



# Prevalence of Postpartum Depression and Associated Factors among New Mothers in Neyshabur, Iran During the COVID-19 Pandemic in 2021

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## Abstract

**Background:** Postpartum depression is a significant global health concern that threatens the health of the family and society. The impact of crises such as the COVID-19 pandemic on this condition remains unclear. Therefore, this study aimed to determine the prevalence of postpartum depression and its associated factors in new mothers in Neyshabur, Iran, during the COVID-19 pandemic.

**Methods:** This cross-sectional study was conducted on 401 postpartum women in Neyshabur, Iran, from January to November 2021 during the COVID-19 pandemic. Participants completed the Edinburgh Postnatal Depression Scale (EPDS), the marital satisfaction scale, the social support questionnaire, and the Religiosity Questionnaire 24 hours and 3 months following childbirth. Data were analyzed using a repeated measures model, with a two-sided p-value of  $<0.05$  was considered statistically significant.

**Results:** The prevalence of depression was 3.49% at 24 hours and 19.41% at three months after childbirth. Depression scores differed significantly across the two time points ( $P<0.001$ ). A Linear mixed-effects model, adjusted for confounding variables, confirmed a significant difference in depression scores over time ( $P<0.001$ ). Higher levels of social support, marital satisfaction, and husband's support were associated with the lower depression score ( $P<0.01$ ). Additionally, women with lower incomes have been more depressed than women with enough income ( $P<0.001$ ).

**Conclusion:** Higher social support, higher marital satisfaction, and higher income appear to be protective factors for maternal mental health in the postpartum period during the pandemic. Policymakers and clinicians should be mindful of the increased risk of postpartum depression in the first three and implement regular screening and targeted interventions to support new mothers.

**Keywords:** Postpartum depression, COVID-19, Prevalence, Social support

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## Introduction

The outbreak of the COVID-19 pandemic, along with subsequent social isolation and limited social contact, posed a significant threat to global well-being (1,2). During this global crisis, an increase in mental disorders such as depression, anxiety, stress, anhedonia, and other negative emotions was observed worldwide (2).

Certain vulnerable populations, such as pregnant and postpartum women, were disproportionately affected by COVID-19 (3,4). This is even though pregnancy and the postpartum period are particularly vulnerable times for the onset or recurrence of mental health conditions due to emotional, hormonal, and social changes (5).

Postpartum depression is a major global public health concern with a high prevalence and significant harmful

consequences (6). Studies indicate that the prevalence of postpartum depression worldwide ranges from %6 to approximately 20% (7,8). This disorder may occur at any point during the first year after childbirth and may negatively affect the mother's and her family's quality of life for years (9). Women with postpartum depression often experience extreme sadness, anxiety, mood swings, and thoughts of death (8). This condition can negatively impact the infant's health and development by reducing the mother's sensitivity in caring for the baby and disrupting mother-infant interactions (6,10-12).

During the pandemic, the mother's fear of infecting herself and her child with COVID-19 likely led to an increase in the risk of postpartum depression (13). Furthermore, significant changes in obstetrics care



during the pandemic, such as reduced prenatal visits, have also contributed to increased psychological distress (14). Preventive measures such as isolation, repeated lockdowns, and social distancing during the pandemic seem to have exacerbated the psychological stress (15). Collectively, these stressors may have increased the risk of postpartum depression among new mothers, although this requires further study.

Several studies on the impact of the COVID-19 pandemic on postpartum depression show conflicting results, with some indicating no change or a decrease in prevalence, while others suggest an increase (15-20). For example, a meta-analysis conducted by Hessami et al found that the pandemic had no significant impact on the incidence of depression symptoms during pregnancy and the postpartum period (21).

A meta-analysis by Chen et al reported that the prevalence of postpartum depression during the pandemic was 34%, much higher than the rates reported before the pandemic. However, since most studies in this meta-analysis were from developed countries, it is recommended that further investigation be conducted in low- and middle-income countries (6).

