



# The Incidence of Postpartum Depression and Associated Factors Among Iranian Healthy Mothers: Findings of a Prospective Cohort Study

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## Abstract

**Background:** The occurrence of some psychological and emotional crisis in pregnancy may lead to postpartum depression in mothers.

**Objectives:** This prospective cohort study aimed to estimate the incidence of postpartum depression (PPD) and its associated factors among Iranian mothers.

**Methods:** A total of 164 women in their third trimester of pregnancy were recruited through quota sampling from February to July 2018 in Kerman, Iran. Women suffering from depression were excluded. The remained healthy women (n = 164) were traced up to two months after the delivery. The incidence of PPD was calculated by dividing the number of new cases of depression within the postpartum period by the number of initial healthy mothers. The Edinburgh Postnatal Depression Scale was applied to detect PPD. The Cox regression model was used to assess PPD-related factors. Crude and adjusted hazard ratios, as well as their 95% confidence intervals (95% CI) were reported. P-values of < 0.05 were considered statistically significant. SPSS version 22 was used to analyze the data.

**Results:** The incidence of PPD within the two months after delivery was 9.8% and was higher among mothers who had high-school diploma or lower (11.9% vs. 6.4%), had unplanned pregnancy (25% vs. 9.2%), underwent cesarean section (11.3% vs. 8.7%), or were multiparous (10.6% vs. 6.3%). The mean (SD) social support was lower among mothers with depression (69.1 ± 13.1 vs. 77.4 ± 16.6). There was significant association between type of delivery (adjusted hazard ratio [AHR] = 0.57, 95% confidence interval (95% CI) = 0.36; 0.97) and social support (AHR = 0.95, 95% CI = 0.93; 0.97) with PPD.

**Conclusions:** In sum, the concerning incidence of PPD highlighted the need for establishment and strengthening of screening programs during the post-partum period. Families' knowledge about the significance of providing sufficient social support for mothers may have prevented this disorder and therefore, it was recommended that it should be incorporated into prenatal cares.

**Keywords:** Incidence, Iran, Postpartum Depression (PPD), Pregnant Women

## 1. Background

Pregnancy, delivery, and adaptation to a newborn baby are the most sensitive stages in a woman's life (1). The occurrence of some psychological and emotional crisis in this period leads to confusion and changes in the personal identity of mothers (1, 2). The fear of delivery and the birth of an abnormal baby, the loss of attractiveness for the spouse, and the dual feeling of having a newborn baby cause anxiety for many mothers (3). Most mothers in postpartum period, especially six weeks after the delivery, are vulnerable to getting variety of mental disorders, includ-

ing postpartum sadness (baby blues), postpartum depression (PPD), and postpartum psychosis (4). The first one is self-limiting and does not require treatment, but the later states are problematic due to their potential impacts on the family and infant as well as the chance of recurrence (5).

PPD is defined as a depression that begins four weeks after delivery (6). The development of depression during pregnancy and the postpartum period is influenced by the dominant culture of the society (7, 8). Low income, lack of social support, history of having mood disorders, type of

delivery, unplanned pregnancy, first pregnancy, mother's illness, and conflict with husband are the main risk factors for PPD (9). It is estimated that 17% of healthy mothers around the world suffer from PPD (10). The prevalence varies from 8% in Europe to 26% in Middle East (10). In Iran, the prevalence of PPD is reported to be 24% which is concerning (11).

Most of our available knowledge regarding the current situation of PPD among new mothers is based on estimation of depression prevalence (12, 13). The main limitation of prevalence is that it doesn't take into account the time of depression onset. In another word, the diagnosis of depression during the post-partum period could be indicative of the disease recurrence among mothers with history of depression or the onset of new disease among mothers without prior psychiatric disorders (14). As the postpartum period is a stressful transition period for most mothers (15), determining the incidence of PPD provides a more realistic picture of PPD among healthy mothers.

