



## Depression and Anxiety Among Pregnant and Non-Pregnant Women During the COVID-19 Pandemic in Isfahan: A Case-Control Study

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### Abstract

**Background:** Exploring how the COVID-19 pandemic has influenced depression and anxiety in pregnant and non-pregnant women is essential for informing mental health policies and interventions. This study focuses on measuring these conditions among women in Isfahan City.

**Methods:** The case-control study included 358 participants comprising 179 pregnant women and 179 non-pregnant women referred to the clinics at Shahid Beheshti and Al-Zahra Hospital, Isfahan, during the COVID-19 pandemic from April 2021 to 2022. Beck Depression Inventory (BDI) and the Hospital Anxiety and Depression Scale (HADS) questionnaire were utilized for assessing depression and anxiety. The data obtained was analyzed using the Chi-square test, one-way analysis of variance, and logistic regression analysis. Regression analysis was applied to explore the depression and anxiety-related factors. All statistical analyses were performed using a 5% error and were done via SPSS for Windows version 23 (SPSS Inc., Chicago, IL, USA).

**Results:** The prevalence rate in pregnant women reached 63.7% and 61.9%, against 35.7% and 36.9% of the non-pregnant women, according to the Beck and HADS depression questionnaires, respectively, during the COVID-19 pandemic. The number of women who did not experience anxiety was the same in both groups, but non-pregnant women with anxiety had significantly higher scores on the HADS anxiety questionnaires. Additionally, pregnant women had significantly more negative dyadic adjustment in relationship quality than non-pregnant women. Relationship quality was a significant independent factor for BDI and both HADS depression and anxiety; pregnancy status was an important independent factor for depression (BDI and HADS depression); and work status was only a significant independent factor for BDI.

**Conclusion:** This study highlights the significant impact of the COVID-19 pandemic on maternal mental health, with pregnant women experiencing elevated rates of depression compared to their non-pregnant counterparts. Future research should continue to explore the long-term consequences of maternal mental health challenges on maternal-infant outcomes and identify effective strategies for promoting maternal well-being in times of crisis.

**Keywords:** Depression, Anxiety, Pregnancy, COVID-19.

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### Introduction

Depression is recognized as a major mental health challenge, and WHO statistics indicate that more than 322 million people worldwide live with this condition<sup>1</sup>. Meanwhile, the prevalence of depression among women stands at 5.1%, a rate notably higher than that observed among men, which is 3.6%<sup>1</sup>.

One in seven women during the perinatal period faces depression and anxiety, which are closely associated with an increased risk of preterm birth, weakened mother-infant bonding, and delays in the infant's cognitive and emotional development, effects that may continue into childhood<sup>2, 3</sup>. During pregnancy and the perinatal phase, depression can be difficult to detect, with half of women affected going undiagnosed. Anxiety is likewise a common symptom in pregnancy, and evidence from broad population surveys shows that one in three individuals has experienced an anxiety disorder at least once<sup>4</sup>.

In December 2019, a new coronavirus (COVID-19) emerged, profoundly impacting the world. This pandemic has led to significant psychological changes, notably increasing anxiety and depression among many individuals. Addressing these mental health challenges is crucial as we face this crisis<sup>5</sup>.

The global impact of the COVID-19 pandemic has prompted a reevaluation of healthcare systems and a nuanced exploration of its multifaceted consequences on diverse populations. Among these populations, pregnant women stand out as particularly vulnerable, contending with an array of stressors, uncertainties, and disruptions in healthcare. Pregnant women evaluated during the COVID-19 pandemic reported higher levels of distress and psychiatric symptoms than those assessed before the pandemic, primarily experiencing symptoms of depression and anxiety. Additionally, the pandemic affects women in the perinatal period<sup>6</sup>.

In Wuhan, China, within the early period of the COVID-19 outbreak, 53.8% of the participants reported moderate to severe



psychological impacts. Specifically, 17% reported symptoms of moderate to severe depression, while 29% showed symptoms of moderate to severe anxiety<sup>7</sup>. A recent study conducted in Iran indicated that COVID-19 may cause 51.6% of pregnant women to develop abnormal HADS scores, showing high anxiety and depression<sup>8</sup>.

