 7 and 10 loaded cleanly on Factor 1 and questions 3, 4 and 5 loaded cleanly on Factor 2, whereas questions 6, 8 and 9 were split loaded.

Factor 1 questions were related to mood, whereas Factor 2 questions focussed mainly on anxiety-related symptoms. The mood factor's

Table 1
Descriptive statistics of the sample.

	N	%
Way of delivery		
Uncomplicated vaginal delivery	760	(76.93%)
Delivery with forceps	27	(2.73%)
Caesarean section	201	(20.34%)
Parity		
Primiparas	576	(58.30%)
Second child	302	(30.57%)
Third child	84	(8.50%)
Fourth or fifth child	16	(1.62%)
No response	10	(1.01%)
Mental health history		
Depression before pregnancy	125 (41 treated)	(12.65%)
Depression during pregnancy	94 (4 treated)	(9.51%)
Parental depression	79	(7.90%)
Suicide in family history	158	(16.00%)
Drinking problems in the family	311	(31.80%)
Education		
< 8 years	6	(0.61%)
8 years	59	(6.00%)
Trade school	23	(23.24%)
Secondary school	393	(39.79%)
University or higher	283	(28.64%)
No answer	17	(1.72%)
Housing conditions		
Non-convenience flats (No WC and no bathroom)	23	(2.32)
Half-convenience (Either WC or bathroom outside)	35	(3.54%)
Convenience flats (No central heating)	120	(12.15%)
All-convenience flat (With central heating)	779	(78.85%)
Luxury flat	14	(1.42%)
No answer	17	(1.72%)
Place of Living		
Budapest	120	(12.14%)
County seats	227	(22.98%)
Small towns	344	(34.82%)
Villages	280	(28.34%)
Farms	8	(0.81%
No response	9	(0.91%)
Employment		
Unemployed	308	(31.17%)
Relationship status		
Married	818	(86.5%)
Cohabiting	100	(10.5%)
Divorced, Widowed, Single alone	28	(3%)

correlation with the total EPDS scores was 0.89 ($P<0.01$), the anxiety factor's correlation with the total EPDS score was 0.90 ($P<0.01$) and the two factors' correlations with each other were moderate at 0.61 ($P<0.01$). The mood factor's correlation with the BDI was 0.68, the anxiety factor's correlation with the BDI was 0.59 and the difference between these correlations, calculated by Steiger's t-test (Steiger, 1980), was significant ($r1-r2=-0.09$, $t=-4.36$, $P<0.01$).

A multiple regression analysis showed that after removing the effect of the anxiety (Spielberger Trait Anxiety Scale) scores, the mood

Table 2
Factor analysis of the Hungarian EPDS.

	Component	
Items of the EPDS	'Mood'	'Anxiety'
1. I have been able to laugh and see the funny side of things.	-.840	.092
2. I have looked forward with enjoyment to things.	-.909	.326
3. I have blamed myself unnecessarily when things went wrong.	-.114	.771
4. I have been anxious or worried for no good reason.	.136	-.843
5. I have felt scared or panicky for not very good reason.	.032	.746
6. Things have been getting on top of me.	.347	.474
7. I have been so unhappy that I have had difficulty sleeping.	.547	.193
8. I have felt sad or miserable.	.532	.299
9. I have been so unhappy that I have been crying.	.472	.365
10. The thought of harming myself has occurred to me.	.501	.147

Extraction Method: Principal Component Analysis, Oblique (Promax) rotation, Eigenvalue >1. Component 1. explained 42.55% of the variance while component 2. explained 11.31% of the variance.

factor accounted for 10.90% of the variance in depressive symptoms as measured by the BDI, whereas the anxiety factor accounted for only 1.00%. Similarly, after removing the effect of the depressive symptom's (BDI) scores, the anxiety factor accounted for 7.84% of the variance in anxiety as measured by the Spielberger Trait Anxiety Scale, whereas the mood factor accounted for only 2.89%.

3.3. Prevalence of depressive symptomatology measured by the BDI

Of those in the sample, 932 responders provided data for both the BDI and the EPDS. Scores on the BDI and the EPDS highly correlated ($r_{(1,932)}=0.70$, $P<0.001$).

