

# Predictors of postpartum depression in a sample of Egyptian women

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**Introduction:** Postpartum depression (PPD) represents a considerable health problem affecting women and their families. The aims of this study were to: (a) compare female patients with PPD to normal controls with regard to some biopsychosocial variables, (b) correlate between the severity of PPD and some clinical and biological variables, and (c) to predict some risk factors for PPD.

**Method:** Sixty female patients with PPD were compared with 60 healthy postpartum females (control group). Patient and controls were subjected to: (1) a complete psychiatric and obstetric examination, (2) psychometric studies using the Edinburgh Postnatal Depression Scale, Fahmy and El-Sherbini's Social Classification Scale for Egyptian socioeconomic classification and Horowitz et al's Impact of Event Scale, (3) quantities of thyroid hormone (T3), cortisol hormone, and estrogen were assessed.

**Results:** There were high statistical differences between PPD females and controls as regard psychosocial stressors, level of (estradiol, thyroxin [T3], and cortisol), marital status, residence, parity, method of delivery, complicated puerperium, positive history of premenstrual tension syndrome and baby variables (eg, unwelcomed, with a negative attitude of parents toward the baby, underweight, female, artificially feeding, unhealthy baby). While there were moderate statistical differences in attitude toward spouse and social support and mild statistical difference in socioeconomic status between them. Severity of depression is positively highly correlated with onset of depression, psychosocial stress, levels of T3 and cortisol. However, severity of depression is negatively high when correlated with socioeconomic status. Stepwise linear regression indicated that PPD was significantly predicted by social support, socioeconomic status, feeding of baby, and prior psychiatric problems.

**Conclusion:** Many factors may lead to development of PPD. These factors include some psychosocial, socioeconomic, obstetric, and hormonal variables. Early detection of these factors could help in prediction of the development of PPD.

**Keywords:** mood, hormone, delivery, socioeconomic

## Introduction

Clinicians since Hippocrates have noted mood disturbances in new mothers, specifically in the postpartum period.<sup>1</sup> Postpartum depression (PPD) is now considered a major health concern for women from diverse cultures.<sup>2</sup> Globally, the prevalence of major PPD ranges from almost 0% in Singapore to nearly 57% in Brazil.<sup>3</sup> However, there are no recent studies that show the overall provincial and national prevalence rates of PPD.<sup>4</sup>

Postpartum depression occurs in women after they have carried a child, usually in the first few postnatal months, and may last up to several months or even a year.<sup>5</sup>

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Specifically, the onset of PPD begins within 4 weeks and lasts up to 6 months after giving birth.<sup>1</sup> PPD elicits negative clinical implications for maternal–infant attachment; the mother is withdrawn and disengaged, and there may also be intrusive and hostile mother–infant communication.<sup>6–8</sup> Research has shown that experiencing symptoms of PPD can have immediate ill effects on children.<sup>9</sup>

Although there is overwhelming evidence that many factors such as marital disharmony, lack of an intimate relationship, previous psychiatric illness, housing problems, and other socioeconomic problems are strongly associated with PPD,<sup>10,11</sup> a subgroup of women may have a hormonal basis for their depression.<sup>10–12</sup> Anecdotal support for this has been provided by the finding that the mood of some women with postpartum thyroid dysfunction mimics that of “depressive psychosis.”<sup>13</sup> The aims of this study were to: (a) compare biopsychosocial variables between female patients with PPD and normal controls; (b) correlate the severity of PPD with clinical and biological variables (specially hormonal variables that may play an important role in the etiology of PPD, eg, estrogen, thyroid, and cortisol); and (c) predict risk factors for development of PPD.

## Subjects and methods

### Study design

This was a cross-sectional study.

### Location and date of the study

This study was conducted in the in- and outpatient psychiatric departments, and the outpatient clinic of the obstetric and gynecological departments at Mansoura University Hospital, Mansoura city, Dakahlia Governorate, Egypt from July 2006 until January 2007.

