COVID-19: Does it Affect Maternal Anxiety and Maternal Fetal Bonding?

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Abstract

Objective: The aim of this study was to examine pregnant women, who are a mentally sensitive group, in terms of anxiety level, prenatal attachment, thought content, and demographic characteristics in the COVID-19 pandemic where quarantine rules are applied.

Methods: Our study is a cross-sectional study. In the first peak of the pandemic, 204 pregnant women with a gestational period ranging from 20 to 40 weeks who visited our hospital on an outpatient basis between April 2020 and June 2020 voluntarily participated in our study. A demographic data form, Generalized Anxiety Disorder-7 (GAD-7) test, Prenatal Bonding Inventory, and COVID-19-related questionnaire were given to these pregnant women. The women were divided into 2 groups as anxious and non-anxious, and the results were compared.

Results: According to the Generalized Anxiety Disorder-7 test, 36.3% (n = 74) of the pregnant women were found to be anxious. Significant differences were found between the 2 groups in the scores of the Prenatal Bonding Inventory, Generalized Anxiety Disorder-7, and COVID-19-related questionnaire (question 1, question 2, question 4, and question 5) ($P < .05$). There was a positive correlation between the scores of the GAD-7 scale and the Prenatal Bonding Inventory scores which were used to measure the anxiety level of pregnant women, and the Prenatal Bonding Inventory scores of the anxious group were significantly higher than those of the non-anxious group, resulting in the view that prenatal anxiety increased bonding.

Conclusions: Our study supported the fact that the COVID-19 pandemic causes anxiety in pregnant women, but it shows that this anxiety increases the level of maternal–fetal bonding.

Keywords: Anxiety, COVID-19, disorder, pandemics, pregnancy

Introduction

Cases of pneumonia of unknown etiology in Wuhan, China, were first reported in December 2019.[1] It was announced by the Chinese Government to the world in January 2020 that a new type of coronavirus SARS CoV-2 was isolated. A pandemic was declared by the World Health Organization due to the rapidly spreading disease affecting the whole world.[2,3] Although death rates vary by country, the average death rate was reported as 1.4%.[4] Because of the quarantine imposed during this period, feelings such as loneliness, anger, distress, danger, and uncertainty were experienced during this period, and the society was more sensitive in terms of spirit.[5] The effects of a pandemic on mental health may pose different problems for particular segments of the society. In a process such as pregnancy, in which the person tries to adapt to new living conditions, role expectations, and physical changes, the person may be vulnerable to stress, anxiety, and depressive symptoms.[6-8]

In a meta-analysis, the prevalence of any anxiety disorder in pregnant women was found to be 15.2% and that of generalized anxiety disorder was found to be 4.1%.[9] In a study conducted in the center where our study was conducted in our country, the rate of pregnant women with anxiety symptoms was reported to be 28.8%.[10] In another study conducted during the COVID-19 pandemic, moderate anxiety symptoms were found to be 21.6% and severe anxiety symptoms were found to be 21.7% using the GAD-7 scale.[11] Studies conducted during the period of SARS pandemic and COVID-19 revealed that pregnant women may experience symptoms of anxiety and fear both for themselves and for the fetus in this period of uncertainty.[12,13] The fact that anxiety and fear that occur especially in pregnant women are related to the content of thoughts about fetus health and the birth process makes this subject worth investigating.[13,14]

Although Rubin did not use the term "bonding" in her study, she pointed out that the mother became aware of the fetal movements in the second trimester and experienced positive emotions about the situation.[15] Lumley[16,17] stated that the baby can be imagined as more human with time during pregnancy and The baby can be envisioned as more human over time during pregnancy and bonding occurs when mothers see the baby as a real person in their imaginations. Some researchers have considered prenatal bonding as a multifaceted term that includes feelings toward the fetus, attitudes and behaviors related to pregnancy, and the role of motherhood.[18] Although bonding is generally a mutual process, there is no response in prenatal bonding, but it seems to be a unique process that develops to ensure the safety of the fetus.[19] Parents' feelings about the unborn baby during pregnancy are related to their possible behaviors after birth, and prenatal bonding may be affected by individual factors and sociodemographic characteristics.[20]

Studies reveal conflicting results between anxiety symptoms and bonding.[21,22] Anxiety in pregnant women can provide an energy for bonding with the fetus and an adaptation to the pregnancy process, but sometimes it can weaken this bond as a result of the person entering a more self-centered dealing process with her anxieties[21,23,24] Continuous and situational anxiety also has an effect on the relationship between anxiety symptoms and the prenatal bonding level.[21] It is known that mental disorders during pregnancy affect both maternal–fetal bonding and birth and after-birth processes.[9,21] Considering such information, the relationship between bonding and anxiety during pregnancy is still not clearly explained.

