



The Psychological Impact of the COVID-19 Outbreak on Pregnancy and Mother-infant Prenatal Bonding

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Abstract

This study aimed to assess the impact of the COVID-19 stress and anxiety on prenatal attachment during the second trimester of gestation. Pregnancy is an important stage for mothers-to-be in creating representations of themselves as a “mother”, with the developing attachment relationship to the unborn child considered as a milestone in the future parent’s developmental trajectory. The outbreak of the COVID-19 pandemic and the national health measures installed can hence have consequences on these representations and on prenatal attachment. Our sample consisted of 95 mothers that were recruited from a prenatal ultrasound screening center. Results suggested that the COVID-19 pandemic significantly affected prenatal attachment (PAI) with significant correlations between PAI total score and age, anxiety (DASS) and stress (IES-R). When entered in one model looking for predictors of PAI total score, age and COVID-19 stress were the only variables found to significantly predict prenatal attachment. We argue for a cultural component in explaining these results, hypothesizing that stress could trigger defensive strategies, leading to more investment in the attachment relationship, potentially playing the role of a protective factor.

Keywords Prenatal attachment · COVID-19 · Stress · Anxiety

Introduction

The developing parental attachment relationship to the unborn child is considered a milestone in the future parents’ developmental trajectory (Kunkel & Doan, 2003; Van den Bergh & Simons, 2009). Muller & Mercer (1993) devised the Prenatal Attachment Inventory as a measure of mother-infant attachment, which they defined as the quality of the special bond between a woman and her fetus. A wealth of studies have emphasized the role of prenatal attachment in predicting a breadth of child adjustment measures postpartum (Dayton et al., 2019; Siddiqui & Hagglor, 2000;

Theran et al., 2005), thus highlighting the importance of this construct in potentially predicting the developmental pathway of the child. This is of special importance during the COVID-19 pandemic since current health situation, social restrictions as well as the recurrent lockdown periods due to the COVID-19 pandemic have enforced a change in people’s routines, resulting in increased anxiety in many (Matheson et al., 2020), especially pregnant women (Mappa et al., 2020; Mohd Arifin & Hassan, 2020). It is therefore crucial to explore the impact of the COVID-19 stress on pregnant women’s attachment to their unborn child.

Studies investigating demographic correlates to mother-infant bonding prenatally are scarce, with inconsistent results. A meta-analysis by Tichelman et al. (2019) found that, studies reaching a significant association between prenatal attachment and maternal age found a negative correlation between these constructs. Berryman and Windridge (1996) assessed prenatal attachment throughout pregnancy and found a negative significant correlation between maternal age and mother-fetal attachment in early pregnancy; however, this significance disappeared at later stages of pregnancy. They explained the results as a reflection of mothers’ defense mechanisms, playing the role of a protective factor,

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given the increased risk of pregnancy loss in the first trimester in women over 35 years of age. Few studies investigated the role of parity on prenatal maternal attachment, yielding contradicting results. Some found no significant differences in prenatal attachment scores between first-time mothers and multiparous mothers (Berryman & Windridge, 1996; Condon & Esuvaranathan 1990; Lindgren, 2001; Mercer & Ferketich, 1994), whereas others concluded that first-time mothers tended to spend more time in prenatal attachment behaviors than mothers who were expecting a subsequent child (Doan & Zimmerman, 2003) or that prenatal attachment levels of mothers having more than one child were lower (Daglar & Nur, 2018).

Focusing on maternal mental health factors affecting pre- and post-natal attachment, maternal depressive symptoms during pregnancy were found to have a negative effect on pre-natal bonding (Daglar & Nur, 2018; Goecke et al., 2012). However, in their meta-analysis, Tichelman et al. (2019) found that maternal depressive symptoms tended not to be significantly correlated with prenatal attachment. Nonetheless, they played a crucial role in shaping the attachment relationship after birth, as they tended to negatively color mother-infant interaction and the quality of play (Cannella, 2005; Field, 2010; Yarcheski et al., 2009).

