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ORIGINAL ARTICLE

Impact of maternal depression on perinatal outcomes in hospitalized women—a prospective study

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Abstract

Scarce data exists regarding the prevalence of antenatal depression in hospitalized pregnant women, and its effect on perinatal outcome. We aimed to estimate the risk of maternal depression among women hospitalized in a high-risk pregnancy department, and to evaluate its potential association with adverse perinatal outcome. A depression screening self-questionnaire-based prospective study was performed, in which hospitalized pregnant women who screened positive for depression were compared to those who screened negative. The Edinburgh Postnatal Depression Scale (EPDS) was used for antenatal depression screening. Pregnancy course and perinatal outcome were compared between the groups. A multivariate logistic regression model was constructed to control for clinically relevant confounders. During the study period, 279 women met the inclusion criteria. Among them, 28.3% ($n = 79$) screened positive for depression (≥ 10 points on the EPDS). In the univariate analysis, a significantly higher incidence of preterm delivery (< 37 weeks), low birthweight (< 2500 g), low Apgar scores (at 1 and 5 min), and neonatal intensive care unit (NICU) admissions were noted among the screen positive group. In the multivariate regression model, controlled for maternal age, ethnicity, gestational diabetes mellitus, preeclampsia, past preterm delivery, and gestational age upon admission, maternal antenatal depression during hospitalization was noted as an independent risk factor for preterm delivery (adjusted OR 3.32, 95%CI 1.16–9.52, $p = 0.026$). Maternal antenatal depression during hospitalization is very common and appears to play a significant and independent role in the prediction of preterm delivery.

Keywords Antenatal depression · High-risk pregnancy · Screening · EPDS

Introduction

Pregnancy and the postpartum period are vulnerable times for onset or relapse of mental illness, with depression and anxiety being the most common psychiatric disorders during these periods (Biaggi et al. 2016; Pavlov et al. 2014). The risk of major depression peaks during childbearing years, and is twice as high in women than in men (Walfisch 2012; Yedid Sion et al. 2016), with an estimated prevalence ranging from 7 to 20% (Alder et al. 2011; Grigoriadis et al. 2013) while the rate of depression among medically ill hospitalized patients, as measured using a self-questionnaire, might be as high as 32% (Sharma et al. 2002). Specifically, regarding pregnant women hospitalized in a high-risk pregnancy unit, studies have found a wide range of risk for depression, varying from 27 to 44% (Brandon et al. 2008; Byatt et al. 2014). Over 40% of women who were positively screened for depression were found to have a major depressive disorder (Brandon et al. 2008).

The extent to which depressive symptoms effect pregnancy complications is debatable, although accumulating data over the past few decades suggest a profound negative impact (Yedid Sion et al. 2016). Numerous studies have found a correlation between diagnosed antenatal depression and a rise in a variety of complications throughout pregnancy. Antenatal depression was linked to higher miscarriage rate, preterm deliveries, preeclampsia, low birthweights excessive use of analgesics

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during labor, prolonged labor, and higher rates of cesarean deliveries (Walfisch 2012; Grigoriadis et al. 2013; Andersson et al. 2004; Rahman et al. 2007; Dayan et al. 2006; Grote et al. 2010). A number of mechanisms were suggested for this observed link between antenatal depression and adverse perinatal outcomes; dysregulation of the hypothalamic-pituitary-adrenocortical axis stimulates release of stress hormones such as norepinephrine (causing the uterine arteries to constrict and resulting in hypo-perfusion of the uterus, potentially leading to preterm delivery), compromised immune system function (potentially leading to a reproductive tract infection, triggering preterm delivery), maternal illicit substance use as a form of "self-medication", and lack of maternal motivation to adhere to recommended prenatal care (Grote et al. 2010). The many perinatal complications related to maternal depression may lead to an increase in perinatal morbidity and mortality, disabilities, and developmental delays in the offspring (Grote et al. 2010).