The aim of this study is to examine pregnant women, who are a mentally sensitive group, in terms of anxiety level, prenatal bonding, thought content, and demographic characteristics in the COVID-19 pandemic where quarantine rules are applied.

Methods

Sampling

Our study was conducted in the first wave of the pandemic. Women with a gestational period ranging from 20 to 40 weeks who visited our hospital between April 2020 and June 2020 voluntarily participated in our study. Exclusion criteria were mental retardation, past mental illness, chronic illness, and any threatening condition for the mother and the fetus during pregnancy.

Materials Used in the Study

Sociodemographic Data Form: A form containing data including age, number of pregnancies, family structure, working status, education level, and the number of abortions was used.

Generalized Anxiety Disorder-7 Test: Developed by Spitzer et al[25] based on diagnostic and statistical manual of mental disorders IV criteria, GAD-7 is a short self-report test that evaluates generalized anxiety disorder. Considering the situation of the person in the last 2 weeks, he/she should give an appropriate answer to the questions asked on a 4-point Likert self-report scale (0 = none, 1 = many days, 2 = more than half of the days, 3 = almost every day). Konkan et al it was adapted to Turkish and its validity and reliability were shown.[26] When the cutoff score was chosen as 10, its sensitivity for the diagnosis of GAD was found to be 89% and its specificity was found to be 82%.[27] The cutoff score of 10 was used in the study.

Prenatal Bonding Inventory: It was developed by Muller and Mercer.[19] It is based on the definition of the unique compassionate relationship established between the fetus and the mother. It was developed to determine women's emotions, thoughts, and bonding levels with the baby during pregnancy. A minimum of 21 and a maximum of 84 points can be obtained from the 4-point Likert scale. The higher the score the pregnant woman gets, the higher the level of bonding.[19,28] The validity and reliability of the scale was made by Yılmaz and Beji.[28]

Anxiety-Related Symptom and Thought Screening Questions: Questions were related to physical symptoms (asked in Symptom Checklist-90) in pregnant women, sleep problems, expectations of how much harm will be caused by COVID-19, concerns about whether their relatives are affected, pandemic during pregnancy, and the fetus. They were asked whether they were worried about whether they would have problems or not.

Question 1: Are you worried that your relatives will be harmed by the COVID-19 pandemic?

Question 2: Do you think you will experience a malfunction during delivery due to the COVID-19 pandemic?

Question 3: Do you have problems related to sleep during the pandemic process?

Question 4: Do you have any physical symptoms? (feeling of shortness of breath, palpitations, sweating not due to heat, cold hot flashes, numbness-tingling, and bodily pain)

Question 5: Do you think the cause of the COVID-19 pandemic will be a problem with your baby?

Question 6: To what extent do you expect to have a severe illness if you have COVID-19?

Statistical Analysis

The numerical analysis of the study was performed using Statistical Package Program for Social Sciences (SPSS) 22 (Armonk, New York, USA). As a result of Power analysis (G * Power 3.1.9 mn.2); 95% confidence interval in determining the sample of the study; 138 individuals should be reached at a significance level of 5% and an effect size of 0.5. Accordingly, 204 people were included in the study. The mean and standard deviations of the demographic information and clinical conditions of the patients were calculated. The correlation between scales and Likert-type questions was determined by Pearson correlation analysis. The answers given to the questions were expressed as percentages in the groups considered as anxious and non-anxious. One-way analysis of variance (ANOVA) test was used to compare GAD-7 scores according to the income level. It was used with independent *t*-test for comparisons between groups. Linear regression analysis was performed to determine predictive factors for PBI and GAD-7 scale scores. Statistical significance level was set at $P < .05$.

