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Anxiety and depression symptoms in the same pregnant women before and during the COVID-19 pandemic

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Abstract

Objectives: With clinical experience from previous coronavirus infections, public health measures and fear of infection may have negative psychological effects on pregnant women. This study aimed to compare the level of anxiety and depression in the same pregnant women before and during the COVID-19 pandemic.

Methods: The pregnant women continuing pregnancy who participated in the first study which was undertaken to clarify the factors associated with mental health of pregnant women before the COVID-19 pandemic, were included for the current study during the outbreak. Anxiety and depression symptoms of the same pregnant women were evaluated by using the Inventory of Depression and Anxiety Symptoms II and Beck Anxiety Inventory twice before and during the pandemic.

Results: A total of 63 pregnant women completed questionnaires. The mean age of the women and the mean gestational age was 30.35 ± 5.27 years and 32.5 ± 7 weeks, respectively. The mean total IDAS II score was found to increase from 184.78 ± 49.67 (min: 109, max: 308) to 202.57 ± 52.90 (min: 104, max: 329) before and during the SARS-CoV-2 pandemic. According to the BAI scores the number of patients without anxiety (from 10 to 6) and with mild anxiety (from 31 to 24) decreased and patients with moderate (from 20 to 25) and severe anxiety (from 2 to 8) increased after SARS-CoV-2 infection. Multivariate linear

regression analysis revealed that obesity and relationship with her husband are the best predictors of IDAS II scores.

Conclusions: This study indicated that COVID-19 outbreak affects the mental health of pregnant women negatively which leads to adverse birth outcomes. The level of anxiety and depression symptoms of pregnant women during the COVID-19 infection significantly increased. Healthcare professionals should establish comprehensive treatment plans for pregnant women who are highly vulnerable population to prevent mental trauma during the infectious disease outbreaks.

Keywords: anxiety; COVID-19; depression; IDAS II; SARS-CoV-2.

Introduction

COVID-19 (SARS-CoV-2), which is transmitted to humans by the bat and the pangolin, has rapidly spread to the whole world since it was first reported in Wuhan, China, in December 2019 [1]. The World Health Organization (WHO) declared the coronavirus infection as a pandemic on March 11, 2020 [2]. At the time of this writing, the number of infected people with SARS-CoV-2 has reached approximately 18 million, resulting in almost 700,000 deaths. Many people experience increased anxiety and depression with the uncertainty and isolation, public safety protocols required such as border closures, transportation restrictions, social isolation to reduce the spread of coronavirus can cause adverse psychological effects on people [3, 4].

Approximately 10–15% of all pregnant women experience a variety of emotional changes that increase the risk of anxiety and depression, which can adversely affect both pregnant women and developing fetuses [5]. Depression and anxiety during pregnancy may increase the risk for miscarriage, preterm birth, lower birth weight, lower Apgar score, and fetal death [6]. Children of mothers with a high level of stress during pregnancy may show emotional, behavioral, and cognitive problems and may be at higher risk for neurodevelopmental impairment [7].

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It is known that previous coronavirus outbreaks i.e., Severe Acute Respiratory Syndrome (SARS) and Middle East Respiratory Syndrome (MERS), and the H1N1 infection have been associated with adverse maternal and fetal complications, however, the relationship between SARS-CoV-2 and pregnancy complications has not yet been clearly identified [8, 9]. The SARS-CoV-2 pandemic condition creates an additional risk factor likely to increase the stress on pregnant women who are already prone to depression and anxiety. These women are naturally concerned not only with their own health but also for their unborn babies due to infectious diseases. Targeted interventions applied after diagnosis of anxiety and depression can improve the health of newborns and reduce adverse consequences during this pandemic.

To date, there are limited studies on the psychological state of pregnant women during the SARS-CoV-2 outbreak. This study aims to compare the anxiety and depression scores from prior to and during the SARS-CoV-2 pandemic in pregnant women.