### Subjects

During a 6-month period from July 2006 until January 2007, all females delivering in the obstetric department of Mansoura University Hospital were examined by a psychiatrist and obstetrician at least four times: first at 1 week after delivery, then 1, 3, and 12 months after delivery. Patients with PPD were followed more than six times per year. After a senior gynecologist (experience > 12 years) took the obstetric and menstrual history, all patients were referred to the psychiatric department for further assessment and diagnosis by two senior psychiatrists. Exclusion criteria were: (1) organic mental disorder, substance use disorder, and or mental retardation; (2) associated neurological disease, eg, delirium, dementia, or markedly altered cognitive

function; (3) severe language or hearing difficulties; and (4) associated major medical problems. Out of 379 referred females, only 68 (17.9%) were found to meet the diagnostic criteria of the *Diagnostic and Statistical Manual of Mental Disorders*, fourth edition, text revision (DSM IV-TR)<sup>14</sup> for major depression with postpartum onset. Only 60 patients of 68 agreed to participate in the study and they constituted the study group. All patients were interviewed by at least two of the authors (psychiatrist with > 15 years clinical experience) using the Structured Interview for DSM-IV Axis Disorders, Clinician Version (SCID-CV, 10) and diagnosis of PPD was made according to the DSM IV-TR.<sup>14</sup> The diagnosis was further confirmed by the Edinburgh Postnatal Depression Scale (EPDS),<sup>15</sup> we used the conventional 13 cut-off score in detecting depression, ie, EPDS  $\geq$  13 indicates depressive disorder.

Sixty patients were randomly selected from healthy postpartum females for the control group. Criteria for the control group were that patients should pass the postpartum period without any psychological disturbances and have no past history of psychiatric disorders. All of them were followed up for 1 year after delivery to exclude occurrence of any depressive symptoms during the postpartum period. Out of 311 healthy female subjects screened in the start of the study, only 85 regularly came for follow-up at 1 year postpartum. Nineteen patients refused to participate in the study and six did not fulfill the inclusion criteria so they were excluded. Their mean age was about  $28.08 \pm 5.94$  years. The absence of psychiatric disorders was verified by the SCID-CV. All psychological and gynecological data were collected 1 month after delivery. The same exclusion criteria used in selecting the patient group was used for the control group.

### Methods

All puerperal patients and the related control groups were subjected to:

1. Complete psychiatric examination using the semistructured interview of Mansoura University Psychiatric Department with stress upon sociodemographic data and clinical characteristics, which include psychological changes during pregnancy, onset of the disorder after labor, past history of psychiatric illness, etc.
2. Complete obstetric history using the obstetric case sheet of Mansoura University hospital with stress upon parity, pregnancy, labor, puerperium, attitude towards baby, and feeding the baby.
3. Complete menstrual history.

4. Psychometric studies:
  - a. The EPDS<sup>15</sup> is a 10-item self-rating questionnaire that, when used after delivery, is highly specific and sensitive in the detection of PPD, as well as it is used as a research tool to measure the severity of the symptoms and not to imply the existence of a well-defined syndrome.<sup>16</sup> Its reliability and validity has been demonstrated. The Arabic version of the EPDS<sup>17</sup> has been validated among Egyptian women and its psychometric performance is comparable to the original scale. Scores of 10 or less are considered normal. Scores of 13 or more suggest significant depression.
  - b. Fahmy and El-Sherbini's Social Classification Scale<sup>18</sup> for assessing Egyptian socioeconomic status. This score encompasses paternal education and work, family size, housing condition, and per-capita monthly income. A score of 25–30 is considered a high social status, a score of 20–<25 is considered middle social status, a score of 15–<20 is considered low social status, and a score of <15 is considered very low social status.
  - c. The Impact of Event Scale was developed by Horowitz et al<sup>19</sup> to assess the presumptive stress score. Its scores can be classified into no life crises (0–149), mild-to-moderate (150–299), and major life crises (>300).
5. Hormonal assay: thyroid hormone (T3), cortisol, and estrogen were assessed for all control group and patients at 1 week after delivery (which is the expected time for all hormones to return to a normal level).