Ethical Statement

Approval was obtained from the Bakırçay University ethics committee for the study. The decision number is 2020/9-28 and the date is July 23, 2020.

Results

The study included 204 women who were pregnant with a gestational period ranging between 20 and 40 weeks. Sociodemographic data of the participants are given in Table 1.

Sociodemographic Variables According to Clinical Anxiety Level

Clinically, pregnant women were divided into 2 groups as non-anxious (GAD-7 < 10) and anxious (GAD-7 ≥ 10), and their previous birth patterns, working status, and family structure (nuclear family or extended family) were examined with the chi-square test. There was no significant difference ($P > .05$) between groups. An independent *t*-test was used for comparisons involving numerical points and scores between 2 groups. Significant differences were found between the 2 groups in the scores of the PBI and GAD-7 (question 1, question 2, question 4, and question 5) ($P < .05$). No significant difference was found between the other variables (Table 2). One-way ANOVA test was used to compare GAD-7 scores according to income levels. As a result of the analysis, $F(3,200) = 0.128$, no significant difference was found between the anxiety scores of the patients according to their income levels, with $P = .943$ (income level groups were classified into 5 groups as 1000-2500, 2500-4000, 4000-6000, 6000-10 000, 10 000-Turkish lira and above).

Questions Thought to be Related to the Scale and Anxiety

The mean scores and standard deviations obtained from the scales are given in Table 3. Table 4 shows the answers given as numbers and percentages to the questions thought to be related to anxiety.

Table 1. Demographic Data

	Mean ± SD
Age (years)	28.46 ± 6.10
Education (years)	8.86 ± 4.06
BMI (kg/m²)	28.32 ± 5.14
Number of pregnancies	2.60 ± 1.65
Gestational week	31.80 ±6.15
Number of abortions	0.40 ± 0.84
	n (%)
Working status	
Worker	34 (16.7)
Not worker	170 (83.3)
Family	
Extended family	20 (9.8)
Nuclear family	184 (90.2)

BMI, body mass index.

Table 2. Comparison of Potentially Anxious and Non-anxious Pregnant Women in Terms of GAD-7, COVID-19-Related Questions, PBI, and Clinical Features

	Anxious (n = 74) (Mean ± SD)	Non-anxious (n = 130) (Mean ± SD)	F	P
Age	28.59 ± 6.16	28.39 ± 6.10	0.659	.821
PBI	41.40 ± 11.50	37.18 ± 11.19	0.018	.012
Number of pregnancies	2.73 ± 1.80	2.54 ± 1.57	0.938	.430
GAD-7 score	13.34 ± 2.80	4.39 ± 2.62	1.217	.000
Number of abortions	0.36 ± 0.75	0.42 ±0.90	0.460	.637
Gestational week	32.12 ± 5.96	31.63 ± 6.27	1.058	.585
Education (years)	8.72 ± 4.05	8.95 ± 4.88	0.002	.689
Harm to relatives	3.09 ± 1.22	2.65 ± 1.23	0.043	.013
Delivery problems	2.28 ± 1.15	1.78 ± 1.18	0.548	.003
Sleeping problems	1.57 ± 1.40	1.30 ± 1.32	0.943	.186
Physical symptoms	0.80 ± 1.12	0.31 ± 0.70	33.999	.001
Harm to baby	2.66 ± 1.44	2.02 ± 1.40	0.494	.002

GAD-7, Generalized anxiety disorder-7 test; PBI, Prenatal Bonding Inventory.

Correlation and Linear Regression Analysis

Pearson's correlation analysis showing the variables related to anxiety and bonding is given in Table 5. Linear regression analysis, which was performed to reveal the predictions of variables showing correlation on GAD-7 and PBI, is shown in Tables 6 and 7.