The ROC analysis suggested a threshold of 10 in the EPDS as optimal for sensitivity and specificity for both 'moderate' (BDI ≥ 19) and 'moderate and mild' (BDI ≥ 11) categories according to the BDI scale (See Table 3). The sensitivity of the EPDS was 93 (95% CI = 81.7–98.6) and the specificity was 79 (95% CI = 75.8–81.3) at this threshold against a cut-off score of ≥ 19 on the BDI. The area under curve (AUC) was 0.94 (95% CI = 0.92–0.95, $Z=17.51$, $p<0.001$). When using this cut-off score on the EPDS – as suggested for a community sample (Cox et al., 1983) – 24.84% of the sample was above this cut-off score.

Using a cut-off score of 13 in the EPDS (as suggested for clinical samples, Cox et al., 1987), 10.81% scored above this cut-off score, with 76% (95% CI = 60.5–87.1) sensitivity and 92% (95% CI = 90.5–94.1) specificity. The prevalence values measured by the EPDS for each cut-off score are displayed in Table 3, and the distribution of the EPDS scores in the sample is shown in Fig. 1.

3.4. Risk factors associated with post-partum depressive symptomatology

A total of 24 putative risk factors were included in the analysis. Initial individual logistic regression analyses indicated an association between post-partum depressive symptoms measured by the EPDS (with a cut-off score of 13) and education, geographical region, housing conditions, employment status and reported poverty. Mothers from the eastern part of the country, from poor housing conditions, with lower educational levels, with no stable employment or living in poverty had the highest odds for developing post-partum depressive symptoms. Parity and marital status also showed a significant association with postpartum depressive symptoms. Mothers with three, four and five children and mothers who lived alone had a higher risk of post-partum depressive symptoms. Mothers' attitude towards pregnancy, such as unplanned or unwanted pregnancies, significantly increased the odds for post-partum depressive symptoms. Maternal indicators of health and mental health, such as smoking, depression before and during pregnancy and family history of alcohol problems also had a significant association with post-partum depressive symptoms. All these risk factors individually were associated with increased risk for postpartum depressive symptoms (see Table 4).

After the initial analysis, the 'marital relationship' variable was recoded. As the risk for post-partum depressive symptoms in married mothers and mothers with non-married partners was comparable, these two groups were combined, and the two categories 'mothers living with partner' and 'mothers without partner' (divorced, widowed or single) were created.

Because the variables that were independently significantly related to post-partum depressive symptoms may have been associated with each other, collinearity was tested. Tolerance values fell between 0.72 and 0.95, which according to Menard (1995) indicates no collinearity problems. Similarly, variance inflation factor (VIF) values were between 1.04 and 1.85, which according to Myers (1990) indicates no collinearity problems. Hierarchical logistic regression analysis was performed with 14 variables that were individually significantly associated with post-partum depressive symptoms, and were entered in the model in two levels (seven socio-demographic variables, and seven socio-psychiatric variables). The final model is presented in Table 5. The Hosmer–

Table 3
Results of ROC analysis for EPDS against the BDI.

Criterion (EPDS)	N	% of the sample (cumulative)	Sensitivity BDI ≥ 19	95% CI	Specificity BDI ≥ 19	95% CI	Sensitivity BDI ≥ 11	95% CI	Specificity BDI ≥ 11	95% CI
>6	461	49.36	100.00	92.1-100.0	53.21	49.9 - 56.5	85.65	80.4 - 89.9	62.50	58.8 - 66.1
>7	380	40.69	97.78	88.2 - 99.9	62.20	58.9 - 65.4	80.00	74.2 - 85.0	72.16	68.7 - 75.4
>8	296	31.69	93.33	81.7 - 98.6	71.43	68.3 - 74.4	71.30	65.0 - 77.1	81.25	78.2 - 84.1
>9	232	24.84	93.33	81.7 - 98.6	78.63	75.8 - 81.3	65.65	59.1 - 71.8	88.49	85.9 - 90.8
>10	181	19.38	86.67	73.2 - 94.9	84.03	81.5 - 86.4	54.35	47.7 - 60.9	92.05	89.8 - 93.9
>11	135	14.45	82.22	67.9 - 92.0	88.98	86.7 - 91.0	44.78	38.2 - 51.5	95.45	93.6 - 96.9
>12	101	10.81	75.56	60.5 - 87.1	92.46	90.5 - 94.1	36.52	30.3 - 43.1	97.59	96.2 - 98.6
>13	68	7.28	71.11	55.7 - 83.6	95.95	94.4 - 97.1	26.52	20.9 - 32.7	99.01	98.0 - 99.6
>14	53	5.67	55.56	40.0 - 70.4	96.85	95.5 - 97.9	21.30	16.2 - 27.2	99.43	98.6 - 99.8
>15	40	4.28	48.89	33.7 - 64.2	97.98	96.8 - 98.8	16.52	12.0 - 22.0	99.72	99.0 - 100.0
>16	28	3.00	37.78	23.8 - 53.5	98.76	97.8 - 99.4	11.74	7.9 - 16.6	99.86	99.2 - 100.0
>17	20	2.14	33.33	20.0 - 49.0	99.44	98.7 - 99.8	8.70	5.4 - 13.1	100.00	99.5 - 100.0