Materials and methods

Study population

SARS-CoV-2 was first reported and confirmed officially by the Turkish Ministry of Health on March 11, 2020. Since June 1, 2018, we had already been conducting a prospective study evaluating the association between depression and anxiety scores and pregnancy-associated plasma protein-A levels measured at the time of first-trimester screening (11–14 weeks of gestation) in pregnant women at Istanbul Medeniyet University, Goztepe Training and Research Hospital. First-trimester ultrasound exams were consistently performed by the same sonographer (RA), and included the measurement of nuchal translucency (NT), the determination of fetal viability and the examination of certain anatomic structures (head, brain, stomach, abdomen, bladder, and extremities). All patients admitted to the outpatient clinic for first-trimester screening were also asked to complete the Inventory of Depression and Anxiety Symptoms II (IDAS II) and Beck Anxiety Inventory (BAI). These inventory scales were conducted prior to the outbreak of the SARS-COV-2 outbreak.

In their second or third trimester (during SARS-COV-2 pandemic), we retested those whose IDAS II and BAI scores were already available from the first-trimester testing, (before the SARS-COV-2 pandemic). The presence of SARS-CoV-2-related symptoms in the previous months (fever, cough, diarrhea, shortness of breath, sputum, myalgia) was investigated. Data were collected using the personal information form, the IDAS II and the BAI by the same researcher (RA) in face-to-face interviews. For each participant, detailed demographic data were recorded, including age, body mass index (BMI), gravida, parity, number of children, mode of previous delivery, elapsed time after the last delivery, education and income levels, employment, duration of marriage, partner's education level, household size, comorbidities, migration status, the relationship with her husband, own family and

husband's family and her husband's relationship with her family. History of mental health problems, obstetric history, pregnancy complications (threatened abortion, hyperemesis gravidarum, presence of diabetes mellitus, hypertension), intended or unintended pregnancy were evaluated. Only those who reside in Turkey, can speak and understand Turkish and have sufficient reading and writing skills to properly complete surveys were included in the study. We excluded those with a history of any psychiatric illness or those carrying an anomalous fetus from the study.

Clinical measures

The BAI questionnaire, which includes 21 items, screen for the presence of anxiety symptoms such as heart-pounding, nervousness, inability to relax, and dizziness, or light-headedness. The participant rated each question on a scale of 0–3. In this survey, overall total scores of 0–9 indicate normal or no anxiety, scores of 10–18 indicated mild to moderate anxiety, scores 19–29 shown moderate to severe anxiety, and scores 30–63 indicated severe anxiety. The Turkish version has previously been found to be reliable and valid [10].

In this study, the IDAS II was used to evaluate the depression and anxiety of the participants. The IDAS II, which includes 99 items, was developed by Watson to assess specific symptoms of major depression, anxiety disorders, and bipolar disorder. The Turkish validity and reliability studies were performed by Irak. The Turkish IDAS-II subscales revealed Cronbach's alpha values ranged between 0.947 and 0.949 and the items have a relatively high internal consistency [11].

Ethical approval

Ethical approval was obtained from the Clinical Studies Ethics Committee of Istanbul Medeniyet University, Goztepe Training and Research Hospital, (2020/0400). Informed consent was taken from the participants in the study.

Power calculation and statistical analysis

All statistical analyses were performed using SPSS 18.0. A p-value of <0.05 was considered statistically significant. A power analysis was revealed that a sample of 54 patients was required to achieve a power of 0.95 in a test based on $\alpha=0.05$. The power of the present study was calculated as 86.5%. The McNemar test was used to compare the results of BAI before and after the pandemic. A paired-samples *t*-test was used to compare the results of IDAS II before and after the SARS-COV-2 outbreak. Categorical variables were described through absolute frequencies and continuous variables through mean and standard deviation (SD). Multiple regressions were performed with the main characteristics of the participants as predictors and their factor score on each of the IDAS II and BAI.