Discussion

Pregnancy is one of the most important events of life that causes social, psychological, and hormonal changes, and mental health problems such as anxiety and depression can occur. Although we used a scale evaluating the symptoms of generalized anxiety disorder in our study and found a rate of 36.3% and a cutoff score of 10 and above, it draws attention to the increase in anxiety disorders in pregnant women during the COVID-19 pandemic compared to other studies.[9,10,29-31]

Studies showing that the COVID-19 pandemic is effective on anxiety experienced during pregnancy also support our findings that anxiety disorders increase in pregnant women during the pandemic period.[32-34]

Although it was not included in the GAD-7 scale, pregnant women were asked about thought content processes and about sleep and physical symptoms in anxiety disorder. Among the pregnant women we consider as anxious and non-anxious, "Question 3: Do you have problems related to sleep during the pandemic process?" and "Question 6: To what extent do you expect to have a severe illness if you have COVID-19?" were asked. There was no significant difference between the mean scores of the answer given to the question. Although there was a significant correlation between sleep problems and GAD-7 scores, it was not one of the predictive factors for the GAD-7 score. It was thought that this situation could be explained by the deterioration in sleep quality independent of anxiety during pregnancy.[35] In case of getting COVID-19, it can be interpreted that there is no significant correlation between the sixth question asked about the course of the disease and the GAD-7 and PBI, and the content of thoughts related to the effects of this disease on them does not affect anxiety

and bonding. In our study, the clinically anxious group had significantly higher scores in the questions of the probability of having a malfunction related to their baby during and/or after birth due to the pandemic. Studies suggesting that women who perceive high risk during pregnancy and pregnancy outcome feel more anxious during pregnancy, supporting our findings.[33,36,37]

The scoring of pregnant women regarding the content of thought that both the fetus would be affected by the disease and that there would be a malfunction during delivery showed a significant positive correlation with GAD-7 and PBI. In regression analysis, thoughts of having problems during pregnancy are predictors of anxiety. It was observed that a negative situation to be experienced in the fetus was a predictor of the PBI score. Our findings were

Table 3. Scale Scores and the Rate of Clinically Anxious Pregnant Women

	n (%)
State of anxiety	
Clinically anxious (GAD-7 ≥ 10)	74 (36.3)
Non-anxious (GAD-7 < 10)	130 (63.7)
	Mean ± SD
GAD-7	7.64 ± 5.08
Prenatal Bonding Inventory	38.71 ± 11.58
COVID-19-related questions	12.86 ± 5.22

GAD-7, Generalized Anxiety Disorder-7 test.

Table 4. Comparison of Those with and Without Anxiety Disorder in Terms of Anxiety Questions Associated with the COVID-19 Period

Questions		Harm to Relatives *n* (%)	Delivery Problems *n* (%)	Sleeping Problems *n* (%)	Physical Symptoms *n* (%)	Harm to Baby *n* (%)	Severity of the Illness* *n* (%)
Answers (points)	Clinic						
Never (0)	Non-anxious	11 (8.5)	30 (42.3)	55 (42.3)	105 (80.8)	31 (23.8)	11 (8.5)
	Anxious	4 (5.4)	9 (36.5)	27 (36.5)	44 (59.5)	11 (14.9)	5 (6.8)
Rarely (1)	Non-anxious	9 (6.9)	16 (13.1)	17 (13.1)	13 (10)	11 (8.5)	37 (28.5)
	Anxious	5 (6.8)	7 (10.8)	8 (10.8)	10 (13.5)	4 (5.4)	23 (31.1)
Sometimes (2)	Non-anxious	35 (26.9)	39 (20.8)	27 (65.9)	9 (6.9)	35 (26.9)	55 (42.3)
	Anxious	12 (16.2)	19 (18.9)	14 (34.1)	13 (17.6)	14 (18.9)	25 (33.8)
Often (3)	Non-anxious	35 (26.9)	43 (19.2)	25 (55.6)	3 (2.3)	31 (23.8)	27 (20.8)
	Anxious	12 (16.2)	32 (27)	20 (44.4)	5 (6.8)	15 (20.3)	18 (24.3)
Always (4)	Non-anxious	40 (30.8)	2 (1.5)	6 (4.6)	0 (0)	22 (16.9)	0 (0)
	Anxious	41 (55.4)	7 (9.5)	5 (6.8)	2 (2.7)	30 (40.5)	3 (4.1)

*Answers to the sixth question were asked to the patients in a way to show that the person's expectations were negative as the score given on the Likert-type scale increased.