The Edinburgh Postnatal Depression Scale (EPDS) is a self-report questionnaire, containing 10 questions in which women are asked to rate their feelings during the past week. It has been developed by Cox et al. (1987) and has since been validated as a screening tool for antenatal depression (Alder et al. 2011). According to the Israeli Ministry of Health circular from January 2014, a score of 10 and above on the EPDS indicates a high risk for depression in a pregnant woman, and requires further assessment and treatment by a mental health specialist (Israeli Ministry of Health 2014). This cutoff score has been recommended by the developers of the scale (Cox et al. 1987) and has previously been used in several other studies, as indicating a risk for both antenatal and postpartum depression (Byatt et al. 2014; Bergink et al. 2011; Glasser et al. 2011; Lau et al. 2010; Miller et al. 2009). According to the circular, the questionnaire should be given to every pregnant woman who is at least 26 weeks' gestation, and once again 4–9 weeks after birth, at a clinic (Israeli Ministry of Health 2014). Although awareness, early detection, and appropriate treatment, appear to be of crucial importance (Walfisch 2012), under diagnosis of maternal depression worldwide is common and is the result of under awareness among other reasons such as atypical depressive manifestation including non-specific somatic complaints (Biaggi et al. 2016; Walfisch 2012; Andersson et al. 2004).

With little existing published data, specifically focusing on antenatal depression among hospitalized pregnant women, and in light of its potential adverse effect on perinatal outcomes, we aimed to assess antenatal depression prevalence in hospitalized women and to further examine its possible link to adverse maternal and neonatal perinatal outcomes.

Study design

In this prospective observational study, we included pregnant women at ≥ 24 0/7-week gestation of all ages and ethnicities, hospitalized at our high-risk pregnancy department at the Soroka University Medical Center (SUMC) for any reason. All women were asked to sign an informed consent form. Illiterate women and patients who did not provide an oral and written consent to participate in the study were excluded. The study was approved by the local institutional ethical review board (SUMC IRB).

All participating women were screened for depression, using the Edinburgh Postnatal Depression Scale—a validated screening tool for maternal depression during pregnancy and the post-partum period. Each woman participated at a single time-point during her antepartum hospitalization stay. Women who screened positive for depression were compared to those who screened negative, in terms of pregnancy course and perinatal outcome. Data was prospectively collected during the period of November 2016–July 2017 from three sources—maternal questionnaires filled upon recruitment containing information regarding maternal background health, obstetrical history and pregnancy course, the computerized perinatal medical files containing all data surrounding the index delivery following the hospitalization, and finally, the neonatal computerized database containing all data surrounding the newborn (including birthweight, Apgar score, and neonatal intensive care unit [NICU] admissions).

During the time frame stated above (November 2016–July 2017), 2–4 times per week, the research team handed out self-report questionnaires to any women in the high-risk pregnancy unit who was 24-week pregnant or more, met the inclusion criteria, and signed the informed consent. All hospitalized women were approached regardless of hospitalization length or indication. Each women answered questions regarding her socioeconomic state, medical background, obstetrical history, current pregnancy course, and finally the EPDS questionnaire. After completing the questionnaires, these were collected and computer-coded for analysis. In addition, the research team later collected information on all participants, regarding the delivery and the newborn, from the computerized databases of the hospital, both perinatal and neonatal, as stated above.

For the analysis, the study population was divided into two main groups according to the EPDS scores: the first group (study group) was defined as high risk for antenatal depression with EPDS scores of 10 and above, and the second group (comparison group) represented women at low antenatal depression risk (EPDS score < 10).

Statistical analysis was performed using the statistical software SPSS version 23.0. Comparison of continuous variables was done by the Student test. A chi-square test was used to examine differences in the distribution of the categorical variables. Multivariate logistic models were constructed to examine the relationship between the independent variables and the dependent variables, while adjusting for confounding variables (maternal age, ethnicity, gestational diabetes mellitus,

preeclampsia, past preterm delivery, and gestational age upon admission), based on the univariable analysis.