Another line of studies focused on the effect of maternal prenatal anxiety, consistently finding a negative correlation between anxiety and a mother's ability to imagine and develop a healthy positive relationship with her child pre- and post-partum (Bergman et al., 2008; Dubber et al., 2015; Glover & Capron, 2017; Hopkins et al., 2018; Lindgren, 2001; Ossa et al., 2012; Rubertsson et al., 2015). Anxiety levels were found to increase across pregnancy as some women reported concerns and fears about theirs and the child's health (Ust et al., 2013). Hakanen et al., (2019) and Parfitt et al., (2013) explained that mothers' anxiety tends to negatively affect maternal interactions with their children, as they become colored by their own anxieties rather than being able to see and react to the baby's needs. This, in turn, leads to lower attachment scores (Gobel et al., 2019).

The effect of maternal stress on prenatal attachment has also been explored, with research yielding consistent results of a negative correlation between the two variables (Bulbul et al., 2018; Ossa et al., 2012), and studies replicating these findings in high contextual risk settings (Dayton et al., 2019; Kuroda et al., 2020). The health and safety measures of social distancing instilled due to the COVID-19 pandemic have left some pregnant women feeling anxious and stressed about contamination, lockdown and an inability to go to antenatal classes (Caparros-Gonzalez & Alderdice, 2020; Kajdy et al., 2020). Scholars have investigated the effect of the COVID-19 on related stress and anxiety with some finding a doubling of the number of pregnant women

reaching the threshold for anxiety (Mappa et al., 2020) or scoring significantly higher on distress (Mohd Arifin & Hassan, 2020) during this period. However, no study to date has investigated the effects of the increased maternal anxiety and stress in pregnancy on prenatal attachment.

The current study aimed to investigate mother-infant attachment during the COVID-19 pandemic. Therefore we hypothesized (1) that current mother-infant attachment scores will be lower than their perceived attachment scores had the pandemic not started, (2) a negative correlation between maternal prenatal attachment, demographic correlates (age and birth order), and mental health constructs (anxiety, depression and COVID-19 stress). We also investigated predictors of mother-infant attachment during the second trimester of pregnancy.

Method

Participants

The sample consisted of 95 mothers aged between 23 and 47 ($M=31.41$; $SD=4.39$). 52% of women were pregnant with their first child. All mothers were recruited from a prenatal ultrasound screening center in Beirut. The inclusion criteria were being fluent in English and not having complications or high risk pregnancies. The latter criterion was validated by the Ob-Gyn performing the ultrasound.

Procedure

After receiving IRB approval, data collection began at a gynecologist's private practice, a referral center for morphological scans. All women who met the inclusion criteria were approached over the study period. First, the gynecologist explained the study objectives to women coming for their second and third trimester ultrasounds. They were asked to sign the consent, upon agreement, and then filled out the questionnaire booklet in the waiting room. All questionnaires were anonymous with only a code number in case of a follow-up needed. The contact details of two clinical psychologists were included in the information sheet in case participants wanted to discuss any concerns.

Measures

The Prenatal Attachment Inventory (PAI; Muller & Mercer 1993) is a 21-item self-report questionnaire measuring prenatal parent-infant attachment. Items include "I enjoy feeling the baby move" and are scored on a 4-point Likert scale. The total score is computed by summing answers for each item, leading to scores ranging from 21 to 84, with

higher scores indicating higher levels of prenatal attachment. The PAI has demonstrated evidence of reliability with Cronbach's alpha coefficient of internal consistency ranging from 0.81 to 0.91 (Muller, 1993; Tyler, 1992; Wilson, 1991) and $\alpha=0.92$ in this sample.

Given that we wanted to measure whether participants perceived they would have had different answers on the PAI items if they were pregnant before the COVID-19 outbreak, we added a question at the end of that questionnaire enquiring about this. It read "Do you think that any of your answers would have been different before the COVID-19 outbreak? If yes, which item/s and what would have been the alternative score?" We were therefore able to have an alternative PAI total score and then compute the difference between the 2 scores.

