Mental health of pregnant women during the COVID-19 pandemic: a longitudinal study

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Highlights

- Prenatal anxiety and depression increase progressively throughout the pandemic
- Pandemic context differentially affects pregnant and non-pregnant women.
- As the pandemic progresses, differences between groups intensify
- Being pregnant is a risk factor for the development of psychopathological indicators.

Mental health of pregnant women during the COVID-19 pandemic: a longitudinal study

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Abstract

Several studies have reported the susceptibility of pregnant women to emotional instability and stress. Thus, pregnancy may be a risk factor that could deepen the already negative effects of the current COVID-19 pandemic. Therefore, the aim of this study is to analyze longitudinally the psychopathological consequences of the pandemic in pregnant women, and to explore differences with non-pregnant women. The participants in this study were 102 pregnant women, and a control group of 102 non-pregnant women (most of them reported having university studies and little financial impact from the pandemic). They completed the Beck Depression Inventory-II, the State-Trait Anxiety Inventory, and the Positive and Negative Affect Schedule, in three different times (2, 14, and 47 days after the start of the lockdown). In a time range of 50 days of quarantine, all women showed a gradual increase in psychopathological indicators and a decrease in positive affect. Pregnant women showed a more pronounced increase in depression, anxiety and negative affect than the non-pregnant women did. In addition, pregnant women showed a more pronounced decrease in positive

affect. It is important for institutions dedicated to perinatal health care to count on empirical information to optimize the provision of their services.

Keywords:

Pregnancy; isolation; lockdown; prenatal depression; prenatal anxiety; stress.

1. Introduction

On January 12, 2020, the World Health Organization (WHO, 2020a) confirmed that a novel coronavirus was the cause of a respiratory illness in Wuhan City, Hubei Province, China, that was reported to the WHO on December 31, 2019 (Zhu et al., 2020). On March 11, 2020, with a sum of 118,319 confirmed cases and a total of 4,292 deaths worldwide, the WHO (2020b) declared a pandemic of coronavirus disease 2019 (COVID-19), caused by Severe Acute Respiratory Syndrome Coronavirus-2 (SARS-CoV-2). Rapidly, the disease has spread throughout the world, reaching to date more than 10 million confirmed cases, more than 500,000 deaths and more than 5 million patients recovered (WHO, 2020c).

As a result, governments and public health authorities began to implement health policies, including spatial distancing, isolation, and even partial and total lockdown measures to prevent the spread of the virus. In addition to the effects on public health systems and the brake on world economies, the measures implemented could have a negative effect on the mental health of the population (Frasquilho et al., 2016; Holmes et al., 2020). The novel living conditions include confinement, changes in daily routines, transformation of social life, loss of freedom, concern about health and financial issues, among other consequences (Abbas & Kamel, 2020; Abel & McQueen, 2020; Orrù et al., 2020). Although limited, previous work shows a significant impact of epidemics (Hawryluck et al., 2004; Jeong et al., 2016) and of the COVID-19 pandemic (Canet-Juric et al., 2020; Tavares et al., 2020) on psychological distress, with increased depression, anxiety, and stress, and longer periods of lockdown associated with more severe symptoms. Considering these new living conditions and their possible negative effects, governments and public health authorities urgently need guidance and actionable information on effective public health measures and psychological interventions that can safeguard the mental health of the general population (Rubin et al., 2020).

Currently, there is little information on the longitudinal change in mental health status throughout the COVID-19 pandemic. In a recent investigation, Wang et al. (2020) found that

more than half of the respondents reported moderate to severe psychological symptoms (anxiety, depression and stress). Furthermore, in general terms, women and young people were the most affected groups (Fullana et al., 2020; Wang et al., 2020).

This complex global panorama has a particularly detrimental effect on more vulnerable groups. The pandemic could exacerbate health inequalities within populations (Holmes et al., 2020), particularly affecting people with established mental health problems and physical disabilities, unemployed people (Wilson et al., 2019), or special vulnerable groups, such as pregnant women (Menendez et al., 2020), mainly in low-and-middle-income countries.

Historically, pregnant women have always been considered a high-risk population. Systematic reviews have reported that mental disorders, such as depression and anxiety, are more prevalent during perinatal periods, compared to periods of non-pregnancy in low-and-middle-income countries (Abdoli et al., 2020; Fisher et al., 2012; Sawyer et al., 2010). Several studies have reported the susceptibility of pregnant women to emotional instability (Stein et al., 2014) and daily stress (Loomans et al., 2013). At the same time, pregnant women represent a particularly vulnerable group, given the dual impact on both them and their offspring (Madigan et al., 2018). These adverse conditions can lead to physical and mental illness in newborns, can increase the risk of premature delivery (Gemmill et al., 2019; Hoffman et al., 2019), and even increase the risks of infant mortality (D'Onofrio et al., 2013). In addition, there are studies that have found a higher prevalence of mental disorders in the offspring (e.g., attention deficit or anxiety disorders), the consequences of which could extend from childhood to adolescence (Huizink et al., 2003; O'Donnell et al., 2014).

In contexts such as the present, and knowing that pregnant women constitute a vulnerable population, it is necessary to evaluate this population in depth. Although there is a greater predisposition to psychopathology during pregnancy, the pandemic context and associated factors could accentuate this predisposition. During the *swine flu* pandemic and *severe acute respiratory syndrome* (SARS), pregnancy was associated with more negative clinical effects and a higher mortality rate (Lam et al., 2004; Mosby et al., 2011). The aggravation due to stress situations generated by the pandemic context could pronounce pre-existing conditions of vulnerability, mainly in low-and-middle-income countries due to the greater risk of financial and socio-environmental problems (Gelaye et al., 2016). In the current pandemic context, some studies (Corbett et al., 2020; Thapa et al., 2020; Zhang & Ma, 2020) reported that the measures implemented to avoid the spread of the virus can have indirect negative

effects on pregnant women, due to the concomitant financial problems, the interruption of prenatal cares, and the concerns for their own health and that of the fetus (or other children).