Sample size calculation was based on the following assumptions: antenatal depression prevalence of 30%, cesarean delivery rate of 17–20% in the general population cared for at SUMC and 40% among hospitalized depressed women, a power of 80%, and a bilateral hypothesis with a statistical significance set at 95% (α error of 5%). Using a WinPepi software (version 11.65), a sample of 174 women in total was calculated to be sufficient in order to detect twice the rate of cesarean delivery in the depressed group (20 vs. 40%).

Results

A total of 279 women participated in the study. The study group composed of 79 women (28.3% of the study population), and the comparison group composed of 200 women (71.7% of the study population).

Table 1 summarizes clinical and epidemiological characteristics in both groups (according to EPDS scores). Mean maternal age was slightly younger in the study group (28.1 ± 5.1 vs. 29.6 ± 5.5, $p = 0.043$). A considerable difference was noted in the ethnicity mix, with a significantly higher percentage of Muslim Bedouin women in the study group (60.6% Bedouin women in the study group vs. 30.7% Bedouin women in the comparison group, $p < 0.001$). In terms of background maternal health, maternal asthma was more common in the study group (40% vs. 8.3%, respectively, $p = 0.048$, $p < 0.001$). In the study group, women were more likely to be multiparous (parity≥ 4) and less likely to be nulliparous, as compared with the comparison group ($p = 0.019$). The rate of previously diagnosed antenatal depression (i.e., antenatal depression diagnosed in previous pregnancies) was higher in the study group (47.4 vs. 10.6%, respectively, $p < 0.001$). Only 2 women stated that they have been taking anti-depressant medication during the current pregnancy. One was in the screen positive group and the other in the screen negative group.

Table 2 summarizes the pregnancy course. Gestational age upon hospital admission was earlier in the study group (32.3 ± 5.1 vs. 34.3 ± 4.9). Additionally, the study group presented with higher rates of preterm cervical effacement (cervical

Table 1 Clinical and epidemiological characteristics

Characteristic			EPDS ≥ 10 n = 79 (28.3%)	EPDS < 10 n = 200 (71.7%)	OR (95%CI)	p value
Maternal age mean ± SD[a]			28.1 ± 5.143	29.56 ± 5.504		0.043
Familial status[b]	Single		2 (2.5%)	10 (5%)		0.514
	Married		76 (96.2%)	183 (91.5%)		
	Divorced		1 (1.3%)	4 (2%)		
	Other		3 (1.5%)	0 (0%)		
Ethnicity[b]	Jewish		28 (39.4%)	131 (69.3%)	3.469 (1.966–6.118)	< 0.001
	Bedouin		43 (60.6%)	58 (30.7%)		
Parity[b]	0		20 (25.3%)	77 (38.5%)		0.019
	1–3		45 (57%)	107 (53.5%)		
	≥4		14 (17.7%)	16 (8.0%)		
BMI (weight/height^2) (mean ± SD)[a]			28 ± 5.0	29 ± 5.2		0.3
Chronic illness[b]	Total					
	Chronic Hypertension		5 (55.6%)	6 (24.0%)	3.956 (0.796–19.674)	0.111
	Pre-gestational diabetes	DMT1	0 (0%)	3 (11.5%)	0.767 (0.629–0.934)	1.0
		DMT2	1 (12.5%)	2 (7.7%)	1.714 (0.135–21.82)	1.0
	Asthma		4 (40%)	2 (8.3%)	7.333 (1.072–50.145)	0.048
	Thyroid disorder		2 (22.2%)	8 (29.6%)	0.679 (0.115–4.005)	1.0
	Autoimmune disorder		1 (12.5%)	5 (18.5%)	0.629 (0.062–6.328)	1.0
	Cardiac illness		1 (11.1%)	5 (19.2%)	0.525 (0.053–5.217)	1.0
Mood disorder[b]			36 (47.4%)	21 (10.6%)	7.586 (4.007–14.361)	< 0.001
Anti-depression treatment during pregnancy (medication)[b]			1 (1.4%)	1 (0.5%)	2.797 (0.173–45.331)	0.461
Smoking[b]			9 (12.9%)	21 (11.4%)	1.145 (0.497–2.638)	0.750
Past preterm delivery (< 37 weeks), n (%)[b]			17 (28.3%)	25 (20.2%)	1.566 (0.768–3.193)	0.261
Previously diagnosed antenatal\postpartum depression, n (%)[b]			10 (17.2%)	4 (3.2%)	6.354 (1.9–21.24)	0.001