The Depression, Anxiety and Stress Scale (DASS; Lovibond & Lovibond 1995) is a 21-item self-report questionnaire assessing mental health status based on emotional states of Anxiety, Depression and Stress. Items are scored on a 4-point Likert scale, assessing the presence or not of a symptom over the previous week. For this study, we only computed anxiety scores, based on the sum of answers on 7 items ("I was aware of dryness of my mouth") and depression scores, based on the sum of answers on another 7 items ("I couldn't seem to experience any positive feeling at all"). Given that the IES-R measures stress reactions to an event, in this case the COVID-19 pandemic, we did not use the Stress subscale of the DASS which measures overall stress. Internal consistencies of these 2 subscales were $\alpha=0.73$ for Anxiety and $\alpha=0.81$ for Depression (Lovibond & Lovibond, 1995) and $\alpha=0.81$ and $\alpha=0.84$ respectively in this sample.

The Impact of Event Scale-Revised (IES-R; Weiss & Marmar 1997) is a 22-item self-report questionnaire assessing stress reactions after an emotional and stressful event. Participants were asked to think about the difficulties they have been facing over the past week with respect to the current COVID-19 pandemic. Answers are based on the participant's feelings during the past 7 days and scored on a 5-point Likert scale, with higher mean scores reflecting higher stress. Items include "Other things kept making me think about it". The IES-R demonstrated good discriminant validity, differentiating between traumatized groups and non-traumatized groups in general population. The IES was shown to have good internal consistency for the total and subscale scores in a sample of psychotherapy outpatients who had experienced a serious life event, with α ranging from 0.78 to 0.86 (Horowitz et al., 1979) and a sample including outpatients and controls who had experienced parental bereavement, $\alpha=0.86$ (Zilberg, Weiss, & Horowitz et al., 1982). The IES-R has been demonstrated to have very good internal consistency and moderate to good test-retest

Table 1 Descriptive statistics of key variables

Variable	Mean	SD
PAI	60.79	12.64
PAI alternative	61.53	12.88
DASS Depression	12.23	4.43
DASS Anxiety	13.74	4.66
IES-R Stress	26.78	17.75

reliability (Weiss & Marmar, 1997). Internal consistency was of $\alpha=0.95$ for this sample. The IES-R total score will be coined as COVID-19 stress hereafter.

Data analysis

The first aim of this study was to look at whether mother perceived that the COVID-19 pandemic affected prenatal attachment. For this purpose, we ran paired t-tests comparing the mean PAI total score and the mean alternative PAI total scores. Second, we used Pearson correlations investigating correlations between maternal prenatal attachment (PAI total scores) and demographic correlates (age and birth order), as well as scores on mental health constructs including anxiety, depression and COVID-19 stress. Lastly, a multiple linear regression was conducted to predict PAI total scores (mother-infant attachment during the second trimester of pregnancy) based on age, birth order, DASS anxiety, DASS depression, and IES-R total score (COVID-19 stress).

Results

The 95 women who took part were aged between 23 and 47 years ($M=31.41$; $SD=4.39$), with more than half (52%) pregnant with their first child. First, we ran descriptive statistics of key variables in our sample (Table 1). T-tests results revealed significant but small differences between the PAI scores ($M=60.79$, $SD=12.64$) and PAI alternate scores ($M=61.53$, $SD=12.88$) with $t(94) = -2.44$, $p=0.02$, $d=0.06$.

Pearson analyses (Table 2) revealed significant correlations between PAI total scores and age, $r(94) = -0.31$, $p<0.05$, DASS anxiety, $r(94)=0.24$, $p<0.05$, and IES-R total score, $r(94)=0.31$, $p<0.05$.