## Ethical consideration

The current study was approved by the Mansoura University Faculty of Medicine Ethical Committee. All patients and controls gave informed consent in accordance with the Helsinki II Declaration after the purpose of the study and the protocol had been explained to them, and before any intervention was performed.

## Statistical analysis

Data entry and analysis were made by SPSS software (version 19; IBM, Armonk, NY). Parametric data were summarized as means and standard deviations, and the association differences were compared using *t*-tests. Nonparametric data were described as number and percentage, and the associated differences were compared using chi-square test. The main findings were presented as proportions with 95% confidence intervals. Correlation was tested by Pearson product-moment

correlation coefficient equation and stepwise linear regression model was applied to predict PPD risk factors.

## Results

The prevalence of PPD was 17.9%. Of 60 patients with PPD, the onset of PPD was as follows: In the first week after labor, 10.6% of patients started to develop PPD; from the second week to 1 month postlabor, 19.4% of patients started to develop PPD; 42% of patients showed PPD in the second month, 26% in the third to sixth month, and 2% of them in more than 6 months. The mean age of women with PPD was  $28.97 \pm 5.08$  years. Nine (15%) PPD women had psychiatric problems prior onset of PPD, eg, postpartum blues, 25 (41.7%) were previously hospitalized due to their disorder, and 41 (68.3%) had a past history of similar conditions whether puerperal, nonpuerperal, and with pregnancy without delivery.

The present study found that there was a mild statistical difference in socioeconomic status between PPD and control groups ( $t = -2.063$ ;  $P < 0.01$ ), while there was a high statistical difference in psychosocial stressors and the level of hormones (estradiol, thyroxin [T3], and cortisol) between groups (Table 1).

High statistical differences were found in marital status, residence, parity, method of delivery, complicated puerperium, positive history of premenstrual tension syndrome (PMTS) between the PPD and control groups (Table 2). There were moderate statistical differences in attitude toward spouse and social support. However, there was no significant difference whether the pregnancy was planned or unwanted between both groups.

Having an unwelcome infant, with a negative parental attitude toward the baby was more prevalent in the PPD group than the control group with a high statistical difference. Having an underweight female infant, artificially feeding, and unhealthy baby was more prevalent in the PPD group than the control group with high statistical difference (Table 3).

Table 4 shows the correlation between the severity of PPD using EPDS and some clinical and biological variables in PPD patients. Severity of depression was positively highly correlated with onset of depression, psychosocial stress, levels of T3 and cortisol. On the other hand, severity of depression was negatively high correlated with socioeconomic status. There was no significant correlation in age and level of estradiol. Stepwise linear regression indicated that PPD was significantly predicted by social support, socioeconomic status, feeding baby, and prior psychiatric problems (Table 5).

**Table 1** Clinical data of both postpartum depression and control groups

	Postpartum depression group No = 60		Control group No = 60		t
	Mean	±SD	Mean	±SD	
Age	28.97	5.08	28.08	5.94	1.38
Age of menarche	12.15	1.44	12.80	1.77	-1.96
Socioeconomic status <sup>a</sup>	17.93	4.56	24.98	26.57	-2.06*
Presence of postpartum depression <sup>b</sup>	11.57	4.99	5.97	2.78	8.16***
Psychosocial stressors <sup>c</sup>	207.67	62.05	45.07	19.32	13.38***
Level of estradiol	20.63	60.00	58.21	77.41	-6.07***
Level of thyroxin (T3)	1.07	0.43	1.39	0.36	-7.57***
Level of cortisol	8.32	4.27	11.92	4.91	-11.16***

**Notes:** <sup>a</sup>Using Fahmy and El-Sherbini's Social Classification Scale; <sup>b</sup>using Edinburgh Postnatal Depression Scale; <sup>c</sup>using Horowitz's Impact of Event Scale; \* $P < 0.05$ ; \*\*\* $P < 0.001$ .