Table 5. Correlation Analysis Between GAD-7 Total Score, and Prenatal Attachment Scales

	Bonding Score	Harm to Relatives	Delivery Problems	Sleeping Problems	Physical Symptoms	Harm to Baby
GAD-7 score	0.237**	0.316**	0.349**	0.164*	0.307**	0.368**
Prenatal bonding Inventory	–	0.366**	0.267**	0.207**	0.146*	0.351**

GAD-7, Generalized Anxiety Disorder-7 test.
$**P < .01$, $*P < .05$, Pearson correlation analysis.

consistent with studies showing that pregnant women would not be able to receive safe prenatal care during a pandemic and that pregnant women felt anxious that the fetus would be harmed by the pandemic.[13,38,39] Although the content of negative thoughts that their relatives would be harmed was significantly higher in the anxious group, it was found to be a predictor for both GAD-7 and PBI scores. Studies showing that the health status of the relatives and their thoughts or the affected relatives are related to anxiety during the pandemic period were consistent with our findings.[40,41]

In our study, findings related to somatic symptoms were significantly higher in the anxious group than in the non-anxious group.

Anxiety disorders and somatic symptoms overlap in the general population.[42] The positive correlation between the answer given to the fourth question and the GAD-7 scores in our study suggests that somatic symptoms may be higher in those with high anxiety levels during pregnancy. Another study showing that there is more somatization disorder in those with anxiety disorder supports our findings.[43] When the anxiety scores of 5 categories according to

Table 6. Linear Regression Analysis of Factors Predicting the GAD-7 Scale

Dependent: GAD-7	*B*	95% CI	*P*	Adjusted *R²*
Harm to relatives	0.673	0.044 to 1.302	.036	0.231
Delivery problems	0.697	0.011 to 1.383	.046	
Sleeping problems	-0.041	-0.533 to 0.452	.870	
Physical symptoms	1.512	0.815 to 2.209	.000	
Harm to baby	0.564	-0.035 to 1.162	.065	
Education	-0.157	-0.313 to 0.000	.050	

Table 7. Linear Regression Analysis of Factors Predicting the Prenatal Attachment Scale

Dependent: PBI	*B*	95% CI	*P*	Adjusted *R²*
Harm to relatives	2.095	0.644-3.547	.005	0.193
Delivery problems	-0.046	-1.663-1.572	.956	
Sleeping problems	0.436	-0.720-1.593	.458	
Physical symptoms	1.402	-0.322-3.126	.110	
Harm to baby	1.556	0.144-2.968	.031	
Gestational week	0.361	0.122-0.601	.003	
GAD-7	0.118	-0.208-0.444	.477	

PBI, Prenatal Bonding Inventory; GAD-7, Generalized Anxiety Disorder-7.

income level were examined in the study, no significant difference was found between the groups. Based on our results, it can be inferred that different socioeconomic classes are similarly affected by the pandemic.

Some researchers such as Cranley (1979), prenatal bonding, feelings toward the fetus; it defines it as a versatile structure that includes attitudes and behaviors related to pregnancy and the role of the mother.[44] Similarly, it is stated that prenatal bonding is associated with cognitive, situational, and emotional factors.[45,46] Besides there are opinions stating that prenatal anxiety contributes to maternal–fetal bond; there are also studies indicating that depression and anxiety negatively affect the development of mother–baby relationship and thus the child's cognitive, emotional, and behavioral development.[21,23,47,48,49] The maternal–fetal bond, which is affected by the bonding patterns of adults but has a unique structure, can be considered as a bond where a partner does not respond and basically aims to provide security for the fetus.[19,50] During the pandemic period, the health of the baby, the birth process, and many uncertainties in our environment can increase fear and anxiety in pregnant women.[51,52] Considering this information, positive correlation of prenatal bonding level with anxiety and more negative thought contents can be expected in order to ensure the safety of the fetus. In our study, there was a positive correlation between the scores of the GAD-7 scale and the PBI scores which were used to measure the anxiety level of pregnant women, and the PBI scores of the anxious pregnant group were significantly higher than those of the non-anxious group, resulting in the view that prenatal anxiety increased bonding and it supported our expectations.[47] Considering the predictive factors on GAD-7 and PBI, situational anxiety can also be considered to have an effect on bonding, although in our study, the scores obtained from the answers given to the questions about understanding the anxiety levels of the patients with birth and fetus showed a significantly positive correlation with the level of prenatal bonding. Considering the inconsistent results of anxiety on prenatal bonding, it should be kept in mind that the effects of anxiety symptoms on bonding that can be demonstrated by causality link can be revealed more clearly.