Several factors contribute to the onset and increased susceptibility to postpartum depression. For example, in an umbrella review, Hutchens and Kearney identified risk factors for postpartum depression, including stressful life events, lack of social support, previous or current sexual abuse, prenatal depression, and marital dissatisfaction (8). Other studies have proposed factors such as low maternal education, low socio-economic status and previous psychiatric illness as risk factors for postpartum depression (22-24). However, there is limited research on the factors associated with postpartum depression during the COVID-19 pandemic (3,17,25). Understanding these factors in the context of the global crisis could help healthcare professionals and policymakers better address postpartum depression and provide appropriate support for affected women.

Since the postpartum period is a time for mothers to adapt to new conditions and learn optimal behaviors for effective child care, it is crucial to address factors that hinder this adaptation, such as depression. Given the limited information about postpartum depression in new mothers in developing countries like Iran during the COVID-19 pandemic, this study aims to assess the prevalence of postpartum depression at 24 hours and three months after childbirth and explore associated factors in new mothers during the COVID-19 pandemic in Neyshabur, Iran.

## Methods

### Study design

This cross-sectional study was conducted on 401 women

who gave birth at a public Hospital in Neyshabur, a city in the northeast of Iran, during the COVID-19 pandemic between January 2021 and November 2021.

### Settings

This study was conducted in Neyshabur, a city is located in the northeast of Iran. This city has a population of about 341 thousand people. This city has a public hospital, and the number of births per month in this hospital is about 500, which includes about 90% of births in this city.

### Participants

This study included postpartum women evaluated in two periods, 24 hours and three months after childbirth. They were healthy married women aged 18 to 45 who had given birth to a healthy singleton baby at term and were of Iranian nationality. Women with a history of addiction, drug or alcohol abuse, or diagnosed psychological disorders other than depression were excluded.

### Study size

Since the main aim of this study was to estimate the prevalence of postpartum depression in new mothers during the outbreak of COVID-19, and according to the reported prevalence in similar studies, the sample size of the present study was calculated (26-28). Based on this, considering a 5% margin of error at the 95% confidence interval and a prevalence rate of 39.2%, a sample size of 365 cases was calculated. Finally, considering 10% of the possible loss of samples, 401 participants were included in the present study.

### Data sources/measurement

The data collection tools are the socio-demographics and obstetrics information forms, Edinburgh Postnatal Depression Scale (EPDS), Kansas Marital Satisfaction Scale (KMSS), Sherborn and Stewart social support questionnaire, and Glock & Stark Religiosity Questionnaire.

### Edinburgh Postnatal Depression Scale

This tool is a standard questionnaire for measuring postpartum depression. This scale consists of 10 questions on a four-point Likert scale, with a minimum score of 0 and a maximum score of 30. Each question has a score between 0 and 3 based on the severity of the symptoms. A lower score indicates a better person's condition, and a score above 12 indicates the possible presence of depression (29). The validity and reliability of this questionnaire have been confirmed in the Montazeri study in Iran (30).

### Kansas Marital Satisfaction Scale

The KMSS is a short self-report scale that includes three items. KMSS assesses satisfaction with a spouse, marriage,

and marital relationship. In this scale, people rate their satisfaction on a 7-point Likert scale from 1 (extremely dissatisfied) to 7 (extremely satisfied) (31). A score of 18 or higher was considered the threshold for satisfactory marital satisfaction. The validity and reliability of the Persian version of this tool were confirmed in Iran (32).

#### **Medical Outcomes Study Social Support Survey (MOS-SSS)**

This questionnaire is designed to evaluate the amount of social support the subject receives. It includes 19 functional support items that assess social support with four subscales, including tangible support, affection, positive social interaction, and emotional or informational support.

The questions of this tool are on a 5-point Likert scale from never to always (33). The validity and reliability of this tool in Iran was confirmed in several studies (34).

#### **Glock & Stark Religiosity Questionnaire**

This questionnaire has 26 items, which are designed in four dimensions of belief (with 7 items), emotions (with 6 items), consequences (with 6 items), and rituals (with 7 items) to measure the level of religiosity (35). Individuals were classified into three groups based on this tool: low religiosity (0-25), moderate religiosity (26-77), and high religiosity (78-104). This questionnaire has been validated in Iran and adapted to Islam religion (36).

#### **Data collection**

Mothers were recruited in the present study from the maternity ward in the public hospital using the census method. Before collecting the data, the objectives of the study were explained to the mothers, and a written informed consent form was completed.