With respect to psychological effects, extreme stress conditions, emergencies, or natural disasters have shown to have detrimental effects on the mental health of pregnant women (Cao-Lei et al., 2017) and their children's well-being (Cao-Lei et al., 2015; de Rooij et al., 2016; Roseboom et al. 2011; Stein et al., 2014). These data allow us to think that the current pandemic context could have a similar impact on mental health, making relevant the specific study of this group.

There is a small body of research that has investigated the specific effects of infectious outbreaks and social distancing on the mental health of pregnant women. Studies conducted during SARS confinement found significant increases in levels of anxiety (Lee et al., 2006; Ng et al., 2013; Dodgson et al., 2010), depression (Lee et al., 2006; Linde & Siqueira, 2018) and stress (Lohm et al., 2014).

Also several studies have been published on the relationship between maternal mental health and COVID-19. These studies have reported an increase in symptoms of depression (Dong et al., 2020; Durankuş & Aksu, 2020; Sun et al., 2020) and anxiety (Kotabagi et al., 2020; Liu et al., 2020), lower quality of mental life (Kwasi Ahorsu et al., 2020), increase in perceived levels of distress (Berthelot et al., 2020) and moderate psychological impact due to isolation (Saccone et al., 2020). In addition, other studies have identified that psychopathological indicators increase with the number of confirmed COVID-19 cases or daily deaths (Zhou et al., 2020), and that both anxiety and depression symptoms decrease when isolation measures are suspended (Kotagabi et al., 2020). However, there is no record of studies that have longitudinally monitored this population throughout the lockdown.

Given the potential negative psychological consequences that the pandemic context could have, the aim of this study is to analyze longitudinally the presence and evolution of psychopathological indicators in pregnant women throughout their period of confinement, and to compare it with non-pregnant women. The reality of pregnant women meets a set of conditions of inequality and impacts on a group that is especially vulnerable to the side effects of the pandemic. We believe that pregnancy could represent an extra risk factor for the emergence of psychological distress, the development of some psychopathological disorder and the increase the severity as the days of the pandemic pass. A rigorous and precise evaluation of pregnant women in this context will represent a valuable input for the

subsequent design, planning, and execution of health policies, with the main objective of preventing and counteracting the negative consequences on the mental health of mothers and children.

2. Methods

2.1 Participants

The study was conducted with 204 women from different Argentinian cities, all of them affected by social isolation measures in the context of the COVID-19 pandemic. The age ranged from 18 to 45 years (mean = 32.56; SD = 4.71). The participants were divided into two groups: a pregnancy group with 102 pregnant women, and a control group with 102 non-pregnant women. Both groups presented homogeneous sociodemographic characteristics (age, educational level, number of children, level of economic affectation due to the pandemic, work before lockdown, work during lockdown, housing conditions during lockdown) (Table 1). The inclusion criteria for the entire sample were: being over 18 years old, living in Argentina, not to suffer from any serious physical/psychological diseases and absence of risk factors for COVID-19. Regarding the pregnancy group, only single pregnancies were included, in any week of gestation. The exclusion criteria were the use of psychotropic medication or steroids during pregnancy and the consumption of alcohol and / or illicit drugs. Three pregnant women delivered during third survey, for which they were removed from the analyses at Time 3 (N at Time 3 = 201).

[Insert Table 1]

2.2. Measures

Depression symptoms: The Spanish adaptation (Sanz et al., 2005; Sánz & Vázquez, 2011) of the Beck Depression Inventory-II (BDI-II; Beck et al, 1996) was administered. The BDI-II assesses the presence and severity of depressive symptoms through 21 items that indicate symptoms such as sadness, crying, loss of pleasure, guilt, pessimism, etc. In every item, the respondents are asked to choose the statement that best describes their feelings and thoughts during the last two weeks (to be consistent with the DSM IV criteria for major depression). The statements (4-point scale) describe increasing levels of severity of that symptom. The BDI-II has demonstrated adequate reliability (α = .89, Sanz et al., 2003) and validity (e.g.

Beltrán et al., 2012; Sanz & Vázquez, 1998). For this study, item 9, which explores suicidal ideation, was omitted due to the potential risk it might imply in online surveys. Beck's (1996) classification of levels of depression was also used (absent, minimum, mild, moderate and severe). The Cronbach's α for the BDI in the current study was of .93.

State Anxiety: The state anxiety dimension of the Spanish version (Spielberger et al., 1999) of the State-Trait Anxiety Inventory (STAI; Spielberger et al., 1970) was used. The STAI is a self-report measure composed of 40 items designed to separately assess anxiety as a state and as a trait. For the purpose of this study, only the 20 items of the state anxiety subscale were applied. The items are answered in a range from 0 to 3. The internal consistency of the Spanish adaptation oscillates from α 0.84 to 0.93 (Riquelme & Buela-Casal, 2011). The Cronbach's α for the STAI in the current study was of .86.