## 2. Objectives

This study aimed to provide an insight into PPD incidence among Iranian women during the early postpartum period.

## 3. Methods

### 3.1. Study Design and Participants

This prospective-cohort study was conducted on 164 pregnant women referred to governmental health centers of Kerman, Iran. Taking into account the prevalence of postpartum depression in vaginal delivery and cesarean section (13% and 27%, respectively) as well as the probability of the first type of error = 5% and the second type of error = 20%, the calculated sample size was determined to be 164 pregnant women (16). We used cluster sampling to recruit the participants. After stratifying the city into 10 geographic districts, the list of health centers affiliated to Kerman University of Medical Sciences in each district was provided. Out of each district, at least one center was randomly selected using random numbers table. From February to July 2018, a total of 188 pregnant women were recruited from 15 centers using quota sampling.

Eligible participants were pregnant women aged between 16 - 35 years, were at the third trimester of pregnancy, had no history of psychological problems, depression, or severe stressful life events in the past nine months, and were free of depression at the time of enrollment (assessed by applying the Edinburgh depression questionnaire). Women who used cigarettes or narcotics, underwent emergency cesarean delivery, or hospitalized after

delivery, and those with ill or disabled neonates were excluded from the study. The remained participants (n = 164) were followed up and screened for depression symptoms within the two months after the delivery.

### 3.2. Outcome

The main outcome was the incidence of PPD within two months after the delivery and was calculated by dividing the number of new cases of depression during the postpartum period by the number of initial healthy mothers.

The depression was detected using the Persian version of Edinburgh Postnatal Depression questionnaire (EPDS). The questionnaire consisted of 10 questions. All responses were scored using 0 - 3 Likert scale. The minimum and maximum possible scores were zero and 30, respectively. The total score of > 12 was indicative of incident PPD (17). The validity and reliability of the questionnaire were confirmed previously (9, 18).

### 3.3. Independent Variables

The independent variables were participants' and spouses' ages at the time of study, age at marriage (y), level of education (high-school diplomas or lower, college degrees and higher), employment status (employed, unemployed), planning of current pregnancy (planned, unplanned), parity (nulliparous, multiparous), type of delivery [cesarean section (CS), normal vaginal delivery (NVD)], and the social support score. The social support was measured using Sherbourne and Stewart Social Support scale (MOS-SSS).

The MOS-SSS consisted of 19 questions categorized into five subscale, including tangible, emotional, informational, and affectionate support and positive social interaction. The responses were coded as 5-point Likert type scale. Obtaining the higher score was indicative of receiving better social support. The reliability of the questionnaire was assessed by Bakhshyan and Pourand (19), and the reported Cronbach's Alpha was excellent (0.94). The Cronbach's alpha of the EPDS and MOS-SSS in this study were 0.81 and 0.70, respectively.

### 3.4. Statistical Analysis

To calculate the cumulative incidence, the number of events during the follow-up period was divided by the number of disease-free participants at the time of enrollment. The normality of the quantitative data was examined using the Kolmogorov-Smirnov test. Descriptive analysis was reported by mean, standard deviation (SD), percentage (%), and frequency (n). The Cox regression models were used to assess PPD-related factors. Hazard ratio (HR)

and adjusted hazard ratio (AHR), and 95% confidence intervals (95% CI) were reported. The P-value < 0.05 was considered as significant. All analysis were performed using SPSS version 22 (IBM Corp., Armonk, N.Y., USA).

### 3.5. Ethics

Verbal informed consent was obtained from all participants. Participants were provided with information on the study objectives, and were also assured of the confidentiality of their information. The study protocol was reviewed and approved by the Research Review Board of the Kerman University of Medical Sciences Organization (Ethics code: IR.KMU.REC.1396.1787).

## 4. Results

The mean (SD) age of participants was 26.7 (5.7) years. Most mothers had secondary school diploma (61.6%), were unemployed (87.8%), were nulliparous (80.5%), had planned pregnancy (86.6%), and had NVD (91.3%). The characteristics of the study participants are shown in [Table 1](#).