Finally, a multiple linear regression was conducted to predict PAI total score based on mother's age, child's birth order, mother's levels of anxiety and depression, as measured by the DASS, and her level of stress, as measured by the IES-R. A significant regression equation was found, $F(5,76)=3.88$, $p=0.003$, with an adjusted R^2 of 15.08%. Only age and stress were found to be significant predictors of PAI. As per the regression model, the PAI total score

Table 2 Correlations among key variables

	1	2	3	4	5	6
1. Age	1					
2. Birth order	0.11	1				
3. DASS anxiety	-0.11	-0.11	1			
4. DASS depression	-0.12	0.00	0.69*	1		
5. IES-R stress	-0.16	-0.05	0.60*	0.72*	1	
6. PAI total	-0.31*	-0.06	0.24*	0.14	0.31*	1

Note. * $p < 0.05$

Table 3 Regression model predicting PAI total scores

	B (unstandardized)	SE B	β (standardized)
Age	-0.84*	0.32	-0.29*
Birth order	0.18	1.23	0.02
DASS anxiety	0.57	0.41	0.21
DASS depression	-0.88	0.50	-0.31
IES-R stress	0.28*	0.12	0.39*

Adj $R^2 = 15.08\%$

Note. * $p < 0.05$

decreases 0.84 unit for an increase of one year in mother's age, and increases 0.28 unit for an increase in one unit of stress. The unstandardized and standardized regression weights are reported in Table 3.

Discussion

Our results suggest a significant correlation between prenatal attachment (PAI total score) and age, anxiety (DASS) and COVID-19 stress (IES-R). When entered in one model looking for predictors of PAI total score, age and COVID-19 stress were the only variables found to significantly predict prenatal attachment, with younger mothers scoring higher on the PAI and higher COVID-19 stress predicting higher PAI scores. The mother-infant attachment bond starts during pregnancy and has been found to be positively correlated to attachment after birth and to other parent and child psychosocial adjustment measures (Dayton et al., 2019; Tichelman et al., 2019). Stress during pregnancy has been identified as a risk factor, negatively correlated with attachment prenatally and after birth (Bulbul et al., 2018; Ossa et al., 2012); however, few studies so far have explored the impact of the COVID-19 pandemic stress on maternal attachment with the child. The first aim of this study was therefore to investigate mother-infant prenatal attachment during the COVID-19 pandemic. We asked mother whether they felt they would have had a different experience attachment with their unborn child had the COVID-19 pandemic not started. In line with recent studies

identifying this pandemic as a stressor causing significant distress in samples of pregnant women (Caparros-Gonzalez & Alderdice, 2020; Kajdy et al., 2020; Mohd Arifin & Hassan, 2020), our results showed significant, albeit small, differences in mothers' scores on the PAI when comparing current descriptions of their relationship with their unborn child with imagined descriptions of this relationship had the pandemic not occurred during their pregnancy.

Next, we aimed to explore demographics and maternal mental health correlates of prenatal maternal attachment. In line with previous studies, age was found to be negatively correlated to prenatal attachment, with older women scoring lower on the PAI. It could be argued that, in line with previous studies, this finding could reflect a defense mechanism, as a way for mothers to protect themselves against the possible risk of losing the baby, given the increased miscarriage rates at a later age (Tichelman et al., 2019). Here it is important to note that age was not significantly correlated with the mental health markers of depression, anxiety and COVID-19 stress which could further suggest that the association between age and prenatal attachment could refer to it being a defensive strategy, not affected by the current COVID-19 pandemic. It is important to note that more recent studies have advocated for the inclusion of maternal chronological age as a predictor of maternal behaviors and sensitivity with the child in the first months of life (Bornstein et al., 2006; Camberis et al., 2016), which we are currently exploring in a follow-up to this study at 6 months post-partum.