The demographic and obstetrics information forms were completed through the interview and the registered birth information during hospitalization at the maternity ward. Other electronic questionnaires were sent to each mother via WhatsApp, Telegram, or email, and she was asked to complete them. Also, three months later, the questionnaires were again sent to the mothers for completion, and they were informed through a phone call.

#### **Statistical analysis**

The repeated measure model was fitted by using the mixed effects method to evaluate the effect of time on depression scores due to adjusting the effect of some covariates. In this study, the effect of income, marital satisfaction, social support and husband's support was adjusted. Two separate models were fitted for a more detailed analysis of the effect of the variables under study. In the first model, the effect of time on depression scores was investigated. In the second model, the effect of time was analyzed along with the effect of confounding variables. The results of

the two models were compared. Statistical analysis was performed using statistical software R version 4.3.2 for Windows. A two-sided  $P$  value of  $<0.05$  was considered statistically significant.

#### **Results**

##### ***Sociodemographic characteristics of study participants***

The overall mean age of the participants was  $28.62 \pm 6.37$ . Only 14.96% of participants had a university education, and 93.48% had enough income. Additionally, 24.94% of the women had a history of abortion. Approximately 56.93% of the participants had a vaginal delivery. The average birth weight of the last baby was 3155 grams. Most participants (87.3%) reported satisfactory spousal support.

##### ***Prevalence of postpartum depression and associated factors***

Among the 401 women in the study, the prevalence of postpartum depression was 3.49% 24 hours after childbirth. A total of 340 participants were available for follow-up three months postpartum, with a depression prevalence of 19.41% at this time (response rate: 84.79%). The mean depression scores were  $2.69 \pm 3.54$  at 24 hours postpartum and  $6.64 \pm 5.62$  three months after childbirth.

To analyze potential confounding factors, we examined changes in depression scores across the two-time points using a repeated measures analysis. Some variables had statistically significant differences, including income status (less than enough vs. enough,  $P < 0.001$ ), husband's support (satisfactory vs. weak/low,  $P < 0.001$ ), marital satisfaction ( $P < 0.001$ ) and social support ( $P < 0.001$ ; Table 1).

In model 1, the depression scores differed significantly across time points ( $t$ -value = 13.04,  $P < 0.001$ ). In model 2, a linear mixed-effects model, adjusting for confounding variables, confirmed a significant difference in depression scores over time ( $t$ -value = 12.82,  $P < 0.001$ ). All of the variables remained significant (Table 2).

The findings indicate that higher levels of social support, marital satisfaction, and husband's support were associated with lower postpartum depression scores. Conversely, women with lower income levels experienced higher depression scores compared to those with enough income.

#### **Discussion**

The results of the present study indicate that the prevalence of postpartum depression was 3.49% 24 hours and 19.41% three months after childbirth, respectively. In a recent umbrella review of meta-analyses conducted up to 2023, Sahebi et al reported a prevalence of postpartum depression of 25.27%, which was higher than the present study (37).