Positive and negative levels of affect: The Spanish adaptation (López-Gómez et al., 2015) of the Positive and Negative Affect Schedule (PANAS; Watson et al., 1988) was used. The PANAS includes two subscales, Positive Affect (PA) and Negative Affect (NA), each of which consisting of ten items that express affects such as "active", "nervous" or "satisfied". The participant must indicate whether they have felt each affect on a five-point Likert scale (from 1 = not at all or very slightly to 5 = very much). The internal consistency (α) of the PANAS adaptation ranged from 0.83 and 0.92 points (López-Gómez et al., 2015). The Cronbach's α for the Positive Affect subscale and Negative Affect subscale was of .95 and .97, respectively.

Socio-demographic features: Closed-ended questions were used to explore age, educational level, number of children, lockdown compliance, level of economic affectation due to the pandemic, work before the pandemic, work during the pandemic, and housing conditions during lockdown. Exclusively in pregnant women, the weeks of pregnancy and the presence of diseases or medical complications were also recorded (Table 2).

[Insert Table 2]

2.3. Procedure and ethical considerations

The survey was uploaded on Google Forms and disseminated through social networks. Participants answered three surveys at different times during the pandemic (Figure 1). The first survey was answered between March 22 and 25 (i.e. between 2 and 5 days after the mandatory lockdown was installed in Argentina); the second survey was answered between

April 3 and 9 (between the 14th and 20th day of the isolation); and the third survey was answered between May 6 and 10 (between the 47th and 51st day after the lockdown began). For the implementation of this research, all procedures recommended by the Declaration of Helsinki and the American Psychological Association (2010) were fulfilled. Participation was voluntary and the informed consent of the participants was mandatory. They were informed that they could interrupt their participation and abandon the study, without causing negative consequences of any kind. Contact information of the research group was also provided in order to clarify doubts that may arise in relation to the care of rights in research contexts. The study was approved by the Bioethics Committee of the National University of Mar del Plata.

[Insert Figure 1]

2.4. Data analysis

Descriptive statistics were calculated for the entire sample and for each group (experimental and control) (Tabla 3). The *Chi-square* test was used to analyze sociodemographic differences between both groups (educational level, number of children, level of economic affectation due to the pandemic, work during lockdown and housing conditions) and *U Mann Whitney Test* to compare age and lockdown compliance in both groups. No variable was found to differ between the two groups ($p > 0.05$) (Table 1).

According to Van Selst and Jolicoeur (1994), scores above 2.5 SD were considered as outliers (38 scores of 816; 4.65%).

The mixed repeated measures *ANOVA* statistic was used to test the effect of the pandemic over time (intra-subject factor) and inclusion of the pregnant or non-pregnant group (inter-subject factor) on depression, anxiety, negative and positive affectivity (dependent variables). Sociodemographic variables were discarded from the models as co-variables because none showed to be significant ($p > 0.05$). In cases where the *W Mauchnik* leads to rejection of the sphericity test, the *Greenhouse-Geisser* correction was used. The *Bonferroni* statistic was used for the adjustment of multiple comparisons.

All tests were two-sided and p-values less than 0.05 were considered statistically significant. Statistical analyses were performed using IBM SPSS Statistics 24 for Windows.

[Insert Table 3]

3. Results

3.1 Depression: Results of mixed repeated measures ANOVA demonstrated a significant effect of time ($F_{(1.73, 332.98)} = 80.51$, $p < .001$, $\eta_p^2 = .29$) and an interaction effect between time and groups ($F_{(1.73, 332.98)} = 14.78$, $p < .001$, $\eta_p^2 = .07$) (Table 4) (Figure 2A). Mauchly's Test of Sphericity indicated that the assumption of sphericity had been violated ($\chi^2_{(2)} = 31.765$, $p < .001$), and therefore, a Greenhouse-Geisser correction was used. A significant effect of the group factor (inter-subject factor) was also demonstrated ($F_{(1, 192)} = 7.16$, $p = .008$, $\eta_p^2 = .03$) (Table 4). In the total sample, significant differences were observed between the three measures ($p < .01$), evidencing a progressive increase as the pandemic goes by. According to the Post hoc tests for paired comparisons with Bonferroni correction, there were no statistically significant differences in depression between the groups at Time 1, nor at Time 2. In other words, this indicates the homogeneity of the groups in terms of depression at Time 1 and 2. At Time 3, however, significant differences were observed between pregnant women and non-pregnant women ($p < .01$). Furthermore, intragroup analyzes with Bonferroni correction showed that both pregnant and non-pregnant women presented significant differences between the three measures ($p < .05$).

[Insert Table 4]

[Insert Figure 2]

3.2. Anxiety: Results of mixed repeated measures ANOVA demonstrated a significant effect of time ($F_{(2, 402)} = 50.34$, $p < .001$, $\eta_p^2 = .20$) and interaction effect between time and groups ($F_{(2, 402)} = 8.02$, $p < 0.001$, $\eta_p^2 = .04$) (Table 4) (Figure 2B). No significant effect of the group factor (inter-subject factor) was identified ($F_{(1, 201)} = 3.16$, $p = .08$, $\eta_p^2 = .015$) (Table 4). In the total sample, significant differences were found between the measures at Time 1 and 2 with respect to Time 3 ($p < .01$). According to the Post hoc tests for paired comparisons with Bonferroni correction, there were no statistically significant differences in anxiety between the groups at Time 1, nor at Time 2. This indicates the homogeneity of the groups in terms of anxiety. At Time 3, however, significant differences were observed between pregnant women and non-pregnant women ($p < .01$). Furthermore, intragroup analyzes with Bonferroni correction showed that pregnant and non-pregnant women showed significant differences only at Time 3 ($p < .001$).