**Abbreviation:** SD, standard deviation.

**Table 2** Sociodemographic and clinical data of both postpartum depression and control groups

	Postpartum depression group		Control group		$\chi^2$
	n	%	n	%	
Marital status					
Married monogamy	44	73.3%	47	78.3%	84.84***
Married polygamy	7	11.7%	6	10%	
Separated	6	10%	4	6.7%	
Widowed	3	5%	3	5%	
Residence					
Urban	22	36.7%	25	41.7%	48.632***
Rural	38	63.3%	35	58.3%	
Parity					
Primipara	16	26.7%	6	10%	80.93***
Multipara	44	63.3%	54	90%	
2nd-3rd	26	43.3%	23	38.3%	
4th-6th	15	25%	29	48.3%	
>6th	3	5%	2	3.3%	
Attitude towards pregnancy					
Wanted	42	70%	57	95%	1.35
Unwanted	18	30%	3	5%	
Planning of pregnancy					
Planned	42	70%	55	91.7%	0.26
Unplanned	18	30%	5	8.3%	
Method of delivery					
Unassisted	27	45%	48	80%	41.25***
Forceps-assisted	17	28.3%	6	10%	
Caesarean	16	26.7%	6	10%	
Puerperium					
Normal	26	43.3%	48	80%	11.47***
Complicated	34	56.7%	12	20%	
Attitude toward spouse					
Positive	23	38.3%	50	10	7.45**
Negative	37	61.7%	83.3%	16.7%	
Social support					
Adequate	19	31.7%	46	76.7%	8.46**
Inadequate	41	68.3%	14	23.3%	
History of PMTS					
Yes	39	65%	15	25%	10.76***
No	21	35%	45	75%	

**Notes:** \*\* $P < 0.01$ ; \*\*\* $P < 0.001$ .

**Abbreviation:** PMTS, premenstrual tension syndrome.

**Table 3** Factors in newborn infant in both postpartum depression and control groups

	Postpartum depression group		Control group		$\chi^2$
	n	%	n	%	
Emotional reaction toward baby					
Welcomed	25	41.7%	37	61.7%	26.64*
Unwelcomed	35	58.3%	23	38.3%	
Attitude toward baby					
Positive	25	41.7%	48	80%	10.71*
Negative	35	58.3%	12	20%	
Birth weight					
Average	39	65%	49	81.7%	25.01*
Underweight	21	35%	11	18.3%	
Sex of baby					
Male	23	38.3%	35	58.3%	26.64*
Female	37	61.7%	25	41.7%	
Feeding baby					
Breast	23	38.3%	32	53.3%	32.63*
Artificial	37	61.7%	28	46.7%	
Baby health					
Normal	42	70%	45	75%	194.00*
Premature	4	6.7%	1	1.7%	
Stillbirth	2	3.3%	4	6.7%	
Congenitally abnormal	1	1.7%	2	3.3%	
Intrauterine fetal death	1	1.7%	2	3.3%	
Precious baby	6	10%	2	3.3%	
Complication, eg, jaundice, sticky eye, cord around the neck	4	6.7%	4	6.7%	

Note: \* $P < 0.001$ .

