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The COVID-19 outbreak increases maternal stress during pregnancy, but not the incidence of postpartum depression

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Abstract

The COVID-19 pandemic affects society and may especially have an impact on mental health of vulnerable groups, such as perinatal women. This prospective cohort study compared perinatal symptoms of depression and stress during and before the pandemic. Pregnancy-specific stress increased significantly in women during the pandemic. We found no increase in depressive symptoms during pregnancy nor an increase in incidence of postnatal depression during the pandemic. Clinicians should be aware of increased stress in pregnant women and offer adequate care.

Key words

COVID-19 pandemic; pregnancy-specific stress; perinatal; Depression

Introduction

The outbreak of the COVID-19 pandemic and subsequently the lockdown, has had a substantial impact on society, especially for vulnerable groups in the population such as pregnant women. Pregnancy and the postpartum period are already vulnerable periods of time, which can co-occur with heightened levels of distress in many women (Woody et al. 2017). Moreover, this pandemic has led to substantial changes in obstetric care, for example, the frequency of face-to-face consultations decreased during pregnancy. Pregnant women had to deal with the anxiety of infection, along with many other uncertainties such as the concern that their partner may not be present at delivery. On top of that, there is very limited knowledge about the susceptibility or altered disease course for COVID-19 during pregnancy, and what the possible effect might be for the unborn child. Together, these COVID-19 related changes have the potential to increase fear and worries in pregnant women (Ravaldi et al. 2020), and impact perinatal mental health.

Understandably, research on the impact of the COVID-19 pandemic on perinatal women's mental health is still very sparse. The first reports on this topic show higher prevalence of perinatal depression and anxiety during the COVID-19 pandemic, as compared to norm data before the pandemic, both in pregnant and postpartum women (Ceulemans et al. 2020; Lebel et al. 2020). During the pandemic, the incidence of maternal depression and anxiety was also found to be higher in mothers of children aged 0 to 8 years (Cameron et al. 2020). These studies show that perinatal women may be especially vulnerable to psychological distress during the COVID-19 pandemic. Nonetheless, these studies have several major methodological shortcomings, particularly by using cross-sectional data, retrospective measurements and/or comparing pandemic data to norm data (no matching control group). Longitudinal studies that are able to compare pregnant women during the pandemic with a matching control group of women that were pregnant *right before* the pandemic are necessary to make better inferences about the mental health effects of the pandemic on the pregnant population.

The current prospective cohort study from the Netherlands, the Brabant Study (Meems et al. 2020), provides the unique opportunity to fill this gap. The Brabant Study is one of very few studies worldwide for which inclusion continued during the COVID-19 pandemic. The recruitment started in 2019 and continued during the pandemic, as well as during the three-month-long strict nationwide lockdown (March-May 2020). Moreover, Brabant is in the south of the Netherlands, which proved to be one of the pandemic epicenters in Europe. Consequently, the current study provides a unique opportunity to compare symptoms of depression and stress in the perinatal period during and right before the COVID-19 pandemic.

Method

Participants and procedure

The current study is part of a longitudinal prospective cohort study (the Brabant Study) (Meems et al. 2020) among pregnant women who are followed from 12 weeks pregnancy until 10 weeks postpartum. Eligible pregnant women were recruited by community midwife practices and hospitals in Brabant, the Netherlands. Recruitment started in 2019. Details on the design of the Brabant Study are described elsewhere (Meems et al. 2020). In short, Dutch pregnant women (18+ years) who had their first antenatal visit before 14 weeks of gestation were eligible for participation.

Participating women completed online questionnaires during all three trimesters of pregnancy and 8 to 10 weeks postpartum. Up until 1 March 2020, before the COVID-19 pandemic started in the Netherlands, 402 women completed questionnaires during pregnancy, of whom 250 also completed postpartum assessment. During the pandemic, 268 women filled out at least one questionnaire during pregnancy, and 59 completed postpartum assessment. This resulted in data of 670 participants to be analyzed in the current study. The study was approved by Medical Ethics Committee at the Máxima Medical Centre Veldhoven (L64091.015.17). All participants provided written informed consent.

Measures

Depressive symptoms

The 10-item Edinburgh (Postnatal) Depression Scale (E(P)DS) was used to measure depressive symptoms during pregnancy and postpartum. The E(P)DS is a frequently used and widely applicable instrument for perinatal use (O'Connor et al. 2016). Items were rated on a 4-point Likert-type scale, with higher total scores indicating higher levels of depressive symptoms. A score higher than 12 was used to identify the women at high risk for postpartum depression.