3.3. Negative affect: Results of mixed repeated measures ANOVA demonstrated a significant effect of time ($F_{(2, 386)} = 14.76$, $p < .001$, $\eta_p^2 = .07$) and interaction effect between time and groups ($F_{(2, 386)} = 11.19$, $p < .001$, $\eta_p^2 = .055$) (Table 4) (Figure 2C). No significant effect of the group factor (inter-subject factor) was identified ($F_{(1, 193)} = 2.84$, $p = .094$, $\eta_p^2 = .014$) (Table 4). In the total sample, significant differences were found between Time 1 and 2 with respect to Time 3 ($p < .01$). According to the Post hoc tests for paired comparisons with Bonferroni correction, there were no significant differences in NA between the groups at Time 1, nor at Time 2. However, at Time 3, significant differences were observed between pregnant and non-pregnant women ($p < .01$). Furthermore, intragroup analyzes with Bonferroni correction showed significant differences in the three measures only for the pregnant group ($p < .05$).

3.4. Positive affect: Results of mixed repeated measures ANOVA demonstrated a significant effect of time ($F_{(2, 394)} = 10.72$, $p < .01$, $\eta_p^2 = .05$) and interaction effect between time and groups ($F_{(2, 386)} = 5.16$, $p < .001$, $\eta_p^2 = .03$) (Table 4) (Figure 2D). No significant effect of the group factor (inter-subject factor) was identified ($F_{(1, 197)} = 0.90$, $p = .342$, $\eta_p^2 = .005$) (Table 4). In the total sample, significant differences were evidenced between Time 1 and 2, with respect to Time 3 ($p < .05$). According to the Post hoc tests for paired comparisons with Bonferroni correction, there were no statistically significant differences in PA between the groups at Time 1, nor at Time 2. At Time 3, however, significant differences were observed between pregnant and non-pregnant women ($p < .05$). Furthermore, intragroup analyzes with Bonferroni correction showed significant differences between Time 3, and Time 1 and 2, but only for the pregnancy group ($p < .05$).

3.5. *Socio-demographic features:* Results of mixed repeated measures ANOVA demonstrated that none of the sociodemographic variables had significant effects on depression, anxiety and affect (negative and positive), in any of the temporal measures of longitudinal design ($p < .05$) (Table 5).

[Insert Table 5]

4. Discussion

The most recent WHO guide on the prenatal care has reinforced the importance of knowing and intervening on psychosocial variables in pregnant women and newborns, with the aim of optimizing the physical and psychosocial well-being of the mother, the baby, and the family

in the short and the long term (WHO, 2020d, 2020e). Therefore, pregnant women constitute a group that requires special attention in relation to prevention, diagnosis and management (Chen et al., 2020).

However, currently there is no evidence to suggest that the coronavirus can be transmitted vertically from mother to fetus or through breastfeeding (Liu et al., 2020). There is also no evidence to suggest that pregnant women are more likely to acquire COVID-19 or that the potential virus infection is more severe for mothers (Zhang et al., 2020). Due to the uncertainty generated by the pandemic context and the existing lack of knowledge about the transmission routes of the virus and the impact on pregnant women, the investigation of the secondary effects of the pandemic, such as mental health problems, acquire particular relevance. Due to the negative psychological consequences that the pandemic and the social distancing could cause both in mothers and their offspring, this study set out to investigate the presence and evolution of psychopathological indicators of depression, anxiety and affectivity in a sample of pregnant and non-pregnant women. Pregnancy could be an extra risk factor for the emergence of psychological distress or the development or aggravation of some psychopathological disorder during the COVID-19 pandemic or other similar infectious outbreaks (Lee et al., 2006; Lohm et al., 2014).

Although some studies have been published with pregnant women samples (Berthelot et al., 2020; Dong et al., 2020; Durankuş & Aksu, 2020; Kotabagi et al., 2020; Kwasi Ahorsuet al., 2020; Liu et al., 2020; Saccone et al., 2020; Sun et al., 2020; Wu et al., 2020; Zhou et al., 2020), to date, none of them have carried out longitudinal monitoring.

During the pandemic, in a time range of approximately 50 days, the total sample has shown a gradual increase in psychopathological indicators and a decrease in PA. But pregnant women show a more pronounced increase in depression, anxiety and NA than the non-pregnant women. Furthermore, a decrease in the indicators of PA is observed, a trend not observed in the control group. Both findings contrast with what was reported by Wang et al. (2020) in the general population, where they did not identify clinically significant changes over time.

With regard to depression, as the pandemic progresses, so did the symptoms of depression. After 50 days, the group of pregnant women registered 32.7% of clinical indicators of moderate and severe depression (vs. 10% in the control group), a percentage above the prevalence registered in low-and-middle-income-countries (19 - 25%; Gelaye et al., 2016),

and well above the prevalence in developed countries (7 - 15%; Woody et al., 2017). The prevalence recorded in this study is similar to that found by other studies around the world about perinatal depression during the COVID-19 pandemic. For example, in Canada, a 37% prevalence of depression has been reported (Lebel et al., 2020); in Colombia 25% of depression was identified (Parra-Saavedra et al., 2020); in China the studies indicated values close to 30% (27% Dong et al., 2020; 29.6% Wu et al., 2020; 33.71% Sun et al., 2020); in Belgium 25.3% of pregnant women presented indicators compatible with depression (Ceulemans et al. al., 2020); while in Turkey the prevalence was 35.4% (Durankuş et al., 2020)