Similarly, a meta-analysis by Chen et al, which included

**Table 1.** Socio-demographic and clinical profile of the participants for variables

| Variables                   | N (%)                               | Estimate        | Standard error        | T value        | P value        |
|-----------------------------|-------------------------------------|-----------------|-----------------------|----------------|----------------|
| Income                      |                                     |                 |                       |                |                |
| Enough                      | 373 (93.48)                         | Ref             |                       |                |                |
| Less than enough            | 24 (6.01)                           | 3.72            | 0.69                  | 5.40           | < 0.001        |
| More than enough            | 2(0.50)                             | 1.67            | 2.30                  | 0.73           | 0.47           |
| Type of delivery            |                                     |                 |                       |                |                |
| Natural                     | 226 (56.93 )                        | Ref             |                       |                |                |
| Cesarean                    | 171(43.07)                          | 0.30            | 0.34                  | 0.87           | 0.39           |
| Mother's education          |                                     |                 |                       |                |                |
| Elementary                  | 180 (44.89)                         | Ref             |                       |                |                |
| Diploma                     | 161(40.1 5)                         | 0.26            | 0.37                  | 0.72           | 0.47           |
| Advanced                    | 61 (14.96)                          | 0.55            | 0.50                  | 1.10           | 0.27           |
| Husband's education         |                                     |                 |                       |                |                |
| Elementary                  | 184(45.89)                          | Ref             |                       |                |                |
| Diploma                     | 148(36.91)                          | 0.09            | 0.37                  | 0.24           | 0.81           |
| Advanced                    | 69(17.21)                           | -0.01           | 0.48                  | -0.01          | 0.99           |
| History of abortion         |                                     |                 |                       |                |                |
| 0                           | 301(75.06)                          | Ref             |                       |                |                |
| ≥ 1                         | 100(24.94)                          | 0.30            | 0.39                  | 0.77           | 0.44           |
| Number of pregnancy         |                                     |                 |                       |                |                |
| ≤ 3                         | 341(85.04)                          | Ref             |                       |                |                |
| > 3                         | 60(14.96)                           | 0.58            | 0.47                  | 1.24           | 0.22           |
| Huband'support              |                                     |                 |                       |                |                |
| Weak or Low                 | 17(4.28)                            | Ref             |                       |                |                |
| medium                      | 30(7.56)                            | -1.67           | 0.97                  | -1.73          | 0.09           |
| satisfactory                | 350 (88.16)                         | -4.75           | 0.79                  | -5.98          | < 0.001        |
| Marital satisfaction        |                                     |                 |                       |                |                |
| Low                         | 20(4.99)                            | Ref             |                       |                |                |
| Strong                      | 381(95.01)                          | -4.74           | 0.74                  | -6.43          | < 0.001        |
| Religiosity                 |                                     |                 |                       |                |                |
| Moderate                    | 357 (89.03)                         | Ref             |                       |                |                |
| Strong                      | 44 (10.97)                          | 1.53            | 0.54                  | 2.85           | < 0.01         |
| <b>Continuous variables</b> | <b>Median (Interquartile Range)</b> | <b>Estimate</b> | <b>Standard error</b> | <b>T value</b> | <b>P value</b> |
| Mother's age                | 29(23-33)                           | 0.04            | 0.03                  | 1.52           | 0.13           |
| Husband's age               | 33(29-37)                           | 0.03            | 0.03                  | 1.14           | 0.25           |
| Duration marriage           | 8(5-13)                             | 0.003           | 0.03                  | 0.09           | 0.92           |
| Birth weight                | 3155(2900-3450)                     | 0.0001          | 0.0004                | 0.31           | 0.76           |
| Marital satisfaction        | 18(18-18)                           | -0.54           | 0.10                  | -5.26          | < 0.001        |
| Social support              | 95(95-95)                           | -0.09           | 0.01                  | -8.58          | < 0.001        |
| Religiosity                 | 74(71-76)                           | 0.02            | 0.03                  | 0.55           | 0.58           |

eight studies and 6480 postpartum women, found a 34% prevalence of postpartum depression during the pandemic (6). The higher rate compared to the present study may be due to including studies from developed countries.

Liang et al reported a 30% postpartum depression rate in China, while Shuman et al found 38% across 46 US states. Ran et al in Wuhan recorded a higher prevalence

of 56.9%. These studies, unlike the present one, diagnosed depression with an EPDS score of  $\geq 10$  (28,38,39).

Furthermore, a meta-analysis conducted by Shorey et al on 21 studies up to 2020 reported the prevalence of postpartum depression during the pandemic at 17%, which is relatively close to the findings of the present study. This meta-analysis found no significant differences

**Table 2.** Repeated measure model of depression scores indicators

| Variables            | Estimate | Standard error | T-value | P value |
|----------------------|----------|----------------|---------|---------|
| Income               |          |                |         |         |
| Enough               | Ref      |                |         |         |
| Less than enough     | 2.36     | 0.68           | 3.48    | <0.001  |
| More than enough     | 1.34     | 2.11           | 0.63    | 0.53    |
| Marital satisfaction | -0.33    | 0.10           | -3.39   | <0.001  |
| Social support       | -0.06    | 0.01           | -5.55   | <0.001  |
| Huband'support       |          |                |         |         |
| Weak or Low          | Ref      |                |         |         |
| Medium               | -0.63    | 0.91           | -0.69   | 0.49    |
| Satisfactory         | -2.41    | 0.80           | -3.02   | <0.01   |

in postpartum depression prevalence across geographic regions. However, the prevalence was slightly higher in Europe and North America than in Asia (40).