Lemeshow test ($P = 0.97$) indicates that the occurrence of post-partum depressive symptomatology is not significantly different from the one that was predicted by the model; thus, the overall model fit is good. According to the Wald chi-square values, depression during pregnancy was the strongest predictor in the model, followed by depressive symptoms before pregnancy and poor housing conditions. These were followed by marital relationship status and alcohol problems in the mother's family history.

In summary, maternal depressive symptomatology was associated with depression during and before pregnancy, poor housing conditions, living without partner and with history of alcohol problems in the mother's family.

4. Discussion

This epidemiological study found a 10.9% prevalence of postpartum depressive symptoms in Hungary, measured by the EPDS, with a cut-off score of 13. This result is comparable to data reported by Murray and Carothers (1990) using the same cut-off score in a community sample from the UK. The prevalence rate of post-partum depressive symptoms from the current study from Hungary is in the range of prevalence rates measured in other parts of the world, including Western Europe, Asia and North America (O'Hara and Swain, 1996; Klainin and Arthur, 2009). Lower prevalence rates were reported from Germany (6.1%, Reck et al., 2008), comparable prevalence rates from the UK (Murray and Carothers, 1990; Evans et al., 2001), and significantly higher from Athens, Greece (19.8%, Gonidakis et al., 2008).

The prevalence rate, therefore, does not support the prediction of a higher rate of post-partum depressive symptoms in mothers during the socioeconomic transition in Hungary. One explanation could be that only men, who experienced objective or subjective status loss, but not women, were affected during this period (Kopp et al., 2004). If so, the changed social status of women in the past 20 years in Hungary may result in different prevalence rates in more recent surveys. Indeed, Csatordai et al. (2007) reported higher rates – 15% severe vulnerability and 38% moderate vulnerability – for post-partum depression. Although the present survey is from 1999 and Csatordai et al.'s (2007) study was completed in 2006, the present study used the EPDS, while Csatordai et al. (2007) used the Levertone Questionnaire. In addition, the present study covers most of the country, while Csatordai et al.'s study surveyed the southeastern region of the country.

There is a historical socioeconomic difference between Eastern Hungary (defined as east from the river Danube that vertically divides the country) and Western Hungary (west from the Danube), with the eastern regions being more disadvantaged in general. According to the Central Statistical Institute (KSH, 2006) in Hungary, the Western part of the country, especially Zala, Vas, and Tolna counties, had the lowest unemployment rates in 2004 (1.9%, 2.5% and 2.5%, respectively) while Borsod–Abauj–Zemplen and Szabolcs–Szatmar–Bereg counties in the East had the highest rates of unemployment (9% and 8.1%, respectively). The gross domestic product (GPD) per capita values show a similar geographic distribution that is below the national average in counties from Eastern Hungary (76.88%) and significantly higher in counties from Western Hungary (96.25%, $Z = -2.40$, $P < 0.05$, data calculated from KSH, 2006, p. 55). Due to this east–west gradient, somewhat higher rates
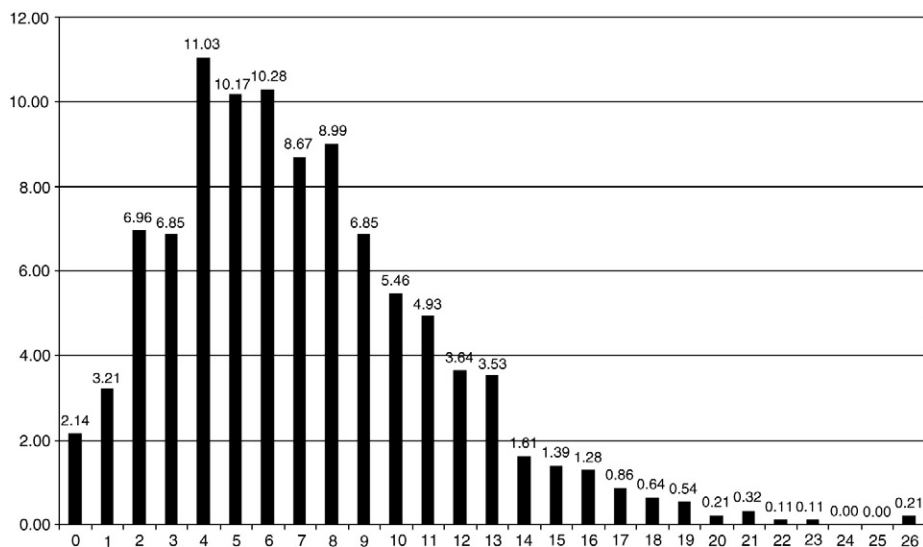
Fig. 1. Title: Distribution of the EPDS scores in the sample (minimum score 0, maximum = 30). X axis : EPDS scores. Y axis: Percentage.