The repeated measures mixed ANOVA demonstrated a significant effect of time and time-group interaction on depression. Therefore, it is shown that the prolongation of the pandemic and pregnancy seem to be variables that aggravate the severity of depressive symptoms. The first period of the pandemic (up to day 15) had a homogeneous effect in both groups; but after 50 days, the effect was greater in pregnant women. Our results are different from the findings identified in similar contexts, such as the SARS outbreak in Hong Kong in 2003. For example, Lee et al. (2006) did not record a substantial increase in depression in pregnant women during SARS outbreak, compared to the general population. Even their mean BDI-II scores (mean BDI-II = 8.7, SD = 7.3) were below the baseline (Time 1) of our study. On this regard, social isolation, as one of the pandemic consequences, increases the perception of less social support, sadness at separation from loved ones, loss of freedom or boredom (Lee et al., 2006), loss of usual habits or pervasive loneliness (Cava et al., 2005), factors that in the medium term could increase the risk of depression. Furthermore, a recent study developed by Corbett et al. (2020) identified that almost 35% of the pregnant women recruited reported having self-isolating behaviors to avoid the transmission of COVID-19. On the other hand, government measures implemented on health systems could also generate negative effects, since the suspension of prenatal cares could cause extra concern in pregnant women (Thapa et al., 2020).

In many cases, pregnancy itself is a factor that could increase vulnerability to developing a mental disorder, such as depression. In turn, the prevalence of depression in our study at Time 1 (before the social isolation) is lower than that identified in low-and-middle-income countries (19% - 25%: Gelaye et al., 2016) and developed countries (7% - 15%: Woody et al., 2017), although significantly higher in Time 3 of quarantine. These suggest that symptoms of depression have increased substantially during the COVID-19 pandemic. This premise is

reinforced by previous studies (that reported a significant increase in psychopathological indicators due to the pandemic context) and arises from having compared pre-pandemic findings with current indicators. For example, Zhou et al. (2020) recently reported that pregnant women had significantly higher rates when compared to pre-pandemic registries. In addition, the authors identified that these values also increased as more confirmed cases of COVID-19 and greater number of deaths were recorded. Similarly, Berthelot et al. (2020) have reported that pregnant women presented higher levels of depression and anxiety, more symptoms of post-traumatic stress, more negative affect, and less positive affect than the pre-COVID-19 cohort used in their study. Although these data are not conclusive, they reinforce the hypothesis that the pandemic context may exacerbate pre-existing conditions of vulnerability.

The results on anxiety indicators also registered an increase in the 50th day of lockdown compared to the data from the beginning of the lockdown, which is in correspondence with that reported by previous studies. Parra-Saavedra et al. (2020) reported that more than 50% of pregnant women reported anxiety symptoms, while Sacconne et al. (2020) has found that 46% of pregnant women have intense anxiety. Lower rates were recorded by Liu et al. (2020) and Dong et al. (2020), who reported a 25% and a 8.3% of prevalence of prenatal anxiety, respectively.

Our results are similar to studies carried out during the SARS outbreak, such as the research carried out by Lee et al. (2006), who found a slight increase in anxiety in pregnant women; or the study by Ng et al. (2004), where 65.2% of pregnant women experienced moderate levels of anxiety and 22.6% had high levels of anxiety.

A significant effect of time and an interaction between time and group on anxiety was identified. This suggests that anxiety symptoms increased during the pandemic and that pregnancy represents an extra factor in aggravating mental health. In multiple comparisons, the differences between groups were only significant after 50 days of confinement and social isolation measures began. The progressive increase in anxiety in both groups is probably associated with the daily restrictions, the social isolation, the feelings of uncertainty regarding the future and the fear regarding a new and unknown infectious agent (Khan et al., 2020). In pregnant women, anxiety could be further increased due to concerns regarding the health of the fetus or uncertainty regarding the development of pregnancy (which are common stressors that could potentiate anxiety indicators) but also due to the fear of contracting the

virus and the interruption of prenatal cares. Sacconne et al. (2020) has found that pregnant women have intense anxiety associated with the fear of transmitting the virus vertically to their baby. These studies again reinforce the idea that the increase the pandemic situation tends to increase the number and intensity of psychopathological symptoms.

Concerning PA and NA, the changes are slight in non-pregnant women, but pronounced for pregnant women: PA decreases and NA increases across the COVID-19 pandemic. A unique single previous study has evaluated affectivity in pregnant women during the COVID-19 pandemic (Berthelot et al., 2020), which has reported similar findings: increased negative affect and decreased positive affect. In turn, the authors reported that these indicators were significantly more pronounced during the pandemic context compared to a pre-COVID-19 cohort. In the same way, the findings are consistent with what was found in this study about symptoms of depression and anxiety, and also with the differences already reported among pregnant and non-pregnant women. Besides, our results are compatible with those reported in previous studies about the effects of the pandemic on women in general (Wang et al., 2020) and on pregnant women in particular (Lebel et al., 2020; Sun et al., 2020). Indeed, the conditions of the pandemic (social isolation, uncertainty about the pandemic, fear of contracting the virus, economic impact, etc.) seem to have a clear effect on the affect of pregnant women (Kwasi Ahorsu, 2020).

Contrary to what was expected, no effect was found of the sociodemographic variables on the changes in the symptoms of depression, anxiety and affectivity. These findings contrast with recent studies that have shown the effect of sociodemographic variables on psychopathology, such as financial or work problems (Thayer & Gildner, 2020; Zhang & Ma, 2020), age (Wu et al., 2020), social support (Sun et al., 2020), access to outdoor space (Preis, 2020), educational background and living conditions (Dong et al., 2020; Wu et al., 2020). Furthermore, it contrasts with previous studies such as that of Ng et al. (2004), who found significant effects on socioeconomic level or social support. In turn, it also contrasts with the findings of Peng et al. (2010) who identified that the youngest, least educated and married had the highest prevalence of depression. However, the values identified in the present study are not very heterogeneous, as most of the participants reported university studies and few financial or work problems. This may explain the absence of significant effects.

