



## Effects of COVID-19 on maternal anxiety and depressive disease: a literature review

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### Abstract

The coronavirus SARS-CoV-2 (COVID-19) infection is a public health emergency of international concern. Pandemics pose a challenge to psychological resilience and can have an adverse impact on mental health. The impact of the ensuing social isolation and loneliness imposed by quarantine along with the worries about the risks of the infection and its economic fallout would appear likely to affect the mental health of the population. It has been reported that women are more likely to experience anxiety and depression symptoms during COVID-19 than men. COVID-19 pandemic had a profound impact on the level of anxiety and depression of pregnant women according to their basal level and pregnancy characteristics. Antenatal mental disorders may be a risk factor for maternal mental health problems such as an increased likelihood of postnatal depression and adverse obstetric and developmental outcomes. Effective coping strategies are associated with better psychological wellbeing during the COVID-19 pandemic, including reduced anxiety and depression. The increased risk of mental disorders due to COVID-19 requires policies to be developed to address prenatal and postpartum care to promote maternal–child wellbeing outcomes.

**Keywords:** COVID-19; SARS-CoV-2; pregnancy; maternal anxiety; maternal depression; maternal mental health; maternal mental disorders

#### MeSH terms:

PREGNANCY COMPLICATIONS, INFECTIOUS – DIAGNOSIS

PREGNANCY COMPLICATIONS, INFECTIOUS – PSYCHOLOGY

COVID-19 – DIAGNOSIS

COVID-19 – COMPLICATIONS

ANXIETY – PREVENTION & CONTROL

ANXIETY – ETIOLOGY

DEPRESSION, POSTPARTUM – PREVENTION & CONTROL

DEPRESSION, POSTPARTUM – ETIOLOGY

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## Влияние COVID-19 на тревожность и депрессивные расстройства у матерей: обзор литературы

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### Аннотация

Инфекция, вызванная коронавирусом SARS-CoV-2 (COVID-19), представляет собой чрезвычайную ситуацию в области общественного здравоохранения, имеющую международное значение. Пандемии бросают вызов психологической устойчивости и могут отрицательно сказаться на психическом здоровье. Последствия социальной изоляции и одиночества, вызванные карантином, наряду с опасениями по поводу риска инфекции и ее экономических последствий, вероятно, оказывают влияние на психическое здоровье населения. Сообщается, что женщины чаще, чем мужчины, испытывают симптомы тревоги и депрессии во время пандемии COVID-19. Выраженный эффект пандемия COVID-19 оказала на уровень тревожности и депрессии беременных женщин в зависимости от их базальной тревожности и особенностей течения беременности. Дородовые психические расстройства могут быть фактором риска возникновения проблем с психическим здоровьем матери, таких как повышенная вероятность послеродовой депрессии и акушерских осложнений, а также нарушений развития плода. Эффективные стратегии преодоления связаны с улучшением психологического благополучия во время пандемии COVID-19, включая снижение тревожности и депрессии. Повышенный риск психических расстройств из-за COVID-19 требует разработки программ для обеспечения дородового и послеродового ухода с целью улучшения благополучия матери и ребенка.

**Ключевые слова:** COVID-19; SARS-CoV-2; беременность; тревожность у матерей; депрессия у матерей; психическое здоровье матери; психическое расстройство матери