Table 4
Potential risk factors for postpartum depression measured by the EPDS in a Hungarian sample of mothers.

Variable	Category	Depressed		OR	P
		N	%	(95% CLs)	
Geographic region	East	51	14.5	1.8 (1.19, 2.72)	<0.005
	West and Budapest	51	8.6	1	
Education	University	24	8.9	1	0.01
	Secondary school	36	9.4	1.06 (0.61, 1,82)	
	Trade School	27	12.3	1.44 (0.80, 2.57)	
	8 primary or less	16	21.6	2.81 (1.41, 5.64)	
Place of living	Capital	9	7.6	1	0.15
	Region centre	16	7.5	0.99 (0.43, 2.32)	
	Town	40	12.2	1.69 (0.80, 3.60)	
	Village and farms	35	12.6	1.77 (0.82, 3.80)	
Quality of housing	Convenience	16	29.63	1	<0.001
	Partial / no convenience	83	9.5	4.02 (2.15, 7.53)	
Stable Employment	Yes	56	8.7	1	<0.001
	No	43	14.9	1.85 (1.21, 2.83)	
Perceived as very poor	No	83	9.4	1	<0.001
	Yes	15	27.8	3.69 (1.95, 6.97)	
Parity	1	50	9	1	0.02
	2	32	11.2	1.28 (0.80, 2.04)	
	3	14	17.5	2.15 (1.13, 4.10)	
	4 or 5	4	26.7	3.68 (1.13, 11.98)	
Gender of the baby	Boy	52	10	0.81 (0.54, 1.22)	0.31
	Girl	51	12.1	1	
Marital relationship	Married / living together	94	10.2	1	<0.01
	Living alone / divorced / widowed	9	32.1	4.14 (1.83, 9.44)	
High risk pregnancy	no	67	9.6	1	0.09
	yes	33	13.8	1.50 (0.96, 2.35)	
Delivery	vaginal	79	10.5	1	0.52
	caesarean section	24	12.2	1.19 (0.73, 1.93)	
Pregnancy attitudes	planned	67	9.2	1	0.02
	not planned	29	14.6	1.68 (1.05, 2.67)	
	not wanted	5	26.3	3.51 (1.23, 10.04)	
Baby is healthy	Yes	101	10.8	1	0.52
	No	2	16.7	1.65 (0.36, 7.63)	
Satisfied with baby's gender	Yes	69	10.1	1	0.09
	No expectations	14	9.4	1.08 (0.59, 1.98)	
	Expected other gender	19	16.8	1.95 (0.93, 4.08)	
Smoked before pregnancy	No	67	9.3	1	<0.01
	Yes	36	15.9	1.84 (1.19, 2.85)	
Smoked during pregnancy	No	87	9.9	1	<0.001
	Yes	16	25.4	3.11 (1.69, 5.71)	
Alcohol history in family	No	53	8.1	1	<0.001
	Yes	50	17.1	2.32 (1.54, 3.53)	
Suicide in family	No	82	10.3	1	0.2
	Yes	21	13.9	1.40 (0.84, 2.34)	
Depression in family history	No	91	10.5	1	0.2
	Yes	11	15.5	1.57 (0.79, 3.09)	
Depression before pregnancy	No	62	7.6	1	<0.001
	Yes	41	33.9	6.27 (3.97, 9.89)	
Treatment for depression before pregnancy	No	88	9.8	1	<0.001
	Yes	14	33.33	4.60 (2.34, 9.07)	<0.001
Depression during pregnancy	No	65	7.6	1	<0.001
	Yes	37	41.10	8.43 (5.16, 13.77)	
Age of the mothers	'Depressed'			M = 26.93 SD = 4.56	0.66
	'Non-depressed'			M = 27.13 SD = 4.28	