Considering the questions asked in the study and sociodemographic data, gestational week and GAD-7 scores explained 0.193 of the variance of the score obtained from the PBI (Table 7). About 0.231 of the GAD-7 scale scores were explained by the questions asked and the education level. This information is thought to be important in terms of enlightening the anxiety and bonding processes of pregnant women in a period of uncertainty and mass fear during the first wave of the pandemic.

The fact that this study was conducted during the first wave of the pandemic and that it consisted of non-repeatable findings with a cutoff score of 10 in terms of the GAD-7 scale score is a strength of the study. The fact that the State-Trait Anxiety Scale was not used, that an anxiety inventory was not used for pregnant women, that an anxiety inventory related to the COVID period was not used (it was not available at the time of the study), and that the study was conducted with a single center were some of the limitations of the study.

The results of our study support that the COVID-19 pandemic causes anxiety in pregnant women, but it shows that this anxiety increases the level of prenatal bonding. It can be said that similar studies are needed in order to understand the effects of pandemics and other disasters that may arise on pregnant women and fetus, which can be evaluated as such but can cause a constant state of anxiety.

References

1. Wang C, Horby PW, Hayden FG, Gao GF. A novel coronavirus outbreak of global health concern. *Lancet*. 2020;395(10223): 470-473. **[CrossRef]**
2. Zhu N, Zhang D, Wang W, et al. A novel coronavirus from patients with pneumonia in China, 2019. *N Engl J Med*. 2020;382(8):727-733. **[CrossRef]**
3. WHO Virtual press conference on COVID-19. Available at: https://www.who.int/docs/default source/coronaviruse/transcripts/who-audi o-emergencies-coronavirus-press-conference-full-and-final-11mar20 20.pdf?sfvrsn=cb432bb3_2.
4. Salzberger B, Buder F, Lampl B, Ehrenstein B, Hitzenbichler F, Hanses F. Epidemiology of SARS-CoV-2 infection and COVID-19. *Internist (Berl)*. 2020;61(8):782-788. **[CrossRef]**
5. Wu Y, Zhang C, Liu H, et al. Perinatal depressive and anxiety symptoms of pregnant women during the coronavirus disease 2019 outbreak in China. *Am J Obstet Gynecol*. 2020;223(2):240.e1-240.e9. **[CrossRef]**
6. Biaggi A, Conroy S, Pawlby S, Pariante CM. Identifying the women at risk of antenatal anxiety and depression: a systematic review. *J Affect Disord*. 2016;191:62-77. **[CrossRef]**
7. Caparros-Gonzalez RA, Alderdice F. The COVID-19 pandemic and perinatal mental health. *J Reprod Infant Psychol*. 2020;38(3):223-225. **[CrossRef]**
8. Taubman-Ben-Ari O, Chasson M, Abu Sharkia S, Weiss E. Distress and anxiety associated with COVID-19 among Jewish and Arab pregnant women in Israel. *J Reprod Infant Psychol*. 2020;38(3):340-348. **[CrossRef]**
9. Dennis CL, Falah-Hassani K, Shiri R. Prevalence of antenatal and postnatal anxiety: systematic review and meta-analysis. *Br J Psychiatry*. 2017;210(5):315-323. **[CrossRef]**
10. Arslan B, Arslan A, Kara S, Öngel K, Mungan MT. Risk factors for pregnancy anxiety and depression: assessment in 452 cases. *Tepecik Dergisi*. 2011;21(2):79-84. **[CrossRef]**
11. Preis H, Mahaffey B, Heiselman C, Lobel M. Pandemic-related pregnancy stress and anxiety among women pregnant during the coronavirus disease 2019 pandemic. *Am J Obstet Gynecol MFM*. 2020;2(3):100155. **[CrossRef]**
12. Lee CH, Huang N, Chang HJ, Hsu YJ, Wang MC, Chou YJ. The immediate effects of the severe acute respiratory syndrome (SARS) epidemic on childbirth in Taiwan. *BMC Public Health*. 2005;5:30. **[CrossRef]**
13. Mizrak Sahin B, Kabakci EN. The experiences of pregnant women during the COVID-19 pandemic in Turkey: a qualitative study. *Women Birth*. 2021;34(2):162-169. **[CrossRef]**
14. Blackmore ER, Gustafsson H, Gilchrist M, Wyman C, 'G O'Connor T. Pregnancy-related anxiety: evidence of distinct clinical significance from a prospective longitudinal study. *J Affect Disord*. 2016;197:251-258. **[CrossRef]**
15. Rubin R. Maternal tasks in pregnancy. *J Adv Nurs*. 1976;1(5):367-376. **[CrossRef]**