Results

From April 12 to May 27, 2020, a total of 63 pregnant women completed questionnaires. The mean age and mean gestational age in the study population were 30.4 ± 5.3 years

and 32.5 ± 7 weeks, respectively. Of the study population, 22.2% ($n=7$) were overweight and 20.6% ($n=29$) were obese. Both inventories were again filled out in the second trimester by 36.6% ($n=14$) of the patients and in the third trimester for the remainder of the group (63.4%, $n=15$). The average gravida was 2.1 ± 1.2 (1–5) and 52.3% of participants already had one or more children. Of the total, 54% were housewives with 62% stating their pregnancies were planned. The average monthly income of participants was at typical levels in 61.9% of the women, with a higher than average income in 38.1% of the families. Almost all (91.7%) of patients were part of a nuclear family. At the time of the research, none of the participants and their whole family members reported job loss during the SARS-CoV-2 pandemic. None of the pregnant women were suspected, probable, or confirmed cases for SARS-CoV-2 infection and none reported any SARS-CoV-2 infections within their household. Table 1 summarizes the sociodemographic and clinical characteristics of the sample.

The mean total IDAS II score was found to increase from 184.8 ± 49.8 (109–308) pre-pandemic to 202.6 ± 52.9 (104–329) during the SARS-CoV-2 pandemic, the difference in anxiety and depression of participating patients between the periods was statistically significant ($p < 0.001$) (Table 2). Furthermore, it was observed according to the BAI scores the number of patients without anxiety (from 10 to 6) and with mild anxiety (from 31 to 24) decreased and patients with moderate (from 20 to 25) and severe anxiety (from 2 to 8) increased after SARS-CoV-2 pandemic state ensued (Table 3).

Multiple linear regression was used to explore which of the challenges were most associated with anxiety and depression. Thus, the relationship with her husband, history of depression, occupation, level of education, planned or unplanned pregnancy, BMI, duration of marriage, duration of last delivery were assessed in this study. Multivariate linear regression analyses showed that relationship with her husband and BMI were associated with the state of depression and anxiety ($p=0.02$ and $p=0.001$) (Table 4). In obese pregnant women, IDAS II scores increased more than others before and during the pandemic.

Discussion

Principal findings

To the best of our knowledge, this is the first study that compares the effect of SARS-CoV-2 pandemic condition on depression and anxiety symptoms in pregnant women both before and during the SARS-CoV-2 outbreak. This cross-sectional survey study revealed that coronavirus pandemic

Table 1: Sociodemographic characteristics of the participants ($n=63$).

	n, %	Mean	Standard deviation
Maternal age, years	63	30.35	5.27
Gravida	63	2.08	1.22
Parity	32	1.38	0.61
Number of other children	33	1.24	0.66
Second trimester	28	29.51	7.06
Third trimester	35	32.08	4.68
Body mass index			
Underweight	7, 11.1		
Normal	29, 46		
Overweight	14, 22.2		
Obese	13, 20.6		
Time from last birth	24	49.46	36.94
Marriage time, months	57	62.70	65.18
SBP/DBP	53	101.51	10.77
	53	62.55	8.75
Educational level			
Primary school	10, 16.2		
Secondary school	23, 37.1		
High school	29, 46.8		
Migration status	27, 42.8		
Relationship with her husband			
Good	58, 92		
Moderate	5, 8		
Relationship with her husband's family			
Good	53, 84		
Moderate	6, 9		
Bad	4, 6		
Relationship with her family			
Good	62, 98.4		
Moderate	1, 1.6		
Her husband's relationship with her family			
Good	55, 87.3		
Moderate	6, 9.5		
Bad	2, 3.1		
Household size			
Nuclear family	55, 85.7		
Non-nuclear family	8, 14.3		
Employment status of women			
Unemployed	34, 53.9		
Official	21, 33.3		
Worker	8, 12.6		
Employment status of husbands			
Officer	9, 14.3		
Worker	15, 23.8		
Own business	12, 19		
Private	27, 42.9		
Educational level of husband			
Primary school	23, 36.6		
Secondary school	20, 31.7		
High school	20, 31.7		
Intended pregnancy	39, 61.9		
Unintended pregnancy	24, 38.1		
Level of income			
High	24, 38.1		