Pregnancy-specific stress

We assessed pregnancy-specific stress using the 10-item version of the negative affect subscale of the Tilburg Pregnancy Distress Scale (TPDS-NA). The scale contains items regarding worries about fetal health, childbirth and delivery (Boekhorst et al. 2020). Items were rated on a 4-point Likert-type scale. Higher total scores indicate higher levels of pregnancy-specific stress. The TPDS showed good psychometric properties (Boekhorst et al. 2020) and has been reviewed as excellent in terms of its internal consistency and structural validity (Evans et al. 2015). Since its development, the TPDS has been translated into various languages such as, amongst others, English, Portuguese, Turkish, Spanish, Mandarin and Japanese.

Statistical analyses

Mixed models statistics were used to analyze the possible effect of the pandemic on the individual trajectory of depression and stress symptoms over time (different trimesters of pregnancy), adjusting for several confounders (age, education, parity, previous depression, previous miscarriage, unplanned pregnancy, employment). For mixed model analyses, all cases can be included, including those with missing data (Bagiella et al. 2000). Therefore, all participants that completed at least one assessment during pregnancy were included in the analyses. As an assistance to the interpretation of results, the significant coefficients in terms

of percentage change in symptoms per unit change [formula: (expβ-1)*100] were reported. Next, logistic regression analysis was used to examine whether perinatal pandemic women were more likely (OR, 95%CI) to develop postpartum depression than pre-pandemic women, using the predefined postpartum cut-off (>12) for the E(P)DS.

Results

Table 1 shows the demographic characteristics of the women who were pregnant before and during the COVID-19 pandemic. The demographic characteristics between the pandemic and pre-pandemic group were similar with regard to age, education, employment, marital status, parity, unplanned pregnancy, previous miscarriage and previous diagnosis of depression. The Cronbach's alpha's of the E(P)DS varied between 0.85 and 0.86, while this ranged from 0.80 to 0.86 for the TPDS-NA. The Pearson r correlations between the E(P)DS and the TPDS-NA at different trimesters of pregnancy ranged from 0.37 to 0.56 ($p < 0.001$).

Table 1 Demographic characteristics of women who were pregnant before and during the COVID-19 pandemic (N = 670).

Pregnancy (N = 670)	**Pre-pandemic group (N = 402)**				**Pandemic group (N = 268)**			
Demographics	N	%	Mean (SD)	Range	N	%	Mean (SD)	Range
Age	395		30.88 (3.67)	21-41	265		30.75 (3.64)	19-45
High education	255	64.6			184	69.7		
Employment	372	94.7			252	95.1		
Having a Partner	380	98.4			260	99.2		
Primiparous	177	45.4			139	52.5		
Unplanned pregnancy	24	6.1			24	9.1		
Previous miscarriage	96	24.3			68	25.7		
Previous diagnosis of depression	36	11.6			41	15.5		

Note: High Education, Bachelor's degree or higher; SD, Standard Deviation.

Results of mixed model analyses showed that for the E(P)DS-model, the main effect of the pandemic was not a significant predictor of depressive symptoms throughout pregnancy (*β*=-0.03, SE=0.32, *t*=-0.09, *p*=0.925). However, the TPDS-model showed a main effect of pandemic (*β*=-0.69, SE=0.32, *t*=-2.13, *p*=0.034) on pregnancy-specific stress symptoms. The beta coefficient can be explained as the percentage change in stress per unit change in the pandemic group, corresponding to 49.7% higher stress scores in the pandemic group. **Figure 1** provides a graphical overview of the results.

Seven percent of the pre-pandemic and 8.5% of the pandemic women had a score higher than 12 on the E(P)DS at 8-10 weeks postpartum, which may suggest a postpartum depression. Belonging to the pandemic group was not related to postpartum depression (OR=1.24, 95%CI: 0.44-3.50), *p*=0.689).