16. Lumley JM. The development of maternal-foetal bonding in first pregnancy. Third International Congress, Psychosomatic Medicine in Obstetrics and Gynaecology 1972.

17. Lumley JM. Attitudes to the fetus among primigravidae. *Aust Paediatr J*. 1982;18(2):106-109. [CrossRef]

18. Cranley MS. Development of a tool for the measurement of maternal attachment during pregnancy. *Nurs Res*. 1981;30(5):281-284. [CrossRef]

19. Muller ME. Development of the prenatal attachment inventory. *West J Nurs Res*. 1993;15(2):199-211. [CrossRef]

20. Redshaw M, Martin C. Babies, 'bonding' and ideas about parental 'attachment'. *J Reprod Infant Psychol*. 2013;31(3):219-221. [CrossRef]

21. Göbel A, Stuhrmann LY, Harder S, Schulte-Markwort M, Mudra S. The association between maternal-fetal bonding and prenatal anxiety: an explanatory analysis and systematic review. *J Affect Disord*. 2018;239:313-327. [CrossRef]

22. Mako HS, Deak A. Reliability and validity of the Hungarian version of the Maternal Antenatal attachment Scale. *Int J Gynecol Obstet Res*. 2014;2(1):1-3.

23. Brazelton TB, Keefer CH. *The Early-Mother Child Relationship: a Developmental View of Woman as Mother, The Woman Patient: Concepts of Femininity and the Life Cycle*. New York: Plenum Press; 1982:95-109.

24. Leifer M. Pregnancy. *Signs*. 1980;5(4):754-765. [CrossRef]

25. Spitzer RL, Kroenke K, Williams JB, Löwe B. A brief measure for assessing generalized anxiety disorder: the GAD-7. *Arch Intern Med*. 2006;166(10):1092-1097. [CrossRef]

26. Konkan R, Aydın E, Güçlü O, Şenormancı Ö, Sungur MZ. Obsessive beliefs in panic disorder patients. *Arch Neurol Psychiatry*. 2013;50:141-146.

27. Kroenke K, Spitzer RL, Williams JB, Monahan PO, Löwe B. Anxiety disorders in primary care: prevalence, impairment, comorbidity, and detection. *Ann Intern Med*. 2007;146(5):317-325. [CrossRef]

28. Yılmaz SD, Beji NK. Turkish version of prenatal attachment inventory: a study of reliability and validity. *J Anatolia Nurs Health Sci*. 2013;16:103-109.

29. Glover V. Maternal depression, anxiety and stress during pregnancy and child outcome; what needs to be done. *Best Pract Res Clin Obstet Gynaecol*. 2014;28(1):25-35. [CrossRef]

30. Martini J, Petzoldt J, Einsle F, Beesdo-Baum K, Höfler M, Wittchen HU. Risk factors and course patterns of anxiety and depressive disorders during pregnancy and after delivery: a prospective-longitudinal study. *J Affect Disord*. 2015;175:385-395. [CrossRef]

31. Tiryaki Ö, Doğu Ö, Gök K, Bostancı MS. Fear of birth: an increasing fear in pregnancy During the COVID-19 period. *cjms*. 2022;7(2):252-258. [CrossRef]

32. Saccone G, Florio A, Aiello F, et al. Psychological impact of COVID-19 in pregnant women. *Am J Obstet Gynecol*. 2020;223(2):293-295. [CrossRef]