of post-partum depressive symptomatology are expected in the east, and, due to the different measures, the prevalence rates are difficult to compare directly.

Besides the goal of obtaining prevalence data, in this study we aimed to identify the characteristics of the EPDS in Hungarian. Most previous

Table 5
Final model of factors predictive for postpartum depression.

Variable	OR (95% CLs)	P	Wald Chi Square
Poor quality of housing	3.54 (1.70, 7.36)	<0.01	11.39
Marital status: Living alone	4.50 (1.71, 11.78)	<0.01	9.34
Alcohol history in family	1.84 (1.14, 2.96)	<0.05	6.22
Depression before pregnancy	2.86 (1.55, 5.28)	<0.001	11.38
Depression during pregnancy	3.62 (1.89, 6.96)	<0.001	14.90

Nagelkerke R^2: 0.20, Hosmer and Lemeshow Test $P = 0.97$.

validation studies reported a homogeneous one-factor structure of the EPDS, and the original goal of the instrument was to detect only post-partum depression (Cox et al., 1987; Berle et al., 2003). The two extracted factors, however, correspond with recent reports on the factor-analytic structure of the EPDS. The French, (Teissedre and Chabrol, 2004; Adouard et al., 2005), the Dutch (Pop et al., 1992) and the Quebecois (Des Rivieres-Pigeon et al., 2000) versions similarly yielded two factors that reflect the depressive and the anxiety components of the depressive symptomatology. Although this information could be useful for future research, a valid concern with these subscales is that the two factors strongly overlap (Pop et al., 1992); therefore, the full EPDS is a more sensitive measure of both anxiety and depressive symptoms than the subscales independently (Brouwers et al., 2001).

The third aim of the study was to explore socio-demographic and socio-psychiatric risk factors that are associated with post-partum

depressive symptoms. The strongest risk for post-partum depressive symptomatology in the final model was the history of depression during pregnancy. The vulnerability for depressive symptoms in those with a history of previous depression is supported by both epidemiological data and indirect experimental evidence. A large body of research suggests that previous depression indeed poses a risk factor for post-partum depression (Johanson et al., 2000; Najman et al., 2000; Felice et al., 2004). The Bloch et al. (2000) study provided further experimental support. When women were administered gonadal steroids and then had them rapidly withdrawn, those with a history of post-partum depression were more likely to develop depression than those without depression in their past. Post-partum depression, therefore, is strongly related to depressive episodes over the lifetime of the mother. In the present study, 41% of the mothers, who reported depression during pregnancy, showed depressive symptoms post-partum, and these mothers accounted for approximately 30% of all post-partum depressed cases. Women who reported depression either or both before and during pregnancy contributed to approximately half (48.5%) of all women with post-partum depressive symptomatology.

Living without partner and poor housing conditions remained highly significant even when other socio-demographic risk factors, such as education, age of the mother, parity, employment status and poverty, were taken into account. Married and cohabiting mothers had comparable odds for developing post-partum depressive symptomatology, indicating that the available relationship, not the marital status, determines the odds for post-partum depressive symptoms. Meta-analytic studies reported marital relationship a strong predictor of post-partum depression (O'Hara and Swain, 1996), as did a recent survey from Mongolia (Pollock et al., 2009) where the researchers analysed the data with an analytical method similar to the present study.