[a] T test

[b] Chi-square

length < 25 mm, < 37 weeks gestation, 16.5 vs. 7.0% respectively, $p = 0.023$) and oligohydramnios (7.6 vs. 2.0% respectively, $p = 0.033$). However, rates of premature rupture of membranes were lower in the study group (0.0 vs. 6.5%, respectively, $p = 0.023$). Table 3 summarizes maternal and newborn outcomes in both groups. A significant difference was noted in gestational age upon delivery between the groups (36.69 ± 3.7 vs. 37.71 ± 2.7 weeks, respectively, $p = 0.032$), and preterm delivery rates were significantly higher in the study group both for deliveries occurring at less than < 37 0/7-week gestation (39.2% vs. 19.0% in the comparison group, $p < 0.001$), as well as at < 34 0/7-week gestation (22.8 vs.12.0% in the comparison group, $p = 0.023$). In the study group, a higher rate of low birthweight was noted (< 2500 g, 40.5 vs. 25.5% in the comparison group, $p = 0.014$), as well as higher rates of low Apgar score (< 7) both at 1 min (19.0 vs. 7.6% in the comparison group, $p = 0.009$), and at 5 min (6.3 vs. 0.5% in the comparison group, $p = 0.008$). A higher rate of NICU admission was also noted in the study group (23.4 vs. 10.6% in the comparison group, $p = 0.006$).

When stratified according to gestational age upon delivery, the differences in rates of low birthweight [adjusted OR of 0.37 (95%CI 0.65–3.06)], NICU admission rates, [adjusted OR of 3.4 (95%CI 0.75–15.4)], meconium-stained amniotic fluid [adjusted OR of 0.18 (95%CI 0.08–1.62)], low Apgar at 1 min [adjusted OR of 2.13 (95%CI 0.91–4.99)], and at 5 min [adjusted OR of 7.59 (95%CI 0.66–86.78)] were all non-significant.

Several multivariate regression models were constructed, to assess the independent association between maternal depression and perinatal outcomes including preterm delivery, cesarean delivery, and NICU admission of the newborn. The models controlled for maternal age, ethnicity, gestational diabetes mellitus, preeclampsia, past preterm delivery, and gestational age upon admission. We found maternal depression to be independently and significantly associated with preterm delivery (< 37 0/7-week gestation) with an adjusted OR of