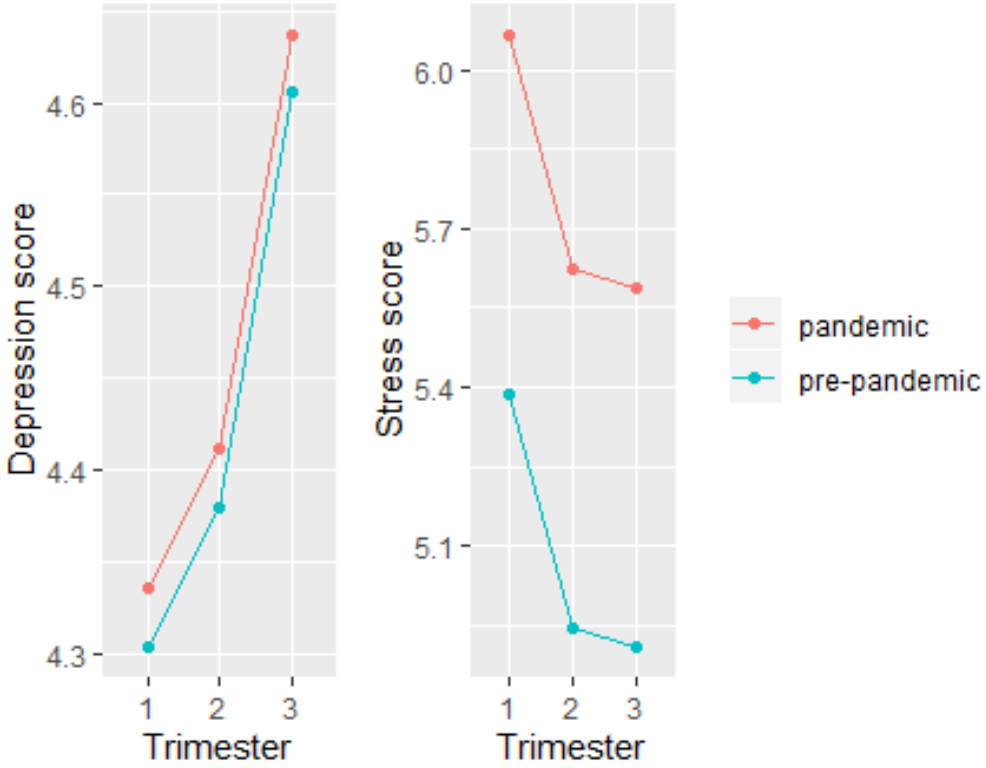

Fig 1. Mean depression and stress symptom scores during gestation for women who were pregnant pre-pandemic (blue line) compared to those pregnant during the pandemic (red line). There were no differences in depression scores but women who were pregnant during the pandemic had significantly higher stress scores compared to non-pandemic women.

Discussion

Stress symptoms increased significantly in pregnancy during the COVID-19 outbreak. Interestingly, we did not see a rise in depressive symptoms during pregnancy nor an increase in incidence of postnatal depression during the pandemic. Although it is well known that anxiety during pregnancy is a strong predictor of postpartum depression, the presence of COVID-19-related worries and anxiety during pregnancy might be unrelated to postpartum depression. It could be that after childbirth has passed, which is a potential stressful event during the COVID-19 pandemic, COVID-19-related anxiety decreases, especially when the newborn is healthy.

Our findings are of great clinical importance. First of all, if replicated, pregnant women could be told that there is no increased risk of depression during pregnancy or after delivery during this pandemic, which in itself is a reassuring message with the potential to reduce their stress and anxiety. Second, our results indicate that many pregnant women may suffer from stress during the COVID-19 outbreak. However, the E(P)DS, a widely used screening instrument during pregnancy (O'Connor et al. 2016), does not measure pregnancy- and delivery-related worries and anxiety. While we fully support the E(P)DS as screening instrument during pregnancy, the use of the E(P)DS may not be sensitive enough to detect COVID-19-induced stress in pregnant women and could lead to underestimation of the mental health burden. Ideally, clinicians would consider adding screening instruments for stress symptoms, especially during the COVID-19 outbreak.

Strengths and limitations

The current study has a number of strengths and limitations that should be mentioned. A key strength of this study is the longitudinal design of our cohort, which allowed us to measure symptoms of stress and depression during the course of pregnancy, as well as to compare symptoms before and during the pandemic. Nevertheless, the following limitations should also be considered. First, the sample that was assessed in the current study consisted solely of Dutch women. Additionally, the participants were predominantly

highly educated and more often had a partner compared to the general Dutch population. Therefore, generalization could be restricted. Finally, we assessed depression with a self-report instrument and not with a diagnostic interview.

Conclusions

Our findings indicated that the COVID-19 pandemic induces worries in pregnant women. Given that fetal exposure to stress can have detrimental effects on brain development (Van den Bergh et al. 2017), we conclude that it is important for clinicians to be extra aware of increased stress levels in pregnant women during the COVID-19 pandemic. It is of great importance that adequate mental health care and support is provided for mothers in need (Hermann et al. 2020).

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Author Contributions

MB and MvdH wrote the initial draft of the manuscript, LM, VB and VP contributed to writing. Data was collected by MB, LM and LH. MB, MvdH and KVD ran the statistical analyses on the data. MB, MvdH, KvD, and VP reviewed the results and contributed to interpretation. VP conceived the original idea of the longitudinal study and supervised the project. All authors reviewed the final draft of the manuscript.

Conflict of Interest

The authors declare that they have no conflict of interest.