The COVID-19 pandemic has introduced unique stressors and uncertainties that have worsened mental health challenges for pregnant women. Non-pregnant women have also been affected by the psychosocial stressors associated with the pandemic, but in different ways. It is essential to understand the prevalence of depression and anxiety among both pregnant and non-pregnant women during this time, as well as the factors influencing these mental health issues. By deepening this understanding, more effective interventions and support systems can be implemented to minimize harmful mental health consequences. Our study aims to assess the levels of depression and anxiety in pregnant and non-pregnant women in Isfahan City during the COVID-19 pandemic, using validated questionnaires to illuminate the unique challenges and implications for maternal mental health.

## Materials and Methods

**Study Design and Population:** In this Case-Control study, we enrolled participants from two groups: pregnant women and non-pregnant women. The pregnant women (case group) were referred to Shahid Beheshti and Al-Zahra clinics for routine pregnancy follow-ups. The non-pregnant women (control group) were also referred to the same clinics and matched the age group of the pregnant participants, attending for routine tests, examinations, and screenings, such as breast examinations and Pap smears. All participants were adult women (aged over 20 years), and the study was conducted during the COVID-19 pandemic, specifically from April 2021 to April 2022. The exclusion criteria included individuals who visited the clinic due to illness, those with a history of mental illnesses (including a history of psychiatric medication use and referrals to psychiatrists), women with high-risk pregnancies, and participants who had lost close relatives during the COVID-19 pandemic. All individuals gave written consent before joining the study, and the research protocol received approval from the Ethics Committee of Isfahan University of Medical Sciences (IR.MUI.MED.REC.1401.311).

**Data Collection and Tools:** Before the study began, participants received detailed information about the study's methods and aims, and after that, they provided written informed consent. Participants were informed that their personal data would be kept confidential and that they had the right to withdraw from the study at any stage. In this study, we collected the participants' characteristics data through a form (being pregnant or not, age, education (college degree or higher, complete high school, and less than high school), economic status (good (above 10 million Tomans), average (between 5 and 10 million Tomans) and bad (at least 5 million Tomans)), and employment status (employed/homemaker)).

For evaluating depression and anxiety, Beck Depression Inventory (BDI) and the Hospital Anxiety and Depression Scale (HADS) questionnaire were used. The questionnaires

were completed in paper form by the participants within 15 minutes.

The BDI is a self-report assessment consisting of 21 items that evaluate characteristic attitudes and symptoms of depression. It has demonstrated both reliability and validity, as confirmed by Hamidi et al.<sup>9</sup>, showing a significant positive internal consistency with a Cronbach's alpha of 0.92 and a test-retest reliability coefficient of  $r=0.64$ , along with an Intra-class Correlation Coefficient (ICC) of 0.81. Published in 1996, the BDI-II is a revised version designed to reflect current diagnostic criteria for depression<sup>7</sup>. The BDI-II yields scores ranging from 0 to 63, with results categorized as minimal (0–13), mild (14–19), moderate (20–28), and severe (29–63)<sup>9</sup>.

The HADS questionnaire was used concurrently, consisting of seven items for both the depression and anxiety subscales<sup>10</sup>. Each item is scored from zero to three, with three representing the highest levels of anxiety or depression. This questionnaire omits physical symptoms to reduce the chances of false positive diagnoses. The overall scores range from 0 to 21; the interpretation of the results goes like this: scores ranging from 0-7 are normal, 8-10 reflect mild levels, 11-15 denote moderate levels, and scores ranging from 16-21 reflect severe levels of anxiety/depression<sup>11</sup>. Its reliability and validity were confirmed by Montazeri A et al., where the Cronbach's alpha coefficient was 0.78 for the anxiety subscale and 0.86 for the depression subscale<sup>10</sup>.

The quality of relationships among intact couples (those who are married or cohabiting) was assessed using the Dyadic Adjustment Scale (DAS-32). This 32-item questionnaire measures various aspects of relationship satisfaction, intimacy, emotional expression, and the extent to which couples agree on important relationship matters<sup>12</sup>. The DAS-32 employs different response scales, and the overall DAS Total Score is calculated by summing all individual subscale scores. The overall score varies within a range from 0 to 151. Scores higher than 101 points to more positive dyadic adjustment and lower levels of distress<sup>12</sup>. This questionnaire had appropriate validity and reliability in Iran with Cronbach's alpha values of 0.86 and 0.89, respectively<sup>13</sup>.

The questionnaires were given to participants only after their informed consent was obtained.