On the other hand, the prevalence of depression in the present study was higher than the rate reported in some studies conducted in Iran before the pandemic. For instance, a meta-analysis by Veisani et al reported a rate of 25.3% in Iran up to 2013 (41). Comparing the findings of this study with research conducted in Iran after 2013 indicated that the prevalence of postpartum depression in the current study is higher than those reported in Natanz (2018), Kerman (2018), and Tehran (2021) but lower than the findings from Khuzestan by Afshar (2014) and Beiranvand (2020) (42-45).

Similar to the findings of the present study, Gluska et al found a rise in the prevalence of depression from three to six months after childbirth (46). This suggests that the pandemic's impact on new mothers' mental health worsened over time. Although the hormonal and physical changes associated with pregnancy gradually improve after childbirth, the rise in depression rates may point to a stronger influence of social factors or COVID-19 -related issues.

According to the present study, depression was more common among women with insufficient income, as also noted by Spinola et al during the COVID-19 pandemic (47). Conversely, increased social support reduced postpartum depression, with Gluska et al finding that decreased family support at six months postpartum led to higher depression rates (46).

Chen and colleagues' meta-analysis identified socio-demographic and clinical characteristics, stress and anxiety, lack of various types of support, and COVID-19-related factors as key risk factors for postpartum depression. This review suggests that receiving social support from different sources, such as economic assistance from family members, emotional support, and care received from healthcare workers, has a positive impact on reducing the prevalence of postpartum depression (6).

Similarly, Liang et al found that reduced social support

during the pandemic was strongly linked to postpartum depression, highlighting the importance of support measures for maternal mental health (28).

The study also showed that increased marital satisfaction and strong husband support significantly reduce the risk of postpartum depression. Similarly, Xayyabouapha et al found that family conflict, intimate partner violence, and moderate social support are linked to a higher risk of postpartum depression (48). In this context, the lower prevalence of depression observed in the current study may be due to pandemic-related quarantines, which allowed families to spend more time together, enhancing social support for mothers.

Finally, this study did not show a relationship between other sociodemographic variables and women's religiosity with postpartum depression. However, Rajaipour et al reported lower spiritual well-being in women with higher depression scores (49).

Understanding postpartum depression, especially during COVID-19, can clarify the psychological and emotional conditions of women who have given birth. Supportive measures and interventions based on the results of this research can be provided by husband, family, policymakers, and health professionals to improve maternal and newborn outcomes.

While this study had strengths, including a large sample size and a focus on the mental health of postpartum women as a vulnerable group, it has several limitations. Second, by evaluating postpartum depression only three months after childbirth, the long-term effects of the pandemic on women's mental health remain unclear. Lastly, not all known variables associated with postpartum depression were included, so other factors that may influence maternal mental health were not assessed. Despite these limitations, the study's findings contribute to research, healthcare practice, and policy-making.

## Conclusion

According to the results of the present study, the prevalence of postpartum depression was 3.49% within 24 hours and 19.41% three months after childbirth during the COVID-19 epidemic. These figures were higher than some studies conducted in Iran during the pandemic but lower than others. The study found that factors such as low income, low social support and marital dissatisfaction, and insufficient support from the husband during the COVID-19 pandemic were associated with an increased prevalence of postpartum depression.

Given the varying prevalence of postpartum depression in different regions of Iran, further research on the mental health of mothers, particularly during crises and natural disasters, is recommended. Additionally, considering the uncertain long-term effects of the COVID-19 epidemic on the mental health of postpartum women, it is advisable to investigate the long-term consequences for women

who gave birth during this period. Furthermore, studies comparing the prevalence of postpartum depression before and after the COVID-19 pandemic could provide better insights into the impact of this crisis on psychological disorders.

#### Authors' Contribution

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#### Competing Interests

The authors declare that they do not have any conflict of interest.

#### Ethical Approval

This research was approved by the Ethics Committee of Neyshabur University of Medical Sciences (Code: IR.NUMS.REC.1400.057). The participants were informed of the aim of the study and were assured of confidentiality. New mothers completed the questionnaires after signing a consent form and agreeing to participate.

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