Based on the reported results, the harmful effects on mental health currently suffered by women in general and pregnant women in particular are alarming. The picture is even worse

if we consider that these psychopathological indicators can extend beyond the pandemic, increasing the risk of mental disorders in the medium and the long term. It is already known that women who experience prenatal depression or anxiety frequently continue to experience them during the postnatal period (Grigoriadis et al., 2019; Milgrom et a., 2008). Considering that the prevalence of postpartum depression is approximately 10-20% in low-and-middle-income countries (Patel et al., 2004), this situation worldwide could increase these figures significantly. Furthermore, postnatal anxiety and depression can cause negative effects on mother and child interaction in the first months (Hakanen et al., 2019), being able to provoke an inadequate development and regulation of the hypothalamic–pituitary–adrenal axis (Cao-Lei et al., 2017; McGowan, 2017; Murgatroyd et al., 2015). Regarding the effects on the development of the fetus, the meta-analysis carried out by Madigan et al. (2018) have identified that prenatal depression and prenatal anxiety have an adverse effect on the socio-emotional and behavioral functioning of children, presenting a risk almost twice as high as children whose mothers did not experience depression or anxiety during pregnancy. Also, situations of prenatal adversity have been associated with an increased risk of premature delivery (Gemmill et al., 2019; Hoffman et al., 2019) and infant mortality (D'Onofrio et al., 2013), and could even generate greater predisposition to the development of mental disorders in the offspring (both in children and adolescents; Huizink et al., 2003; O'Donnell et al., 2014), physical conditions and negatively alter the body's immune response (Johnson et al., 2016).

Furthermore, it is important to note that the 50 days of lockdown included in the time range of this study occurred without major changes in government measures. In Argentina, on March 20, 2020 (between 2 and 5 days before starting this study) with a total of 128 confirmed cases of COVID-19 in the country, the Argentinian government established “social, preventive and mandatory isolation”. This government measure prohibited all citizens from leaving their homes with the exception of going out to buy food or medicine (Canet-Juric et al., 2020). Without changes, such measures were maintained until April 25, after which small flexibilities were implemented, such as allowing recreational outings of one hour per day and within a radius of 500 meters from residences, although only in cities with less than 500 thousand populations. There were no other relevant changes in the period covered by this study. Therefore, no substantial changes in government isolation measures are identified between Time 2 and Time 3 of the present study.

The increased mental susceptibility of pregnant women to the side effects of the pandemic should be one of the central focuses of attention for planning public perinatal health policies.

Our results could facilitate a quick diagnosis of the current context for the prompt implementation of specific psychological interventions to reduce the effects that, as we said, could be sustained over time, both for mothers and their children. For this, it will be necessary that the institutions dedicated to perinatal health care have the necessary empirical information to optimize the provision of their services and adapt them to current requirements. Without effective prevention actions, this could become a problem for public health, overflowing the resources for their care and containment.

A major limitation of the study was the preponderance within the sample of women with high academic level, good socioeconomic conditions and slight effects of the pandemic on their personal economy. This contrasts with the real sociodemographic characteristics of the Argentine population. Furthermore, the sample size is small, limiting the scope of the results. In addition to this, online surveys could have added certain biases to the data that face-to-face encounters would diminished.

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LMH: Conceptualization, Methodology, Formal analysis, Investigation, Writing - Original Draft. **DVMV:** Conceptualization, Methodology, Formal analysis, Visualization. **US:** Writing - Review & Editing, Resources, Supervision, Funding acquisition, Project administration. **CJL:** Project administration, Writing - Review & Editing, Funding acquisition. **AML/GJI/PF:** Formal analysis, Writing - Review & Editing

Conflict of interest

None.

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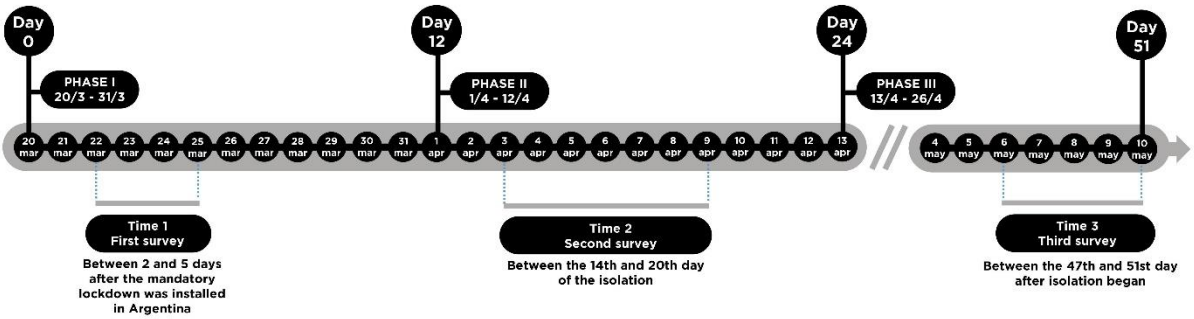

Figure 1. ***Development of lockdown in Argentina and days when the surveys were administered.*** The timeline marks the beginning of the mandatory quarantine decreed by the Argentine State (March 20), and the development of the different stages of the process until May 10. In the lower part of the figure, the ranges of days in which the surveys were answered by the participants are graphed.