The importance of housing conditions in predicting post-partum depression is likely to have a particular significance in the region. In their meta-analytic review of the literature on the socio-demographic risk factors for post-partum depression, Ross et al. (2006) did not find housing conditions to predict post-partum depression. Neither did Pollock et al. (2009) in their study with a similar statistical analysis from Mongolia, a post-communist country. One of the many changes, however, that deeply affected the lives of people in these transitional years was the housing reform in many Eastern European countries, including Hungary (Hegedus et al., 1996), Croatia and others (Sumega and Bezovan, 2007). This reform involved the sale of public housing. As a result, Hungary emerged with the highest homeownership rate (92%) in Europe, which is a dramatic change compared to the communist years with no private properties. In comparison, homeownership rates between 1990 and 2000 remained stable in the UK at 68% and 69%, respectively, 42% and 42% in Sweden, 54% and 55% in France, 55% and 56% in Austria (Doling and Ford, 2007) and 63.9% and 67.9% in the US (US Census Bureau, 2005). The closest to Hungary was Lithuania with an 84% rate (Doling and Ford, 2007), but the process was not so dramatic in the Czech Republic, with rates of 37.7% and 46.8% (Sumega and Bezovan, 2007).

The majority of Hungarian households were, therefore, privately owned at the time of the survey, with a sudden full financial responsibility on the owners with respect to repair, upgrade, extension and with no alternative option to rent and, consequently, with no scope for social mobility. Several generations lived in the same household without the prospect of improving the quality of their housing.

Socioeconomic status, in general, has been found to be a weak but significant predictor for post-partum depression in large-scale meta-analytic reviews (O'Hara and Swain, 1996; Robertson et al., 2004). Indeed, while several studies reported a significant relationship between post-partum depression and low income or the occupational status of the mothers (Warner et al., 1996; Beck, 2001; Lee et al., 2000; Seguin et al., 1999; Patel et al., 2002), several others did not find economic status to be a predictor of post-partum depression (Bloch et al., 2006; Pollock et al., 2009; Ross et al., 2006). Therefore, given the generally small effect socioeconomic variables have on predicting post-

partum depression, it is not surprising that housing conditions have rarely been considered as an additional socioeconomic factor. Pollock et al. (2009) examined 'housing type' and 'house occupation density' in the post-communist Mongolia and found that these variables did not predict post-partum depression. In Hungary, however, the widening socioeconomic inequalities have been found to play an important factor in the development of mental health problems in the transitional period of the 1990s (Kopp et al., 2000, 2004). Given the unique history of the housing conditions in the post-communist Hungary, the socioeconomic inequalities may have accumulated in the housing conditions, and this may explain why 'housing conditions' was the strongest socio-demographic risk factor in predicting post-partum depressive symptomatology in Hungary during this period. While the result is unexpected in the context of the literature, concurrent sociological and socio-demographic surveys predicted this variable to be a robust contributor to the development of post-partum depression in Hungary.

While other socio-demographic risk factors (age of the mother, parity, employment status and poverty) were clearly important and were associated with depressive symptoms when analysed independently, they were found to be less predictive for post-partum depressive symptoms in the presence of other factors. O'Hara and Swain (1996), in their meta-analysis, reported that income predicted post-partum depression only with small effect sizes, and education and employment status were not predictive. Beck's (2001) meta-analytic review reported only socioeconomic status but not education and employment to predict post-partum depression. The Segre et al. (2007) survey of a more heterogeneous socio-demographic sample found income, marital status and parity to be significant predictors for post-partum depression; however, the study did not take socio-psychiatric factors into account. Intrapersonal factors, such as attitudes towards pregnancy, were found to be significantly associated with post-partum depression in the southeastern region of Hungary (Csatordai et al., 2007) and significantly predicted post-partum depressive symptoms in the present study when analysed independently. When analysed in the presence of other, stronger predictor factors, as we did in the present analysis and as in Pollack et al. (2009), maternal attitudes towards pregnancy did not predict post-partum depressive symptoms.

Family and personal history of depression, single status and alcohol use are reported to be significant risk factors for post-partum depression (Marcus, 2009). In the final model, family history of depression did not predict post-partum depressive symptoms, but family history of alcohol problems remained a significant predictor. Our study, however, did not involve questions on the alcohol use of the mother, and used only self-reported history of alcohol use in the mother's family. While alcohol use among post-partum women, in general, is lower than in non-pregnant women (Vesqa-Lopez et al., 2008), the history of alcohol use in the mothers' family is likely to be comparable between pregnant and non-pregnant women. Alcohol use in the mothers' family however, could play a socio-psychiatric risk and determines vulnerability for post-partum depression either through a genetic risk and/or early development.