Table 2 Current pregnancy course

Characteristic		EPDS ≥ 10 *n* = 79 (28.3%)	EPDS < 10 *n* = 200 (71.7%)	OR (95%CI)	*p* value
Gestational age at admission (weeks, average, SD)[a]		32.29 ± 5.08	34.32 ± 4.88		0.003
Gestational age during questionnaire (weeks, average, SD)[a]		32.71 ± 4.81	34.54 ± 4.83		0.005
Reason for hospitalization[b]	Preterm uterine contractions	11 (13.9%)	19 (9.5%)	1.533 (0.693–3.388)	0.29
	Preterm cervical effacement	13 (16.5%)	14 (7.0%)	2.617 (1.169–5.856)	0.023
	Induction of labor	3 (3.8%)	15 (7.5%)	0.487 (0.137–1.730)	0.416
	Vaginal bleeding	2 (2.5%)	11 (5.5%)	0.446 (0.097–2.061)	0.363
	Placenta previa related bleeding	3 (3.8%)	6 (3.0%)	1.276 (0.311–5.233)	0.716
	Oligohydramnios	6 (7.6%)	4 (2.0%)	4.027 (1.105–14.680)	0.033
	Fetal growth restriction	10 (12.7%)	17 (7.9%)	1.697 (0.741–3.882)	0.253
	Urinary tract infection	5 (6.3%)	5 (2.5%)	2.622 (0.738–9.318)	0.153
	Hypertension/preeclampsia	1 (1.3%)	5 (2.5%)	0.50 (0.057–4.349)	1.0
	Premature rupture of membranes	0 (0.0%)	13 (6.5%)	0.703 (0.650–0.760)	0.023
	Preterm premature rupture of membranes	5 (6.3%)	4 (2.0%)	3.311 (0.865–12.666)	0.124
	Abdominal pain	2 (2.5%)	7 (3.5%)	0.716 (0.146–3.524)	1.0
	Other	20 (25.3%)	64 (32.0%)	0.720 (0.400–1.297)	0.312
In vitro fertilization[b]		7 (10.0%)	18 (9.3%)	1.09 (0.43–2.72)	0.82
Nuchal-translucently > 3 mm[b]		2 (4.3%)	2 (1.4%)	0.308 (0.042–2.251)	0.221
Abnormal first trimester screening[b]		1 (3%)	5 (4.3%)	1.441 (0.162–12.787)	1.0
Abnormal triple test[b]		3 (7.3%)	10 (7.3%)	0.997 (0.261–3.81)	1.0
Abnormal early sonographic scan[b]		0 (0%)	1 (0.7%)	1.377 (1.267–1.497)	1.0
Abnormal late sonographic scan[b]		2 (3.4%)	5 (2.9%)	0.843 (0.159–4.469)	1.0
Amniocentesis done[b]		8 (10.3%)	19 (10.1%)	1.023 (0.428–2.445)	0.96
Gestational diabetes[b]		7 (9.0%)	19 (9.7%)	0.913 (0.368–2.267)	0.845
Insulin use[b]		3 (42.9%)	3 (16.7%)	3.75 (0.537–26.188)	0.298
Preeclampsia[b]		4 (5.9%)	7 (3.9%)	1.554 (0.44–5.485)	0.498
Suspected fetal growth restriction[b]		8 (10.8%)	17 (9.3%)	1.184 (0.487–2.875)	0.816
Bleeding during pregnancy[b]		13 (16.7%)	36 (18.7%)	0.872 (0.434–1.751)	0.701

[a] *T* test

[b] Chi-square

Table 3 Maternal and newborn perinatal outcomes

Characteristic		EPDS ≥ 10 *n* = 79 (28.3%)	EPDS < 10 *n* = 200 (71.7%)	OR (95%CI)	*p* value
Gestational age at birth[a]		36.69 ± 3.7	37.71 ± 2.7		0.032
Preterm delivery (< 37 weeks), *n* (%)[b]		31 (39.2%)	38 (19.0%)	2.753 (1.552–4.885)	< 0.001
Early preterm delivery (< 34 weeks), *n* (%) [b]		18 (22.8%)	24 (12.0%)	2.164 (1.1–4.258)	0.023
Mode of delivery[b]	Spontaneous vaginal *n* (%)	47 (59.5%)	134 (67.0%)		0.496
	Vacuum *n* (%)	1 (1.3%)	2 (1.0%)		
	Cesarean *n* (%)	31 (39.2%)	64 (32.0%)		
Postpartum hemorrhage *n* (%)[b]		3 (3.8%)	2 (1.0%)	3.888 (0.637–23.727)	0.141
Need for blood transfusion[b]		2 (2.5%)	5 (2.5%)	1.013 (0.192–5.332)	1.0
Stillbirth *n* (%)[b]		1 (1.3%)	0 (0%)	0.281 (0.232–0.339)	0.283
Birthweight mean ± SD[a]		2701 ± 888.93	2869 ± 703.25		0.14
Macrosomia (> 4000 g) *n* (%)[b]		3 (3.8%)	8 (4.0%)	0.947 (0.245–3.666)	1.0
Low birthweight (< 2500 g) n(%) [b]		32 (40.5%)	51 (25.5%)	1.989 (1.147–3.449)	0.014
Very low birthweight (< 1500 g) *n* (%)[b]		9 (11.4%)	14 (7.0%)	1.708 (0.708–4.124)	0.229
Apgar score 1 min < 7 *n* (%)[b]		15 (19.0%)	15 (7.6%)	2.859 (1.324–6.177)	0.009
Apgar score 5 min < 7 *n* (%)[b]		5 (6.3%)	1 (0.5%)	13.311 (1.530–115.836)	0.008
Umbilical pH mean ± SD[a]		7.29 ± 0.073	7.29 ± 0.075		0.69
Meconium-stained amniotic fluid *n* (%)[b]		2 (4.2%)	17 (11.5%)	0.335 (0.075–1.506)	0.17
Immediate resuscitation *n* (%)[b]		12 (15.4%)	10 (5.0%)	3.436 (1.419–8.324)	0.007
NICU admission *n* (%)[b]		18 (23.4%)	21 (10.6%)	2.586 (1.291–5.182)	0.006
Hypoglycemia during hospitalization *n* (%)[b]		4 (5.3%)	6 (3.0%)	1.796 (0.493–6.550)	0.470
Tachypnea during hospitalization *n* (%)[b]		10 (13.2%)	18 (9.0%)	1.532 (0.675–3.488)	0.372
Seizures during hospitalization *n* (%)[b]		0 (0.0%)	1 (0.5%)	0.724 (0.673–0.778)	1.0
Neonatal mortality *n* (%)[b]		1 (1.3%)	0 (0.0%)	0.275 (0.227–0.333)	0.278