At odds with the literature, our findings revealed a positive correlation between prenatal attachment and maternal mental health markers of anxiety and COVID-19 stress. Previous studies had identified the COVID-19 pandemic and lockdown as increasing contamination anxiety and distress in pregnancy (Caparros-Gonzalez & Alderdice, 2020; Kajdy et al., 2020; Mappa et al., 2020; Mohd Arifin & Hassan, 2020). We therefore posit that, in these unprecedented events, pregnant mothers might exhibit more prenatal attachment behaviors as a way to protect their babies. This defense mechanism could be culturally explained as Lebanon has been classified as a collectivistic culture (Hofstede, 1983), in which family is the unit, thus showing

greater concern with interpersonal relationship and collective health (Kazarian & Taher, 2012). This has been argued to play a role in determining defense styles (Tohme et al., 2020), such as more involvement with the unborn child as a way to channel the stress and anxiety of the contamination risk and the effects of the confinement in a healthy manner. Adding to this the role of support systems including friends and more importantly, big families as well as the active presence of the grandmothers to be. Physicians can use this protective factor as way to help their patients cope with the COVID-19 Stress. We advise obstetricians and midwives to systematically ask their patients about potential psychological discomforts stemming from the COVID-19 situation, and refer them to mental health professionals when necessary.

More studies should investigate the many psychological effects of stress on pregnancy, mainly the psychological effects of the COVID-19 situation in all its aspects, the fear of contaminating, the fear of being contaminated and the confinement. This study is the first to explore the effects of the COVID-19 pandemic on prenatal attachment during the second trimester of pregnancy.

This study is unique as it is the first to look at prenatal attachment during the COVID-19 pandemic; however, results should be interpreted in light of some limitations. First, data collection was based on convenient sampling, and results merit replication at a larger scale. Second, our findings are based on self-report questionnaires which could have biased the results. This is of specific importance when making sense of the alternate mother-infant attachment scores, as mother were asked to rate the perceived potential differences in how they would have bonded with their unborn child had the COVID-19 pandemic not started. Indeed, our findings showed significant, albeit small differences between the two attachment scores, which could be explained by mothers having underestimated the impact of the COVID-19 pandemic on their family. Third, we could not account for participants' socio-economic background which could have buffered the effects of COVID-19 stress during pregnancy. It is also worth noting that, due to low paternal involvement in our study, fathers' support was not measured despite the literature highlighting the importance of the couple's supportive relationship as a buffer against stress. (River et al., 2020). The correlation between attachment and parity did not reach significance in our study despite some findings that women who are pregnant with their second child tend to score lower on prenatal attachment than women pregnant for the first time (Daglar & Nur, 2018). It would be interesting to further explore this relationship in future studies as well as the role of defensive style in mediating between parental stress and prenatal attachment.

To conclude, the COVID-19 pandemic in both its aspects, the health risks as well as the confinement, has confirmed negative effects on the indispensable and crucial stage of our human development which is pregnancy. Healthy prenatal attachment and later post-natal attachment are the building blocks of our psychological health. It is of high importance to realize, that although COVID-19 has devastating effects on health in general, whether directly or indirectly, it is even more dangerous for pregnant women because the stress it generates, if not contained properly, will negatively influence the generation to come. Interestingly, in Lebanon, our results showed that higher stress was associated with greater prenatal attachment. This might be influenced by the collectivistic nature of our culture in which the well-being of one is the concern of the group, especially with pregnant women. Pregnancy is still perceived as a stage in which the carrying mother should be taken care of and protected. This is made possible by big families living in the same geographical location which gives all the family members the capacity to assume the helping and protective role. COVID-19 might have been a reinforcing factor for this collectivistic trait.

Author contribution Dr. Pia Tohme: First author, study design, data analysis, manuscript writing. Dr. Rudy Abi Habib: Corresponding author, study design, data analysis, manuscript writing. Dr. Elma Nassar: Statistical analysis. Dr. Nouran Hamed: Research assistant, data collection. Dr. Gael Abou Ghannam: Referring physician, data collection. Dr. Gihad Chalouhi: Referring physician, manuscript writing.

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Declarations

Competing Interests The authors have no conflicts of interest to declare. All co-authors agree with the contents of the manuscript and there is no financial interest to report. We certify that the submission is original work and is not under review in any other journal.

Consent to participate This study received the Lebanese American University's IRB approval on August 24, 2020 under the reference number: LAU.SAS.RH13.24/Aug/2020. All participants read and signed the informed consent.

Consent to Publish All authors consent on the present form of the manuscript and agree to its submission to Maternal and Child Health Journal.

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