**Sample Size:** The required sample size was calculated using a formula for comparing proportions. A confidence level of 95% and a statistical power of 80% were established for this study. It was assumed that a minimum clinically significant difference between the two groups would be 10%, with a maximum estimated prevalence of 33% in the non-pregnant group. Based on these parameters, the estimated sample size was approximately 150 participants per group. To account for potential attrition and incomplete responses, the sample size was increased to 180 participants per group, resulting in 360 individuals.

**Statistical Analysis:** Continuous variables are presented as mean±standard deviations (SD), while categorical variables are reported as numbers (percentages). To compare the mean values of quantitative variables between pregnant and non-



pregnant participants, a one-way analysis of variance (ANOVA) was used. For the categorical variables across different groups, the chi-square test was applied. Regression analysis examined the relationship between factors associated with depression and anxiety, including age, education, financial status, pregnancy status, work status, and relationship quality. These factors were assessed using the BDI, the HADS for depression, and the HADS for anxiety as dependent variables. Statistical analysis was performed using a 5% significance level with SPSS for Windows version 23 (SPSS Inc, Chicago, IL, USA).

## Results

The baseline characteristics and the information of 358 participants were analyzed (Table 1). The mean±SD of non-pregnant participants was 32.06±7.47 years, and 28.02±4.35 in pregnant participants. No significant differences were observed in educational status between pregnant and non-pregnant women. However, pregnant participants reported better financial conditions compared to their counterparts. Employment was more common among pregnant women, whereas non-pregnant women were more frequently engaged in household roles.

**Table 1. Demographic and baseline attributes of individuals included in the study**

Characteristics	Non-pregnant (n=179)	Pregnant (n=179)	P-value
*Age, years (**mean±SD)	32.06±7.47	28.02±4.35	<0.001
Education, n			0.754
College degree or higher	104	100	
Complete high school	65	71	
Less than high school	10	8	
Financial status***			<0.001
>10 million Toman	70	124	
5-10 million Toman	87	55	
<5 million Toman	22	0	
Work status			<0.001
Employed	65	96	
Household	114	83	

\*\*Measures of central tendency: The mean

\*\*SD: Standard Deviation

\*ANOVA Test

Chi-square Test

\*\*\*The basis for the classification of salaries is the salaries of the Ministry of Labor.

The results of the questionnaire scores are presented in Table 2. During the COVID-19 pandemic, the percentage of pregnant women experiencing depression was significantly higher, with scores of 63.7% and 61.9%, compared to 35.7% and 36.9% for non-pregnant women, as measured by the Beck and HADS depression questionnaires, respectively. Interestingly, the proportion of women who did not experience anxiety was the same in both groups. However, non-pregnant

women who did experience anxiety had significantly higher scores on the HADS anxiety questionnaires. Additionally, pregnant women reported a more negative dyadic adjustment in relationship quality compared to non-pregnant women. This study highlights the significant impact of the COVID-19 pandemic on maternal mental health, with pregnant women experiencing elevated rates of depression and anxiety compared to their non-pregnant counterparts.

**Table 2. Depression status, anxiety status, and relationship quality in pregnant or non-pregnant participant based on Beck, HADS, and DAS questionnaire**

Questionnaire score	Non-pregnant (n=179)	Pregnant (n=179)	P-value
Beck depression Q, n (%)			<0.001
Normal	115 (64.2%)	65 (36.3%)	
Mild	51 (28.5%)	75 (41.9%)	
Mod	11 (6.1%)	34 (19.0%)	
High	2 (1.1%)	5 (2.8%)	
HADS depression Q			<0.001
Normal	113 (63.1%)	69 (38.5%)	
Mild	47 (26.3%)	71 (39.7%)	
Mod	16 (8.9%)	35 (19.6%)	
High	3 (1.7%)	4 (2.2%)	
HADS anxiety Q			0.025
Normal	115 (64.2%)	115 (64.2%)	



<b>Mild</b>	37 (20.7%)	49 (27.4%)	
<b>Mod</b>	20 (11.2%)	15 (8.4%)	
<b>High</b>	7 (3.9%)	0 (0.0%)	
<b>DAS Q Score</b>			0.002
<b>Positive dyadic adjustment</b>	135 (75.4%)	108 (60.3%)	
<b>Negative dyadic adjustment</b>	44 (24.6%)	71 (39.7%)	

Abbreviation: Q=questionnaire; HADS=hospital anxiety and depression scale; DAS=dyadic adjustment scale.