[a] *T* test

[b] Chi-square

3.32 (95%CI 1.16–9.52, $p = 0.026$). However, newborn NICU admission was not independently associated with antenatal depression (adjusted OR of 2.9, 95%CI 0.9–4.5, $p = 0.094$), nor was the risk for cesarean delivery (adjusted OR of 1.1, 95%CI 0.6–2.2, $p = 0.726$).

Discussion

This study was aimed to assess the prevalence of antenatal depression among hospitalized women, and to investigate its possible independent impact on perinatal outcomes. The main finding of this study was that antenatal depression is very common among hospitalized pregnant women, is associated with several maternal characteristics and adverse perinatal outcomes, and is independently associated with preterm delivery.

The study included 279 women hospitalizes at the High-Risk Pregnancy unit in SUMC, of which 28.3% scored ≥ 10 on the EPDS questionnaire and were defined as being at an increased risk for depression. This shocking rate, a third of all hospitalized pregnant women, is consistent with previously published data (Dagklis et al. 2016).

Scarce data exists on depression among hospitalized high-risk pregnant women. However, other studies have shown similar findings; Dagklis et al.)Greece(, Byatt et al.)USA(, and Adouard et al.)France(noted the prevalence of antenatal depression among high-risk hospitalized women to be 28, 27, and 25%, respectively (Byatt et al. 2014; Dagklis et al. 2016; Adouard et al. 2005). Given that untreated antenatal depression may develop into postpartum depression with the associated negative impact on maternal-infant attachment, the American College of Obstetricians and Gynecologists recommended every woman be screened at least once during pregnancy (Dagklis et al. 2016). Despite such high rates of depression among hospitalized women (with readily available psychiatric professionals) referral rates in inpatient obstetrical setting was reported to be as low as 0.3% (Byatt et al. 2014; Dagklis et al. 2016). These stark differences between rates of antenatal depression and rates of psychiatric referral emphasize the lack of physician awareness to this potentially debilitating ailment.

The main finding of our study, the strong association of maternal depression and preterm delivery, was previously described by others (Walfisch 2012; Grigoriadis et al. 2013; Andersson et al. 2004; Dayan et al. 2006; Navaratne et al.