The overall incidence of PPD was 9.8%. The incidence was higher among mothers who had high-school diploma or lower (11.9% vs. 6.4%), their pregnancy was unplanned (25% vs. 9.2%), underwent cesarean section (11.3% vs. 8.7%) or were multiparous (10.6% vs. 6.3%). Furthermore, the mean social support score was lower among mothers with depression ( $69.1 \pm 13.1$  vs.  $77.4 \pm 16.6$ ).

In the final multivariable analysis, undergoing cesarean section (AHR = 0.57, 95% CI = 0.36; 0.97) and having higher social support score (AHR = 0.95, 95% CI = 0.93; 0.97) were found to be associated with decreased risk of PPD ([Table 2](#)).

## 5. Discussion

This study illustrated the ongoing situation of depression during the early post-partum period among Iranian mothers. It was shown that approximately 1 out of 10 Iranian mothers experienced PPD in their early post-partum period. The incidence increased among those who underwent cesarean section and received more social support.

According to our results, around 10% of Iranian pregnant women were at the risk of getting PPD. To our knowledge, a vast majority of the current evidence around the world, including Iran, was about the prevalence of PPD and not about its incidence, which limited the consistency of results with other studies. A systematic review carried out in Iran estimated the prevalence of 24.3% for PPD ([11](#)). In studies conducted in other parts of the world, the prevalence of PPD were reported to be 7% in Ghana (2018), 12%

in Ireland (2018), and 14.6% in China (2018) ([20-22](#)). In a study conducted in Korea, the incidence of PPD in pregnant women was less than 1% (2017) ([23](#)). The difference between our study results and the national estimates may have been attributed to the type of measured index. In the present study, the incidence of PPD was calculated, while in other studies, the prevalence was reported. The main difference between prevalence and incidence lies in the fact that in the calculation of incidence, only new cases of the disease, which are taken from cohort studies, are included; while in prevalence, both old and new cases are examined on the basis of cross-sectional studies. In addition, variations in measurement tool, inclusion criteria, and the duration of follow-up period may explain these differences ([24](#)).

The present study showed that cesarean section reduced the risk of PPD. This finding was consistent with the finding of a meta-analysis conducted in 2017 ([25](#)). Similarly, our findings were confirmed by the results of studies conducted in Iran (2017), Brazil (2019), and Poland (2020) ([26-29](#)). A possible explanation for this association may have been the fear of NVD and related pain among mothers ([30](#)).

It was also demonstrated that receiving more social support reduced the risk of PPD, which was consistent with the findings of other studies conducted in Iran (2019), U.S.A (2018), and, Italy (2017) ([31-34](#)). Social support could act as a social shock absorber and a protective factor in dealing with stressful life events. Social support increases the mother's sense of security and hope. It makes the mothers feel beloved, cared, valued, and respected ([28, 35](#)). Social support is one of the most important predictors of psychiatry disorder, and its improvement contributes to a healthier and happier life and decreases the depression ([35](#)).

The main strength of the present study lies in the fact that a cohort design was adopted to examine the PPD incidence and its associated factors. The main benefit of cohort over other observational studies is that they are less prone to reverse causality. In cohort studies, moreover, the incidence could be estimated directly from the data, which is not possible in other study designs. However, our study was subjected to several limitations. First, our main focus was on the incidence of PPD during the early postpartum period, while PPD can occur any time within the first year after giving birth to a baby. This, in turn, may underestimate the incidence of PPD. Second, recruiting individuals from governmental facility limited the generalizability of results to a larger community.