Table 1: (continued)

	n, %	Mean	Standard deviation
Moderate	39, 61.9		
Mode of previous delivery			
Cesarean delivery	17, 54.8		
Spontane vaginal delivery	14, 45.2		
Pregnancy complication			
Threatened abortion	10, 34.4		
Hyperemesis gravidarum	13, 44.8		
Diabetes mellitus	4, 13.7		
Hypertension	2, 6.8		
Tenant	30, 47.6		
Homeowner	33, 52.4		

Table 2: Comparison of IDAS II scores before and during the COVID-19 infection.

	Mean	Standard deviation	Minimum	Maximum	p-Value
Before the infection	184.78	49.67	109	308	<0.001
During the infection	202.57	52.90	104	329	

has a significant psychological impact on maternal physiological state, as confirmed by two different inventory scales including IDAS-II and BAI. To be able to assess depression and anxiety symptoms, using a single evaluation scale, instead of multiple scales, is preferred as it eliminates other factors related to common variances. Therefore, IDAS II was developed as a single comprehensive measure to assess diverse symptomatology while eliminating confounding methodological factors. Furthermore, the relationship with her husband and BMI were associated with a state of depression and anxiety during pregnancy regardless of pandemic conditions. This study indicates that pregnant women are vulnerable to mental state changes during the

SARS-CoV-2 pandemic and deserve special care to cope with the high level of anxiety and depression generated by a period of uncertainty and stress.

Comparison with other studies

Pregnancy is a particularly vulnerable time and studies with measures of mental health reported that pregnant women experience higher levels of distress during an infectious disease outbreak [12]. In Turkey, the first case of SARS-CoV-2 was reported on 11 March 2020, after six days, the first death due to the SARS-CoV-2 occurred on 17 March. The Turkish government enacted strict rules, such as border closures, transportation restrictions, and quarantine to prevent the spread of infection and all these interventions were continued throughout the study period [13]. The prolongation of the pandemic will have inevitably devastating effects on individuals economically and financially, and as a consequence, undesirable effects on people's mental health will also arise [14]. We conducted this study in a period when the SARS-CoV-2 spread was at its highest in our country and there was a lot of uncertainty about the course of the pandemic and the impact of SARS-CoV-2 infection on pregnancy.

Similar to our results, Wu et al. reported that the prevalence of depressive symptoms was positively associated with the number of newly confirmed cases of SARS-CoV-2, suspected infections, and deaths per day in China [15]. In Canada, 1987 pregnant women were evaluated and compared with previous community pregnancy cohorts in terms of anxiety, depression, and pregnancy-specific anxiety during the SARS-CoV-2 pandemic. They found that pregnant participants had higher level of depression, general anxiety, and pregnancy-specific anxiety symptoms than in previous community pregnancy cohorts with similar demographic profiles. However, unlike our study, in Lebel's study, pregnant women across Canada were recruited via social media to complete an online survey [16]. Answering survey questions

Table 3: Change of anxiety level of pregnant women according to BAI scores between the before and during the COVID-19 infection.

	Before COVID-19						During COVID-19		p-Value
	None		Mild		Moderate		Severe		
	N	%	n	%	n	%	n	%	
None	3	30	6	60	1	10	0	0	0.004
Mild	3	9.7	16	51.6	12	38.7	0	0	
Moderate	0	0	2	10	12	60	6	30	
Severe	0	0	0	0	0	0	2	100	

Table 4: Multiple regressions assessing the relationship between sociodemographic and clinical characteristics and IDAS II scores of the participants.