33. Moyer CA, Compton SD, Kaselitz E, Muzik M. Pregnancy-related anxiety during COVID-19: a nationwide survey of 2740 pregnant women. *Arch Womens Ment Health*. 2020;23(6):757-765. [CrossRef]

34. Kılıç A, Gök K, Yaghouti L, et al. Anxiety, attitudes-behaviors, coping styles, and social support among high-risk pregnant women in the late period of the coronavirus disease 2019 pandemic. *Rev Assoc Med Bras (1992)*. 2022;68(3):337-343. [CrossRef]

35. Sedov ID, Cameron EE, Madigan S, Tomfohr-Madsen LM. Sleep quality during pregnancy: a meta-analysis. *Sleep Med Rev*. 2018;38:168-176. [CrossRef]

36. Harpel TS. Fear of the unknown: ultrasound and anxiety about fetal health. *Health (London)*. 2008;12(3):295-312. [CrossRef]

37. Güçlü O, Şenormanci G, Tüten A, Gök K, Şenormanci Ö. Perinatal grief and related factors after termination of pregnancy for fetal anomaly: one-year follow-up study. *Noro Psikiyatr Ars*. 2021;58(3):221-227. [CrossRef]

38. Walton G. COVID-19. The new normal for midwives, women and families. *Midwifery*. 2020;87:102736. [CrossRef]

39. Brooks SK, Weston D, Greenberg N. Psychological impact of infectious disease outbreaks on pregnant women: rapid evidence review. *Public Health*. 2020;189:26-36. [CrossRef]

40. Maaravi Y, Heller B. Not all worries were created equal: the case of COVID-19 anxiety. *Public Health*. 2020;185:243-245. [CrossRef]

41. Wang ZH, Yang HL, Yang YQ, et al. Prevalence of anxiety and depression symptom, and the demands for psychological knowledge and interventions in college students during COVID-19 epidemic: A large cross-sectional study. *J Affect Disord*. 2020;275:188-193. [CrossRef]

42. Kohlmann S, Gierk B, Hilbert A, Brähler E, Löwe B. The overlap of somatic, anxious and depressive syndromes: a population-based analysis. *J Psychosom Res*. 2016;90:51-56. [CrossRef]

43. Huang Y, Wang Y, Zeng L, et al. Prevalence and correlation of anxiety, insomnia and somatic symptoms in a Chinese population during the COVID-19 Epidemic. *Front Psychiatry*. 2020;11:568329. [CrossRef]

44. Cranley MS. *The Impact of Perceived Stress and Social Support on Maternal-Fetal Attachment in the Third Trimester* [Doctoral dissertation]. Madison: The University of Wisconsin.

45. Zimerman A. Conceptualizing prenatal attachment: Toward a multidimensional view. *J Prenat Perinat Psychol Health*. 2003;18(2):109.

46. Doan HM, Zimerman A. Maternal prenatal attachment: Cranley's contribution twenty-five years later. *Int J Prenat. Perinat. Psychol Med*. 2007;19:137-151.

47. Bosquet M, Egeland B. Associations among maternal depressive symptomatology, state of mind and parent and child behaviors: implications for attachment-based interventions. *Attach Hum Dev*. 2001;3(2):173-199. [CrossRef]

48. Hart R, McMahon CA. Mood state and psychological adjustment to pregnancy. *Arch Womens Ment Health*. 2006;9(6):329-337. [CrossRef]

49. Martins C, Gaffan EA. Effects of early maternal depression on patterns of infant-mother attachment: a meta-analytic investigation. *J Child Psychol Psychiatry*. 2000;41(6):737-746. [CrossRef]

50. Condon JT. The assessment of antenatal emotional attachment: development of a questionnaire instrument. *Br J Med Psychol*. 1993;66(2):167-183. [CrossRef]

51. Brooks SK, Webster RK, Smith LE, et al. The psychological impact of quarantine and how to reduce it: rapid review of the evidence. *Lancet*. 2020;395(10227):912-920. [CrossRef]

52. Giurgescu C, Penckofer S, Maurer MC, Bryant FB. Impact of uncertainty, social support, and prenatal coping on the psychological well-being of high-risk pregnant women. *Nurs Res*. 2006;55(5):356-365. [CrossRef]