A significant limitation of the study is the validation of the EPDS against the BDI without the validation of a diagnosis using clinical interviews. While epidemiological studies on post-partum depression may use only self-report measures, validation of a self-report measure against another self-report measure could be more problematic. When Lee et al. (2001) compared the EPDS and the BDI, however, they found that the BDI had satisfactory sensitivity and predictive value for post-partum depression. Although clinical validation of the diagnosis is the gold standard, we believe that, based on available data from Lee et al. (2001), our study provides valid descriptions of the post-partum depressive symptomatology from Hungary. Because the potential impact of a mother's post-partum depression is not limited to the mother but has a measurable effect on her infant's and children's cognitive emotional development (Murray et al., 1996; Murray and Cooper, 1997; Cooper et al., 1999; Grace et al., 2003), further research

would help not only to understand the consequences of the current societal changes on post-partum mothers in Hungary, but also to aid early mother–infant mental health services.

In summary, our study surveyed post-partum depressive symptomatology in the post-communist Hungary in 1999 using the EPDS, and found the prevalence rates to be comparable to those from Western countries. Previous depression of the mother, poor housing conditions, living without a partner and the history of alcohol problems in the mother's family were found to be the strongest predictors of post-partum depressive symptoms. The unexpected strong association between housing conditions and post-partum depressive symptoms is suggested to be unique to this region and is likely to be related to the nature of the socioeconomic transition that characterised Hungary in the 1990s. This result highlights the need for socio-cultural sensitivity when investigating risk factors that contribute to post-partum depression. Whether the still rapid socioeconomic changes are continuing to differentially modify the predictive values of the socioeconomic factors, and that will be different from those of other countries will still have to be investigated. To understand the impact of the socioeconomic changes on the mental health of a nation, continuing population-wide studies on the changing prevalence and the socioeconomic factors that contribute to the development of post-partum depression are needed in Hungary. Such results could not only provide information for mental health professionals in preventing post-partum depression, but also give unique insights into the mechanisms that mediate the socioeconomic changes that can affect a nation's mental health.

Appendix 1. The Hungarian version of the EPDS (In Hungarian)

Kérjük, legyen szíves bekarikázni a következő 10 kérdésben azt a választ, ami a leginkább jellemző volt Önre az elmúlt 7 napban.

1. Tudtam nevetni és a dolgok jó oldalát nézni
   a. Csakúgy mint régen
   b. Nem olyan gyakran mostanában
   c. Kifejezetten kevésbé mint régen
   d. Egyáltalán nem

2. Örömmel vártam a dolgokat, amik velem történtek
   a. Éppúgy mint régen
   b. Kevésbé, mint szoktam
   c. Sokkal kevésbé, mint szoktam
   d. Szinte egyáltalán nem

3. Feleslegesen hibáztattam magam ha valami rossz történt
   a. Igen, nagyon gyakran
   b. Igen, sokszor
   c. Néha
   d. Soha

4. Ok nélkül ideges voltam, aggódtam
   a. Egyáltalán nem
   b. Alig jellemző
   c. Igen, előfordul
   d. Igen, nagyon gyakran

5. Ok nélkül félelmet, pánikot éreztem
   a. Igen, nagyon gyakran
   b. Igen, néha
   c. Nem, szinte alig
   d. Nem, egyáltalán nem

6. Mindenből elegem volt
   a. Igen, legtöbbször képtelen voltam megbírkózni a problémákkal
   b. Igen, néha előfordult, hogy kevésbé jól bírkóztam meg a problémákkal, mint régen

c. Nem, a legtöbb esetben épp olyan jól bírkózok meg a problémáimmal, mint régen
d. Egyáltalán nem, pont olyan jól bírkózok meg a problémáimmal, mint régen

7. Olyan boldogtalannak éreztem magam, hogy képtelen voltam aludni
   a. Igen, szinte mindig
   b. Igen, gyakran
   c. Néha előfordul
   d. Nem, egyáltalán nem igaz

8. Szomorú, vagy bánatos voltam
   a. Igen, szinte mindig
   b. Igen, nagyon gyakran
   c. Néha előfordult
   d. Nem, egyáltalán nem

9. Olyan boldogtalan voltam, hogy sírtam
   a. Igen, szinte mindig
   b. Igen, nagyon gyakran
   c. Néha előfordult
   d. Nem, egyáltalán nem

10. Felmerült bennem a gondolat, hogy valami rosszat csinálok magammal
    a. Igen, nagyon gyakran
    b. Előfordult
    c. Szinte sosem
    d. Soha

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