In conclusion, the present study illustrated a picture of depression among mothers early after their delivery. Regarding the critical role of mothers in providing cares to their babies and their key role in family management, it was recommended that the screening strategies should

**Table 1.** Characteristic of Women Recruited to the Study of Post-partum Depression Incidence in, Kerman, Iran (n =164)

Variables	Total	Depression	No Depression	P-Value
Age (y)	26.7 ± 5.7	25.8 ± 3.7	26.8 ± 5.8	0.729 <sup>a</sup>
Age at marriage (y)	21.3 ± 4	22.1 ± 3.5	21.3 ± 4.1	0.828 <sup>a</sup>
Spouse's age (y)	31.1 ± 5.6	29.8 ± 4	31.3 ± 5.7	0.286 <sup>a</sup>
Social Support score	76.5 ± 16.4	69.1 ± 13.1	77.4 ± 16.6	< 0.001 <sup>a</sup>
Level of education				0.598 <sup>b</sup>
College or above	63 (38.4)	4 (6.4)	59 (93.6)	
Up to diploma	101 (61.6)	12 (11.9)	89 (88.1)	
Being employed				0.688 <sup>b</sup>
Yes	20 (12.2)	18 (90)	18 (90)	
No	144 (87.8)	130 (90.2)	130 (90.2)	
Type of pregnancy				0.419 <sup>b</sup>
Planned	142 (86.6)	13 (9.2)	129 (90.8)	
Unplanned	22 (13.4)	3 (25.0)	9 (75.0)	
Type of delivery				0.060 <sup>b</sup>
Normal vaginal delivery	85 (91.3)	8 (8.7)	85 (91.3)	
Cesarean section	63 (88.7)	8 (11.3)	63 (88.7)	
Number of previous deliveries				0.957 <sup>b</sup>
≤ 2	30 (93.7)	2 (6.3)	30 (93.7)	
> 2	118 (89.4)	14 (10.6)	118 (89.4)	

<sup>a</sup>t-test P-value.<sup>b</sup>Chi-square P-value.**Table 2.** Univariable and Multivariable Cox Regression Analysis of Risk Factors Associated with Post-partum Depression Among Iranian Women, Kerman

Variables	Univariable			Multivariable		
	Crude Hazard Ratio	95% CI	P-Value	Adjusted Hazard Ratio	95% CI	P-Value
Age (y)	0.99	(0.95, 1.03)	0.680	-	-	-
Marriage age (y)	0.99	(0.93, 1.05)	0.796	-	-	-
Spouse's age (y)	0.97	(0.91, 1.03)	0.206	-	-	-
Social support	0.95	(0.94, 0.97)	< 0.001	0.95	(0.93, 0.97)	< 0.001
Level of education						
College or above	1.17	(0.71, 1.92)	0.537	-	-	-
Up to Diploma	1	1		-	-	
Being employed						
Yes	1.35	(0.57, 2.50)	0.638	-	-	-
No	1	1		-	-	
Type of pregnancy						
Planned	1.35	(0.72, 2.53)	0.344	-	-	-
Unplanned	1	1		-	-	
Type of delivery						
Normal vaginal delivery	0.57	(0.34, 0.94)	0.020	0.59	(0.36, 0.97)	0.041
Cesarean section	1	1		1	1	
Number of previous deliveries						
> 2	1.02	(0.54, 1.91)	0.950	-	-	-
≤ 2	1	1		-	-	

be implemented during the postpartum period. Furthermore, it was suggested that educating pregnant women's families about the social support and its preventive role in PPD should be incorporated into prenatal cares.

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## Footnotes

**Authors' Contribution:** NM and AS developed the original idea and the protocol, abstracted and analyzed data, and wrote the manuscript. ST and ZR contributed to the development of the protocol, abstracted data, and prepared the manuscript. All authors read and approved the final manuscript.

**Conflict of Interests:** Authors have no conflict of interest.

**Ethical Approval:** The study protocol was reviewed and approved by the Research Review Board of the Kerman University of Medical Sciences Organization (Ethics code: IR.KMU.REC.1396.1787).

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**Informed Consent:** Verbal informed consent was obtained from all participants. Participants were informed of the purpose of the study and were also assured of the confidentiality of their information.

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