#### Chi-square Test

Table 3 presents the regression analysis results, showing that relationship quality emerged as a significant independent predictor for both the BDI and the HADS. The findings suggest that poorer couple relationships are associated with elevated levels of depression and anxiety as assessed by these measures. In other words, poorer couple relationships lead to increased anxiety and depression in women.

Pregnancy status was also an important independent factor influencing depression, as measured by both the BDI and HADS depression scores. Meanwhile, work status was found to be a significant independent factor only for the BDI. Additionally, the questionnaires showed no significant associations with age, education, or financial status.

**Table 3. Regression analysis of factors related to depression and anxiety based on Beck questionnaire, HADS depression questionnaire, and HADS anxiety questionnaire**

Dependent Variable	Beck Q		HADS depression Q		HADS anxiety Q	
	Beta	P-value	Beta	P-value	Beta	P-value
<b>Age</b>	0.014	0.795	-0.061	0.254	0.052	0.355
<b>Education</b>	-0.077	0.129	0.060	0.238	0.072	0.182
<b>Financial status</b>	0.024	0.657	0.050	0.354	0.080	0.164
<b>Pregnancy status</b>	0.291	<0.001	0.260	<0.001	0.095	0.113
<b>Work status</b>	0.104	0.043	0.058	0.263	0.062	0.260
<b>Relationship quality</b>	0.232	<0.001	0.190	<0.001	0.121	0.024

Abbreviation: Q=questionnaire; HADS=hospital anxiety and depression scale.

#### Regression Analysis

## Discussion

The current research findings indicate a marked increase in the frequency of anxiety or depression among pregnant women compared to non-pregnant women during the COVID-19 pandemic. Specifically, 63.7% and 61.9% of pregnant women reported experiencing depression, respectively, in contrast to 35.7% and 36.9% among non-pregnant women, as assessed by the Beck and HADS depression questionnaires, respectively. The mental health of pregnant women, particularly regarding depression and anxiety, has been a pressing issue across both pre-pandemic and pandemic periods. Prior research indicates that 15–20% of pregnant women exhibited depressive symptoms before COVID-19<sup>15,16</sup>. However, these rates have surged with the onset of the COVID-19 pandemic. Studies conducted during the pandemic have reported a notable increase in depression among pregnant women, with prevalence rates ranging from 25% to 40%<sup>17,18</sup>.

A meta-analysis study was conducted from December 2019 to February 2021, which included a total of 46 studies. Depression was evaluated in 37 of these studies, involving 47,677 participants, and the prevalence was found to be 25.6%. Anxiety was assessed in 34 studies with 42,773 participants, resulting in a pooled prevalence of 30.5%. Additionally, the rates of anxiety were lower in East Asia compared to Europe and North America, but not in West Asia<sup>19</sup>.

Factors such as fears of contracting the virus, concerns about the health of the unborn child, disruptions in prenatal care, financial worries, and social isolation due to lockdown measures have contributed to this rise in mental health challenges<sup>18</sup>. Similarly, Wang et al. Documented significant psychological distress among pregnant women in the early stages of the COVID-19 outbreak in China, including a significant proportion experiencing moderate to severe depression and anxiety symptoms<sup>7</sup>.

Our study revealed a higher percentage of depression symptoms among pregnant women compared to other studies. This finding aligns with the observation that depression tends to be more common among pregnant women in developing countries than in developed countries<sup>20</sup>. Since our study was conducted in Isfahan, Iran, a developing nation, this trend is particularly relevant. The increased prevalence of depression in these settings can be attributed to various factors related to the socioeconomic, cultural, and healthcare conditions prevalent in developing nations. Based on the systematic review and meta-analysis by Roddy Mitchell et al., encompassing 203 studies and 212,318 women, approximately 20% of pregnant and postpartum women in low- and middle-income countries were identified as having generalized anxiety disorder<sup>20</sup>.

Moreover, the burden of infectious diseases, malnutrition, and inadequate healthcare infrastructure further compounds the



risk of depression during pregnancy in these regions<sup>21</sup>. Additionally, cultural factors such as gender inequity, discrimination, and societal expectations surrounding motherhood can exacerbate stress and contribute to the development of depressive symptoms among pregnant women in developing countries<sup>22,23</sup>.