## Discussion

In this study, the prevalence of PPD was 17.9%, which is similar to previous results in developed countries<sup>20</sup> and developing countries including Sudan<sup>21</sup> and Upper Egypt.<sup>22</sup> There was significant statistical difference in EPDS score between PPD patients and the control group ( $t = 8.16$ ;  $P < 0.001$ ). These results were similar to the results found by Hannah et al<sup>16</sup> and Warner et al.<sup>23</sup>

Most PPD symptoms in this study began within the second and third months and persisted for  $>6$  months. This finding is contrary to other western studies such as Hannah

et al<sup>16</sup> who found that depression in 42% of a PPD sample began in the first week postpartum. This difference may be possibly because a substantial segment of the rural populations of Egypt believe that the puerperium is a period of “uncleanliness,” which imposes taboos on women such as cooking, washing, and cohabiting with her husband. Rest and relative seclusion are also imposed.<sup>24</sup> Even in Egyptian urban areas, rituals allow for 40-day rest periods for the mother after the birth of a baby. During that period, the focus is on allowing the mother time to rest, eat, and sleep. Female relatives come to help with housekeeping and care for the new baby. Thus, social support, education, childcare services, and social recognition of the new motherhood status are ensured. This social fabric may delay the onset of major depression and ameliorate mood disturbances to a subthreshold level. After the first postnatal month, as families and relatives gradually decrease their intense emotional and practical support, depression may ultimately set in. As in Egypt, Chinese women have a relatively lower rate of depression in early puerperium. The first month of puerperium in Chinese society is demarcated by rituals. According to traditional beliefs, a recently delivered woman is in a Yin state (with depletion of vitality) and she is encouraged to recover her health by resting in bed and taking tonics. In the first postnatal month, she is

**Table 4** Correlation between severity of postpartum depression using EPNDQS and clinicobiological variables of postpartum depression patients

Clinical variables	Mean	Standard deviation	r
Age	28.97	5.09	0.18
Onset of depression	3.18	1.63	0.83*
Age of menarche	12.15	1.44	0.071
Socioeconomic status	17.93	4.56	-0.75*
Psychosocial stress	207.67	62.05	0.59*
Level of estradiol	20.63	60.00	0.25
Level of thyroxin (T3)	1.07	0.43	0.64*
Level of cortisol	8.32	4.27	0.66*

Note: \*Pearson's correlation coefficient (r), two-tailed  $P < 0.001$ .

**Table 5** Risk factors of postpartum depression using long linear regression analysis

Model	Unstandardized coefficients		Standardized coefficients	t
	B	Standard error	Beta	
1. (Constant)	-3.70	1.27		-2.91**
Social support	9.07	0.73	0.85	12.47***
2. (Constant)	7.16	2.74		2.61**
Social support	6.65	0.85	0.63	7.85***
Socioeconomic status	-0.38	0.09	-0.35	-4.34***
3. (Constant)	5.90	2.59		2.27*
Social support	3.72	1.24	0.35	2.99**
Socioeconomic status	-0.35	0.08	-0.32	-4.21***
Feeding baby	3.48	1.14	0.34	3.06**
4. (Constant)	0.50	3.52		0.15
Social support	3.10	1.24	0.29	2.47*
Socioeconomic status	-0.25	0.09	-0.23	-2.69**
Feeding baby	3.65	1.10	0.36	3.31*
Prior psychiatric problem	2.40	1.10	0.17	2.19*

Notes: \* $P < 0.05$ ; \*\* $P < 0.01$ ; \*\*\* $P < 0.001$ .

spared from all household chores and is attended by a female relative, usually the mother or mother-in-law.<sup>25</sup> In contrast, Western women usually go home a day after delivery and often without an extended family or neighbors to help with infant care. In that isolated environment, the woman does not receive the supportive therapeutic factors that would help mitigate the development or the exacerbation of a spectrum of nonpsychotic depressions.

## Demographic data

The current study observed that the postpartum psychiatric disorders were  $28.97 \pm 5.08$  years, this finding was consistent with Cutrona<sup>26</sup> who found that the mean age for puerperal depressives was 27 years. This may be attributed to younger age of marriage in Egyptian society especially in rural areas. Wolff et al<sup>27</sup> considered young age as a risk factor for puerperal depression, however, O'Hara and Swain<sup>28</sup> and Beck<sup>29</sup> didn't show the same results.