Predictors	Adjusted R ²	B	p-Value	95% CI lower bound	95% CI upper bound
Relationship with her husband	0.814	56.25	0.020	10.28	102.22
History of depression		54.28	0.062	−3.26	111.83
Profession		1.66	0.833	−14.95	18.26
Educational level		1.27	0.845	−12.43	14.96
Intended pregnancy		−6.35	0.647	−35.64	22.94
BMI		37.91	0.001	19.92	55.90
Marriage time		−0.21	0.195	−0.55	0.12
Time since the last delivery		0.04	0.843	−0.44	0.53

B, under standardized beta; SE, Standard error for the under standardized beta; P, probability value; CI, confidence intervals.

^ap<0.05 was considered statistically significant.

without the physical presence of the interviewer may have influenced the patients' responses.

This cross-sectional study of an ongoing prospective cohort, compared depression and anxiety scores of the same women at different gestational ages before and following the SARS-CoV-2 pandemic by using IDAS II and BAI. Data on the specific effect of gestational age on anxiety and depression in pregnancy is still limited. Da Costa et al. evaluated the variations in stress levels over the course of pregnancy and they reported significantly higher pregnancy-specific stress in the first and third trimester of pregnancy [17]. In another study, the anxiety symptoms were determined by using the State-Trait Anxiety Inventory (STAI) and they found average STAI scores remained statistically stable over time throughout pregnancy [18].

On the contrary, the anxiety level of SARS-CoV-2 positive pregnant women was appeared low at the tail-end of the pandemic in the UK due to increased available clinical information and reassurance through social media, healthcare professionals, and primary care. However, the number of participants in that study was too few to reach a statistically valid result [19].

In our study, depression and anxiety scores were considerably higher during the pandemic than pre-pandemic scores in a cohort of pregnant women with similar demographic profiles. These results point out that SARS-CoV-2 may aggravate psychological challenges for pregnant women, with the potential for both short and long term impacts on the developing fetus. Mental health problems frequently go unnoticed and therefore untreated during pregnancy, but if discovered, treatment results in favorable outcomes.

Strengths and limitations

Some limitations and strengths should be taken into account when interpreting the results of our study. One

limitation is the sample size but power analysis indicated that reduced the effect of this limitation. One of our strengths was while most other studies, administered questionnaires online, thus preventing a face-to-face evaluation of the participants, in our study, the same researcher contacted each patient face-to-face to complete the IDAS II and BAI interviews. The most striking strength of our study is the access to data on anxiety and depression in pregnancy we had fortuitously collected pre-pandemic, and our ability to compare these same data points to mid-pandemic surveys from the same group of women. Another important aspect of our study was the depth of detailed sociodemographic and clinical characteristics recorded for each participant. Because these sociodemographic parameters were mostly invariant during the study period, changes in test scores could more clearly be attributed to the onset of the pandemic and resultant psychological pressures.

Clinical and research implication

Pregnancy may increase the tendency towards anxiety and depression for some women. This change of mental health status is often associated with the offspring's neuro-cognitive development, later psychopathologies, as well as maternal health and functioning. The SARS-CoV-2 pandemic may exacerbate pregnant women's prenatal distress and psychiatric symptomatology. Critical new research is needed to evaluate the impact of maternal anxiety and depression due to the pandemic on the perinatal and postnatal outcomes, and long-term fetal neuro-behavioral consequences. Intervention should be prioritized to ensure optimal perinatal and infant mental health. Obstetrician and mental health specialists can prevent adverse outcomes by identifying problems early and establishing comprehensive treatment plans for

pregnant women in conditions such as extreme stress, emergencies and conflict situations, and natural disasters.

Conclusions

In conclusion, our results pointed out that depressive and anxiety symptoms were significantly increased during the SARS-CoV-2 pandemic compared with pre-pandemic surveys. Effective screening strategies for depression and anxiety symptoms during the SARS-CoV-2 pandemic should be prioritized to allow for timely treatment. This may improve the personal quality of life and daily functioning of women who are bringing forth new life during a “time of plague”.