The percentage of women not experiencing anxiety was consistent across both groups; however, among those with anxiety, non-pregnant women exhibited higher scores on the HADS anxiety questionnaires. The prevalence of anxiety in the pregnant group was 35.8%, which demonstrates a difference with a meta-analysis mentioning that anxiety prevalence is 18.7% in pregnant women during the COVID-19 pandemic<sup>17</sup>. Notably, the proportion of women not experiencing anxiety was consistent across both groups; however, among those with anxiety, non-pregnant women exhibited higher scores on the HADS anxiety questionnaires. The prevalence of anxiety in the pregnant group was 35.8%, which demonstrates a difference with a meta-analysis mentioning that anxiety prevalence is 18.7% in pregnant women during the COVID-19 pandemic<sup>17</sup>. The variation in prevalence rates between studies could be attributed to various factors influencing risk, including anxiety and depression levels, educational attainment, body mass index, cultural norms, smoking habits, household income, physical activity levels, sleep quality, availability of social and family support, conception methods, ethnic background, number of prior pregnancies, parity, pregnancy-related complications, maternal age, gestational trimesters, intentionality of pregnancy, and the strength of the support network<sup>17, 24-26</sup>. However, in our study, both pregnant and non-pregnant women had a similar rate of exhibiting anxiety, and even non-pregnant women had higher scores on the HADS anxiety questionnaire. Findings from a study conducted in the COVID-19 era showed that anxiety symptoms were present in 29% of pregnant women compared to 17% of non-pregnant women<sup>7</sup>. Similarly, evidence from another study demonstrated that 33% of pregnant women had experienced anxiety disorder at least once in their lifetime, highlighting their heightened risk<sup>27</sup>.

The factors that worsen anxiety in the course of pregnancy include a decrease in the perception of general support, smoking during pregnancy, and difficulties in household finances. Undereducated, unemployed during pregnancy, with chronic physical illness before pregnancy, a decrease in the perception of general support, difficulties in household finances, disobeying the rules of isolation, and smoking during pregnancy have been mentioned as risk-increasing factors for depression and anxiety during pregnancy in COVID-19<sup>28</sup>.

In our study, we found that three factors relationship quality, pregnancy status, and work status have an independent effect on depression and anxiety related to pregnancy. Pregnant women often experience significant concerns that can be grouped into three main areas: medical conditions, economic status, and the management of daily activities. It is essential to address these worries to ensure a healthy pregnancy and to facilitate a smooth transition into motherhood<sup>29</sup>.

Limited studies examining the psychiatric effects of the SARS and COVID-19 pandemics on pregnant women indicate that this vulnerable group is likely to encounter significant mental health challenges. These challenges stem from various

factors, including uncertainty, social isolation, the severity of the disease, misinformation, and an increased risk of potential pregnancy complications<sup>30</sup>. Enhancing awareness about disease transmission and outlining precautions for prenatal, postpartum, breastfeeding, and newborn care, as well as encouraging psychiatric counseling for patients, is a key to improving the psychiatric well-being of pregnant women<sup>31</sup>. High marital satisfaction, along with a spouse's education and income, can significantly reduce stress, anxiety, and depression in pregnant women, particularly during crises such as COVID-19. Therefore, enhancing marital satisfaction and socioeconomic status is crucial for managing these mental health issues in pregnant women<sup>32,33</sup>. Longitudinal studies are needed to better understand anxiety and depression symptoms in this population during the current pandemic. Future research should also take into account additional factors.

This study had several limitations. Firstly, the participants were drawn from only two clinic centers in Isfahan City. Additionally, we did not investigate other potential factors that might influence depression and anxiety. Lastly, we did not compare the conditions of depression and anxiety after the COVID-19 pandemic with current data from the ongoing pandemic.

**Conclusion:** Findings show that the COVID-19 pandemic has significantly affected maternal mental health, with pregnant women reporting greater depression rates than non-pregnant women. This evidence highlights key issues for health services and policy development. Comprehensive screening protocols for depression and anxiety during prenatal care visits are essential for identifying and addressing maternal mental health concerns early in pregnancy. Additionally, integrated care models that incorporate mental health services into routine prenatal care may help mitigate the burden of depression and anxiety among pregnant women. Supporting the mental health of pregnant women in the pandemic requires a broad strategy that addresses their unique challenges. Future studies should investigate how maternal mental health issues affect mother–infant outcomes over time and identify ways to strengthen maternal well-being during crises.

## Ethical Considerations

This article is the result of a medical student's thesis. Approval was granted by the Ethics Committee of Isfahan University of Medical Sciences (IR.MUI.MED.REC.1401.311).

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## Conflict of Interest

The authors declare that they have no competing interests.

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