In this study, rural residences were more prevalent in the PPD group than in the control group with a highly statistically significant difference ( $\chi^2 = 48.632$ ;  $P < 0.001$ ). However, Peter et al<sup>30</sup> found no association between the demographic factors and the psychiatric morbidity during puerperium. This may be explained by the fact that most of the Egyptian population comes from rural areas where females married at an earlier age, while being immature, less educated, and less employed, with a greater demand for housekeeping, which may lead to more social and family troubles since the wife is still living with her mother-in-law. This may be considered as a stressful factor for development of PPD in vulnerable individuals. Moreover, in this study, lower socioeconomic

status was more prevalent among the PPD group than in the control group ( $t = -2.06$ ;  $P < 0.05$ ). Socioeconomic status was significantly correlated with PPD ( $r = -0.758$ ;  $P < 0.001$ ) and can be considered as predictor of PPD ( $B = -0.225$ ;  $t = -2.694$ ;  $P < 0.01$ ). This was consistent with Hafiz<sup>31</sup> and Chandra<sup>32</sup> who highlighted the importance of social factors, especially poverty, as a risk factor for antenatal depression and PPD.

Several investigators have drawn attention to links between the occurrence and severity of PPD and the amount and quality of support that is provided by husbands and by relatives.<sup>33</sup> Kumar and Robson<sup>34</sup> emphasized the importance of the relationship with the husband and its role in postpartum disorders, especially depression. Our study revealed that marital disruption, whether emotionally (ie, a negative attitude toward spouse) or sexually (ie, married polygamy, separated, and widowed), were more prevalent in puerperal patients than control ( $\chi^2 = 84.835$  and  $7.459$ , respectively;  $P < 0.001$ ). This point also was supported by Okasha et al.<sup>35</sup> To reinforce the idea that feelings of being unloved by the husband, being separated, or any other marital problems, were found to be associated with PPD in vulnerable females, a western study enumerates polygamy, marital problems, and divorce as risk factors for postpartum psychiatric disorders.<sup>36</sup>

Oyewumi et al<sup>37</sup> defined social support as the availability of assistance in daily living from one or any combination of family, relatives, friends or community agencies. Our results revealed that social support provided by the spouse and/or relatives to women experiencing PPD was deficient and inadequate with statistical significant difference between patients and controls ( $\chi^2 = 8.462$ ;  $P < 0.01$ ) and can be considered



as predictor of PPD ( $B = 0.288$ ;  $t = 2.466$ ;  $P < 0.05$ ). That finding was in agreement with several studies. Two studies stated that lack of social support becomes more important as people migrate to big cities with disappearance of the extended family and the rituals that give help and social support to postpartum women after delivery.<sup>38,39</sup>

PPD was found to be associated with an increased number of stressful life events during the preceding 12 months.<sup>40</sup> In our study, psychosocial stressors were found to be significantly higher in the PPD group than control group ( $t = 13.38$ ;  $P < 0.001$ ) and positively highly correlated with the severity of PPD ( $r = 0.588$ ;  $P < 0.001$ ). Stressful life events might be associated with depressive episodes in two ways. First, life stresses might have a causal relationship to a depressive episode and once a depression-related life event occurs, it might then cause negative feelings in the patient with increased feelings of hopelessness with deepening of the depressive episode.<sup>41</sup> Finally, it was predicted that depressed subjects would experience more stressful life events since the beginning of pregnancy and since delivery compared to nondepressed subjects.<sup>16</sup>

In this study, 15% of PPD women had psychiatric problems prior to onset of PPD, eg, anxiety, postpartum blues, etc. Psychiatric problems prior to onset of PPD were considered as a predictor for PPD ( $B = 0.173$ ;  $t = 2.190$ ;  $P < 0.05$ ). This is consistent with O'Hara et al<sup>33</sup> who described the depressive symptoms during pregnancy as the best predictor of PPD. Dean and Kendell<sup>42</sup> found most of the PPD patients whose symptoms began during pregnancy had an exacerbation of symptoms in the 2 weeks following delivery.