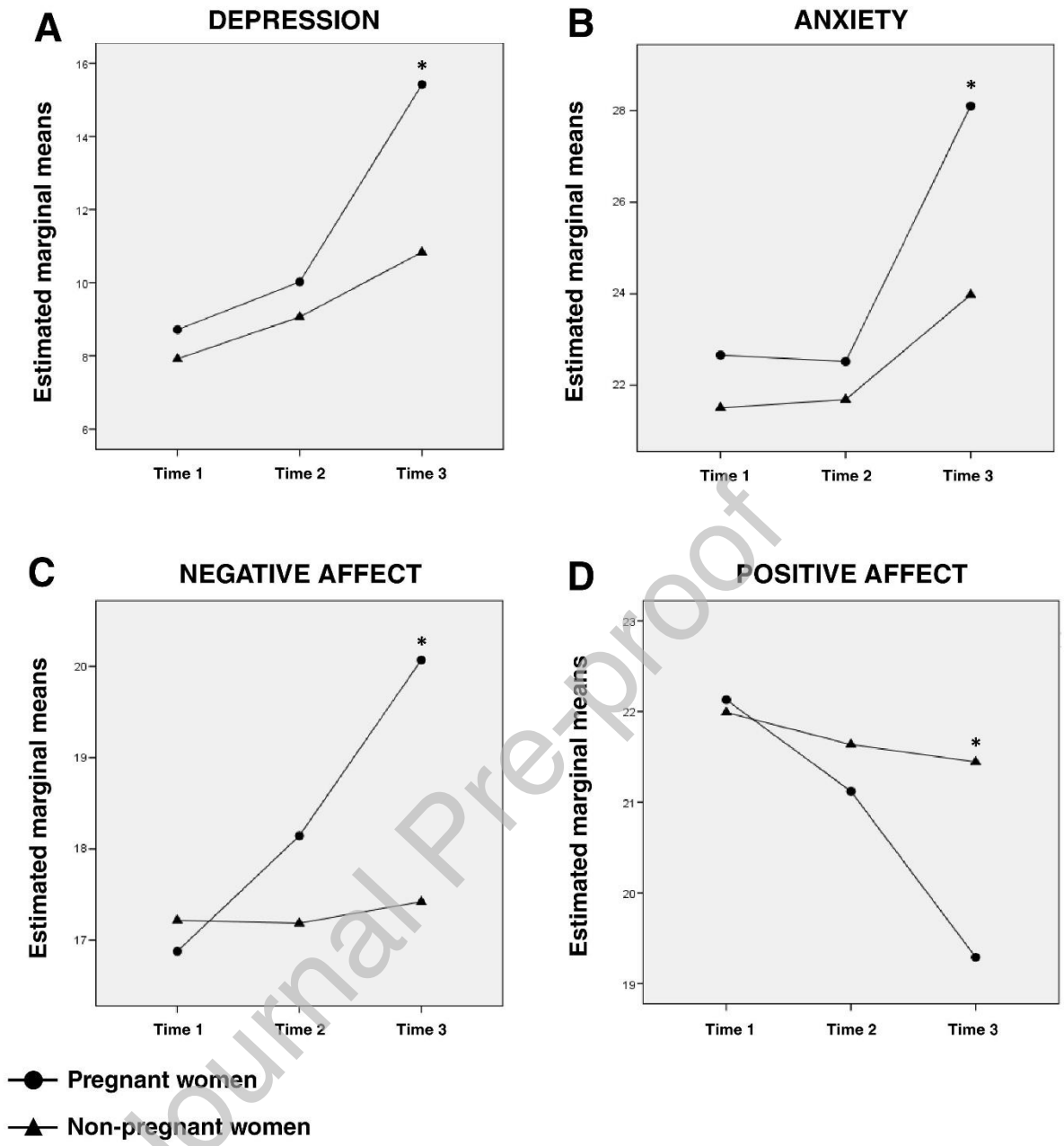

Figure 2. Comparison of the adjusted mean of the psychopathological variables in both groups, during the three phases of the study. Figure 2 compares the adjusted means for depression (A), anxiety (B), negative affectivity (C) and positive affectivity (D) in pregnant women (circles) and non-pregnant women (triangles), during the three phases of the study (Time 1, Time 2 and Time 3). *p <0.01

Table 1.

Sociodemographic variables in both groups and Chi-square

Variable		Pregnant women	Non-pregnant women	Total sample	X^2	Z
Age	*Mean*	32.59	32.54	32.56	-	-1.11
	SD	4.73	4.71	4.71		
Lockdown compliance	*Mean*	96.4	95.0	95.7	-	-1.06
	SD	.69	.80	.75		
Level of economic affectation due to the pandemic	*No*	37.3%	38.2%	37.7%	1.61	-
	Few	22.5%	25.5%	24.0%		
	Some	24.5%	21.6%	23.0%		
	Much	5.9%	5.9%	5.9%		
	Very much	9.8%	7.8%	8.8%		
Educational level	*Postgrad*	34.3%	32.4%	33.3%	1.20	-
	University (complete)	34.3%	35.3%	34.8%		
	University (incomplete)	26.5%	27.5%	27.0%		
	Secondary (complete)	3.9%	4.9%	4.4%		
	Secondary (incomplete)	1.0%	0%	0.5%		
	Primary (complete)	0%	0%	0%		
	Primary (incomplete)	0%	0%	0%		
Work before lockdown	*Yes*	90.2%	85.3%	87.7%	1.14	-
	No	9.8%	14.7%	12.3%		
Work during lockdown	*No*	11.8%	10.8%	11.3%	0.55	-
	Some tasks	61.8%	66.7%	64.2%		
	Yes just like before	26.5%	22.5%	24.5%		
Number of children	*0*	57.8%	56.9%	57.4%	0.99	-
	1	37.3%	37.3%	37.3%		
	2	4.9%	5.9%	5.4%		
Number of rooms in her home	*1*	10.8%	7.8%	9.3%	3.60	-
	2	16.7%	20.6%	18.6%		
	3	44.1%	35.3%	39.7%		
	4 or more	26.5%	31.4%	28.9%		
	Other responses	2.0%	4.9%	3.4%		