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References

1. Liao X, Wang B, Kang Y. Novel coronavirus infection during the 2019–2020 epidemic: preparing intensive care units—the experience in Sichuan Province, China. *Intensive Care Med* 2020; 46:357–60.
2. Cucinotta D, Vanelli M. WHO declares COVID-19 a pandemic. *Acta Biomed* 2020;91:157–60.
3. Cheng VC, Wong SC, To KK, Ho PL, Yuen KY. Preparedness and proactive infection control measures against the emerging novel coronavirus in China. *J Hosp Infect* 2020;104:254–5.
4. Wang C, Pan R, Wan X, Tan Y, Xu L, Ho CS, et al. Immediate psychological responses and associated factors during the initial stage of the 2019 coronavirus disease (COVID-19) epidemic among the general population in China. *Int J Environ Res Publ Health* 2020; 17:1729.
5. NICE. Antenatal and postnatal mental health: clinical management and service guidance. Clinical Guidelines. No: 192. London: National Institute for Health and Care Excellence (UK); 2014.
6. Alder J, Fink N, Bitzer J, Hösl I, Holzgreve W. Depression and anxiety during pregnancy: a risk factor for obstetric, fetal, and neonatal outcome? A critical review of the literature. *J Matern Neonatal Med* 2007;20:189–209.
7. Kinsella MT, Monk C. Impact of maternal stress, depression, and anxiety on fetal neurobehavioral development. *Clin Obstet Gynecol* 2009;52:425–40.
8. Mosby, LG, Rasmussen, SA, Jamieson, DJ. 2009 pandemic influenza A (H1N1) in pregnancy: a systematic review of the literature. *Am J Obstet Gynecol* 2011;205:10–8.
9. Lam CM, Wong SF, Leung TN, Chow KM, Yu WC, Wong TY, et al. A case-controlled study comparing clinical course and outcomes of pregnant and non-pregnant women with severe acute respiratory syndrome. *BJOG An Int J Obstet Gynaecol* 2004;111:771–4.
10. Ulusoy M, Sahin NH, Erkmen H. Turkish version of the Beck anxiety inventory: psychometric properties. *J Cognit Psychother*; New York 1998;12:163–72.
11. Irak M, Albayrak, EO. Psychometric properties of the expanded version of the inventory of depression and anxiety symptoms in a Turkish population. *Psychol Rep* 2020;123:517–45.
12. Brooks S, Weston D, Greenberg N. Psychological impact of infectious disease outbreaks on pregnant women: rapid evidence review. *medRxiv* in press; 2020.
13. Durankuş F, Aksu E. Effects of the COVID-19 pandemic on anxiety and depressive symptoms in pregnant women: a preliminary study. *J Matern Fetal Neonatal Med* 2020;18:1–7.
14. Thapa SB, Mainali A, Schwank SE, Acharya G. Maternal mental health in the time of the COVID-19 pandemic. *Acta Obstet Gynecol Scand* 2020;99:817–18.
15. Wu Y, Zhang C, Liu H, Duan C, Li C, Fan J, et al. Perinatal depressive and anxiety symptoms of pregnant women along with COVID-19 outbreak in China. *Am J Obstet Gynecol* 2020;10:S0002-9378(20) 30534-2. <https://doi.org/10.1016/j.ajog.2020.05.009>.
16. Lebel C, MacKinnon A, Bagshawe M, Tomfohr-Madsen L, Giesbrecht G. Elevated depression and anxiety among pregnant individuals during the COVID-19 pandemic *J Affect Disord* 2020; 277:5–13.
17. Schubert KO, Air T, Clark SR, Grzeskowiak LE, Miller E, Dekker GA, et al. Trajectories of anxiety and health related quality of life during pregnancy. *PloS One* 2017;12:e0181149.
18. Da Costa D, Larouche J, Dritsa M, Brender W. Variations in stress levels over the course of pregnancy: factors associated with elevated hassles, state anxiety and pregnancy-specific stress. *J Psychosom Res* 1999;4:609–21.
19. Kotabagi P, Fortune L, Essien S, Nauta M, Yoong W. Anxiety and depression levels among pregnant women with COVID-19. *Acta Obstet Gynecol Scand* 2020;99:953–954.