In our study, more than two thirds of PPD patients had a past history of similar conditions. This is concordant with many previous studies.<sup>43-45</sup> However, other studies<sup>16,37</sup> found no association between past psychiatric history and PPD.

## Obstetric variables

Some earlier studies didn't find any association between parity and PPD.<sup>15,34</sup> Our parity results contradict previously mentioned studies, ie, primipara represented only one fourth of PPD females. Moreover, in a Saudi Arabian study, Shoeb and Hassan<sup>46</sup> found that multigravida admissions to psychiatric hospitals occurred more readily than primigravida admissions. Our finding and that of Shoeb and Hassan<sup>46</sup> could be explained by the characteristic social norms of the locality especially in rural Egyptian areas (63.3% of our PPD females came from rural areas). As a newly married woman is likely to spend the first few years of her marriage with the extended family (her parents or her husband's parents),

where there is considerable support, she is also likely to be treated in a private hospital. The couples are likely to live apart from the extended family after a few years of marriage when they have children and are becoming more independent economically. Hence, we suspect that multigravida patients have less support during pregnancy and after delivery than primigravida patients, and this may account for the increased number of multigravida patients in our sample.

Unwanted and/or unplanned pregnancy may result in an ambivalent feeling towards the child even before birth or a lack of commitment to the infant, both of which have been associated with depression. Difficulties in adjusting to parenthood and feelings of entrapment are prominent in PPD and are likely to be greater if the baby is unplanned.<sup>34</sup> These findings were consistent with this study where 30% of PPD females reported unwanted and/or unplanned pregnancy compared with the control group (5% and 8.3%, respectively), in spite of an absence of statistical difference in unwanted and unplanned pregnancy between groups. Kubicka et al<sup>47</sup> and Wolff et al<sup>27</sup> found that mothers with unwanted pregnancies were more frequently emotionally disturbed than the female control group who accepted their pregnancy. Some researchers stated that there are established antenatal risk factors for PPD such as obstetric and pregnancy complications and depression or anxiety during pregnancy while our study didn't show pregnancy complication, length of gestation, or interval between pregnancies to play a significant role in puerperal illness.<sup>48,49</sup>

The current study revealed a significant difference in difficult labor and/or complicated puerperium between PPD patients and the control group. These findings were in agreement with many studies as operative interventions leave a mother susceptible to grief, post-traumatic distress, diminution in self-esteem and depression.<sup>16,50-52</sup> In contrast, some researchers didn't find a significant correlation between PPD and difficult labor.<sup>53</sup>

## Infant variables

In this study, infants were unwelcome for PPD patients, who had a negative reaction towards them, which ranged from a nonaffectionate attitude to attempted infanticide. Many authors support this finding, eg, Curran et al<sup>54</sup> reported that not every baby is wholeheartedly wanted and there is quite often underlying hostility and jealousy toward him or her. Gelder et al<sup>55</sup> explained that severely depressed patients may have delusional ideas that the child is malformed or otherwise imperfect. These false ideas may lead to attempts to kill the child to spare it from future suffering.

Studies conducted within Western societies have found no association between the sex of the child and PPD. However, recent studies from India suggested that spousal disappointment with the sex of the baby, specifically if the baby is a girl, is significantly associated with developing PPD.<sup>56,57</sup> In the current study, PPD patients gave birth to more female babies with high significant difference between them and controls ( $\chi^2 = 26.641$ ;  $P < 0.001$ ). In Egyptian culture, the social belief is that males are superior and have more advantages than females. In some cultures, especially in rural areas, delivery of a female baby may bring criticism of the mother from the father and his family and the relationship may end in divorce. Therefore, the parent's reaction to the sex of the baby may be a potential risk factor for PPD within certain cultural groups.