2016). Importantly, other factors known to be associated with induced or spontaneous preterm delivery as well as possibly with maternal depression were controlled for in our multivariate regression model, proving the independent association of maternal depression with preterm delivery. However, the mechanism by which maternal depression contributes to preterm delivery is not fully understood. Previous studies suggest that increased levels of stress hormones (such as norepinephrine) cause the uterine artery to constrict, thus leading to uteroplacental hypo-perfusion—leading to preterm delivery. Some authors found an increase in corti
cotrophin-releasing hormone, known to play a role in cervical ripening (Navaratne et al. 2016). Another possible explanation involves the fact that depression causes a decrease in natural-killer (NK) cells, making the body susceptible to inflammation, which in turn activates the immune system and potentially damages the placenta (Yedid Sion et al. 2016).

We found maternal depression to be associated with high rates of cesarean delivery (nearly 40%) although not significantly higher than the comparison group (32%). Although some authors suggested antenatal depression to be associated with higher rates of cesarean (Andersson et al. 2004; Navaratne et al. 2016; Chung et al. 2001) we have not. Possibly, the high rates of cesarean deliveries among hospitalized women masked the antenatal depression effect on cesarean delivery rates. Perhaps a larger sample would have clarified this relationship.

The two study groups differed in gestational age upon admission, with the study group being ~2 weeks earlier in gestation, as well as in mean maternal age, with the study group being 1.4 years younger. Differences were also noted in parity and ethnicity. Higher parity was noted in the study group. This is not surprising as hospitalized parous women may feel worried or guilty about being away, and higher parity is associated with Bedouin ethnicity, a risk factor in itself.

Ethnicity appears to play a significant role in the risk for antenatal depression, with Muslim Bedouin women being over 1.5 times more likely to suffer from antenatal depression, in comparison to Jewish women. This striking finding, of 42.6% of the hospitalized Bedouin parturients suffering from depression, is in agreement with findings reported by others (Bergink et al. 2011). Studies have shown that Bedouin women suffer high rates of domestic violence (as high as 48%) related to high parity and other factors (Cwikel et al. 2003). These findings may be due to lack of familial support, lower socioeconomic status, significantly high parity, and in general, the neglect these women suffer from (Israeli Ministry of Health 2014; Abu-Ghanem et al. 2012; Brittain et al. 2015; Sheiner et al. 1998). Nevertheless, our findings cannot be overlooked and warrant significant interventions. Welfare authorities should consider active screening for domestic violence in high-risk populations, as well as for depression, and initiate an appropriate intervention policy. Notably, many of these women have no access to public transportation or facilities and may be reluctant to report their genuine status.

Several limitations of our study should be noted. Our findings are based on a self-report questionnaire, and as such may be influenced by factors such as miss-interpretation, family members or other people who were with the women and may have affected the answers, and lack of privacy or a peaceful state of mind. However, the study team made an effort to approach the patients in the best setting possible and usually with nobody else present. Nevertheless, tiredness and the time of day may have impacted maternal mood and answers. Importantly, we used a reliable and validated tool for the evaluation of maternal antenatal depression and reached significant results, consistent with previously published data; results which, in our opinion, deserve immediate attention and potentially lifesaving intervention.

We chose that the study be powered for cesarean deliveries, as this is a common perinatal outcome, which has previously been linked to antenatal depression in numerous studies. The sample size, although well powered for cesarean delivery differences, may have been too small to detect other subtle differences or rare occurrences within and between the groups. Less common adverse outcomes such as stillbirths, neonatal death, and very low birthweight, all showed a trend towards higher rates in the depressed group but did not reach statistical significance, possibly due to a small sample size.

In conclusion, antenatal depression is widespread among hospitalized women, is effected by ethnicity, and is significantly and independently associated with later preterm delivery regardless of other clinical features. As previously stressed by others, it appears to be crucial to screen every woman for antenatal and postnatal depression, offer professional help, and create an appropriate support system. Depression among Bedouin women has not been sufficiently researched, and in light of our findings, must further be examined.

Compliance with ethical standards

The study was approved by the local institutional ethical review board (SUMC IRB).

Conflict of interest The authors report no conflict of interest. This study was conducted as part of the requirements for graduation from the Medical School of the Faculty of Health Sciences, Ben-Gurion University of the Negev, Israel.

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