X^2 = Chi-square / Z = Mann-Whitney U Test / All values were > .05

Table 2.
Specific characteristics of the group of pregnant women

Variable		Pregnant women			
		Time 1	**Time 2**	**Time 3**	**Total**
Weeks of pregnancy	*Mean*	17.82	19.82	22.47	20.05
	SD	9.01	9.01	8.01	8.70
Trimester of pregnancy	*First trimester*	38.5%	27.7%	15.0%	25.67%
	Second trimester	41.5%	44.6%	53.3%	47.05%
	Third trimester	20.0%	27.7%	31.7%	29.95%
Diseases or medical complications	*Heavy bleeding*	-	-	-	2.9%
	Fluid retention	-	-	-	9.8%
	Nausea or vomiting in excess	-	-	-	19.6%
	Drop of 5 kg or more	-	-	-	2.9%
	Increase of 12 kg or more	-	-	-	11.8%
	Infections	-	-	-	2.9%
	Hypertension	-	-	-	1.0%
	Thyroid problems	-	-	-	8.8%
	Gestational diabetes	-	-	-	2.0%
	Blood incompatibility	-	-	-	1.0%
	Other diseases	-	-	-	3.9%

Table 3.
Descriptive statistics of the administered tests

Variable		Pregnant women			Non-pregnant women			Total		
		Time 1	**Time 2**	**Time 3**	**Time 1**	**Time 2**	**Time 3**	**Time 1**	**Time 2**	**Time 3**
Depression	*Mean*	8.71	10.02	15.42	7.92	9.06	10.83	8.32	9.55	13.15
	SD	6.08	6.43	8.50	4.53	4.86	6.79	5.37	5.71	8.02
	Absent	57.8%	52.0%	27.7%	60.6%	54.5%	43.0%	59.2%	53.3%	35.3%
	Minimum	20.6%	17.3%	18.8%	26.3%	23.2%	28.0%	23.4%	20.3%	23.4%
	Mild	12.7%	23.5%	20.8%	11.1%	16.2%	19.0%	11.9%	19.8%	19.9%
	Moderate	8.8%	7.1%	19.8%	2.0%	6.1%	6.0%	5.5%	6.6%	12.9%
	Severe	0%	0%	12.9%	0%	0%	4.0%	0%	0%	8.5%
	Moderate +Severe	8.8%	7.1%	32.7%	2.0%	6.1%	10.0%	5.5%	6.6%	21.4%
Anxiety	*Mean*	22.66	22.52	28.10	21.51	21.69	23.97	22.09	22.11	26.04
	SD	9.48	8.76	9.60	8.44	8.20	9.27	8.98	8.49	9.63
Negative Affect	*Mean*	16.88	18.14	20.07	17.22	17.18	17.42	17.05	17.67	18.75
	SD	4.65	5.48	5.93	5.04	4.46	5.41	4.84	5.01	5.81
Positive Affect	*Mean*	22.13	21.12	19.29	21.99	21.64	21.44	22.06	21.38	20.36
	SD	6.77	7.24	7.23	6.52	6.97	6.82	6.63	7.09	7.10

Table 4.
Results of Repeated Measures ANOVA for Depression, Anxiety, Negative and Positive Affect

Variable	Effect	Repeated Measures		
		F	***p*-value**	η_p^2
Depression	*Time*	80.51	.001	.29
	Group	7.16	.008	.03
	Time-Group	14.78	.001	.07
Anxiety	*Time*	50.34	.001	.20
	Group	3.16	.08	.01
	Time-Group	8.02	.001	.04
Negative Affect	*Time*	14.76	.001	.07
	Group	2.84	.094	.01
	Time-Group	11.19	.001	.05
Positive Affect	*Time*	10.72	.01	.05
	Group	0.90	.342	.00
	Time-Group	5.16	.001	.03

Table 5.
Results of Repeated Measures ANOVA for the dependent variables (depression, anxiety, negative and positive affect) with sociodemographic variables as intersubject factors.

Variable	Effect	Repeated Measures		
		F	*p*	η_p^2
Depression	Level of economic affectation due to the pandemic	2.500	.054	.051
	Age	.725	.485	.008
	Educational level	1.364	.258	.015
	Work before lockdown	.275	.601	.001
	Work during lockdown	1.818	.165	.019
	Number of children	.453	.636	.005
	Amount rooms in her home	.401	.752	.007
Anxiety	Level of economic affectation due to the pandemic	2.223	.068	.043
	Age	.774	.462	.008
	Educational level	.157	.855	.002
	Work before lockdown	.004	.948	.000
	Work during lockdown	.720	.488	.007
	Number of children	.468	.627	.005
	Amount rooms in her home	.235	.872	.004
Negative affect	Level of economic affectation due to the pandemic	2.341	.057	.047
	Age	1.149	.319	.012
	Educational level	1.145	.321	.012
	Work before lockdown	.006	.939	.000
	Work during lockdown	1.857	.159	.019
	Number of children	1.516	.222	.016
	Amount rooms in her home	.985	.401	.016
Positive affect	Level of economic affectation due to the pandemic	1.880	.115	.038
	Age	2.598	.077	.026
	Educational level	.807	.448	.009
	Work before lockdown	.001	.978	.000
	Work during lockdown	2.207	.113	.022
	Number of children	2.387	.124	.013
	Amount rooms in her home	3.644	.054	.025