In this study, infants of PPD patients were more liable to be underweight than infants of the control group. This is inconsistent with Hannah et al's<sup>16</sup> findings; underweight babies may be prone to impaired health, which in turn leads to more stress on their mothers. In the current study, 18 of our puerperal patients had problems with their baby (premature baby, 6.7%; stillbirth, 3.3%; congenitally abnormal, 1.7%; intrauterine fetal death, 1.7%; baby complication, eg, cord around the neck, 6.7%) with highly significant differences between groups. Our results coincide with Paradiso et al<sup>58</sup> who reported that women were scared by giving birth to a deformed child.

In the current study, PPD patients fed their babies artificially more than control patients. Moreover, bottlefeeding was found to be a predictor of PPD. This finding could be explained by the failure of the depressed mother to breastfeed their babies. Similarly, several studies found that bottle feeding was a significant risk factor for PPD.<sup>16,59-61</sup> While breast feeding may enhance self-esteem and so make depression less likely<sup>16</sup> and some claim that breastfeeding can reduce the incidence of PPD by as much as 50%.<sup>62</sup>

## Biological data (hormonal profile)

Changes in hormone levels are informally believed to lead to PPD, but, to date, there have not been any conclusive research linking hormonal changes as a causal factor in the onset of PPD. Data does exist implicating changes in progesterone, estradiol, and prolactin levels, as well as changes in thyroid functioning and adrenal steroid level, in the development of depression.<sup>63-65</sup>

This study revealed that there is a greater postpartum drop in serum estradiol, T3, and morning cortisol levels in the PPD group compared with the control group. Positive correlation

with the severity of depression was found with morning cortisol level and T3, but not with serum estradiol.

Since hormonal levels immediately change following pregnancy, these changes may account for some of the immediate mood fluctuations. However, the development of significant postpartum symptoms appears to be related to additional necessary factors such as sensitivity to mood-destabilizing effects of gonadal steroids<sup>63</sup> or the interaction of hormonal factors and external stressors.<sup>64</sup> As noted in a review by Gjerdingen and Yawn,<sup>66</sup> research examining hormonal factors has not been conclusive. Additional systematic research is necessary to assess the etiological and possible interactive role of hormonal factors in the development of PPD. Nevertheless, treating PPD with hormonal therapies has had some demonstrated support. The findings in the current study were in agreement with Ahokas et al<sup>67</sup> where they found that estrogen and progesterone sharply drop to prepregnant levels by the third postpartum day. The relationship between postpartum thyroid dysfunction and PPD may support a "hormonal" etiology for a small number of cases of PPD. In one study, the incidence of transient postpartum thyroid dysfunction was 7% and the incidence of either major or minor depression was 21% according to research diagnostic criteria.<sup>68</sup>

## Limitation of the study

This is a cross-sectional study and hence it is not possible to reach conclusions regarding causal links. It is a longitudinal study including serial hormonal levels before delivery and several times in different periods after labor. Because it was impossible to study every reported risk factor, only the consistently reported ones in the literature were evaluated (psychosocial, clinical, and hormonal variables). This study focuses on outlining the obstetric, psychological, and social factors predicting causation of PPD, and on exploration of the role of the three commonly studied hormones in relation to PPD and identification of risk factors that have been reported to be associated with the PPD. Further studies exploring more factors would be beneficial.

## Conclusion and recommendation

Many factors may lead to development of PPD, including psychosocial, socioeconomic, obstetric, and hormonal factors. Early detection of these factors may help for early intervention and management.

A psychiatrist and a social worker must attend a postnatal care unit to advise mothers who may be at risk to develop not only PPD, but also other psychiatric disorders.



Recording a psychiatric history for pregnant women in antenatal care units are important to know the mothers at risk for developing puerperal psychiatric disorders as they need extra support. Screening for PPD should become routine by using the EPDS 5 days postpartum for early detection and management.

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