### Рубрики MeSH:

БЕРЕМЕННОСТИ ОСЛОЖНЕНИЯ ИНФЕКЦИОННЫЕ – ДИАГНОСТИКА

БЕРЕМЕННОСТИ ОСЛОЖНЕНИЯ ИНФЕКЦИОННЫЕ – ПСИХОЛОГИЯ

COVID-19 – ДИАГНОСТИКА

COVID-19 – ОСЛОЖНЕНИЯ

ТРЕВОГИ СОСТОЯНИЕ – ПРОФИЛАКТИКА И КОНТРОЛЬ

ТРЕВОГИ СОСТОЯНИЕ – ЭТИОЛОГИЯ

ДЕПРЕССИЯ ПОСЛЕРОДОВАЯ – ПРОФИЛАКТИКА И КОНТРОЛЬ

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**List of abbreviation**

CI – confidence interval

COVID-19 – COrona Vlrus Disease 2019

IQR – interquartile range

SARS – severe acute respiratory syndrome

SARS-CoV-2 – severe acute respiratory syndrome coronavirus 2

STAI – state-trait anxiety inventory

HIGHLIGHTS	КЛЮЧЕВЫЕ ПОЛОЖЕНИЯ
The COVID-19 outbreak has a major psychological impact on pregnant women	Вспышка COVID-19 оказывает серьезное психологическое воздействие на беременных женщин
SARS-CoV-2 induces anxiety in 77% of pregnant women	Инфекция SARS-CoV-2 вызывает повышенную тревожность у 77% беременных женщин
Anxiety is more frequent in pregnancies with a higher level of education	Повышенная тревожность чаще возникает у беременных с более высоким уровнем образования
Anxiety is more frequent in women unfavorable to COVID-19 vaccination	Повышенная тревожность чаще встречается у женщин, не желающих вакцинироваться от COVID-19
One in three pregnant women experience depression during the pandemic	Каждая третья беременная женщина испытывает депрессию во время пандемии

The coronavirus 2019-nCoV (COrona Vlrus Disease 2019, COVID-19) infection is a public health emergency of international concern in which a coronavirus has been identified as the cause of an outbreak of respiratory illness. It was first detected in Wuhan, China [1], spreading rapidly to other countries worldwide [2, 3]. On the 11<sup>th</sup> of March 2020, the World Health Organization (WHO) announced the new Coronavirus pandemic outbreak according to the WHO official website of the World Health Organization<sup>1</sup>.

As the pandemic unfolded, public concern about the risks to life and health, inadequate healthcare services, and economic consequences grew. As part of the infection containment strategies, governments around the world imposed unprecedented restrictions on movement, work, and travel for all people in a city, region, or country and these resulted in compromising personal and social liberty. Lockdown and mandatory quarantine are the most commonly used and effective measures that are implemented by governments to contain the transmission of respiratory infectious diseases, including the COVID-19 disease. Within a month of the declaration of the pandemic, 90% of the world's population was subject to some kind of restriction of movement to limit infection spread<sup>2</sup>.

In non-pandemic times, quarantine and social isolation are well-known risk factors for psychological and psychiatric disturbances in the general population [4, 5], particularly for children and adolescents, the elderly, and those from lower socio-economic groups, females, as well as people with pre-existing mental health conditions [6].

The impact of the ensuing social isolation and loneliness along with the worries about the risks of the infection and its economic fallout would appear likely to have influenced the mental health of the population. Indeed, increased mental health morbidity including anxiety and depression, in a similar context, has been reported previously with fears arising from the severe acute respiratory syndrome (SARS) outbreak [7].

Pandemics pose a challenge to psychological resilience and can have an adverse impact on mental health [8, 9], and it has been reported that women are more likely to experience anxiety and depressive symptoms during COVID-19 than men [10].

Prenatal and postnatal mental disorders induce disturbances in the physical activity, nutrition, and sleep of pregnant and postpartum women; these disturbances subsequently affect the mood of pregnant and postpartum women and the development of fetuses and children [11].

Anxiety is a common response to any stressful situation. Pregnant women, who experience mental and physical changes during gestation, are more likely to be at risk. Prevalence of anxiety disorder during pregnancy, in developed and developing countries, are 10 and 25%, respectively [12]. Anxiety symptoms during pregnancy have emerged as an independent risk factor for adverse obstetric and developmental outcomes [13]. Antenatal mental disorders may be a risk factor for maternal mental health problems such as an increased likelihood of postnatal depression [14], impaired bonding [15], and physical disorders, such as preeclampsia [16], gestational hypertension [17], and gestational diabetes [18], preterm birth [19, 13] miscarriage [20, 21], low infant birth

<sup>1</sup> <https://www.who.int/director-general/speeches/detail/who-director-general-s-opening-remarks-at-the-media-briefing-on-covid-19---11-march-2020> Accessed July 27<sup>th</sup>, 2021.

<sup>2</sup> <https://www.pewresearch.org/fact-tank/2020/04/01/more-than-nine-in-ten-people-worldwide-live-in-countries-with-travel-restrictions-amid-covid-19/> Accessed July 27<sup>th</sup>, 2021.

weight and fetal growth restriction [22, 23], and lower Apgar scores at birth [24].

## ANXIETY

A systematic review and meta-analysis that involved 102 studies with 221,974 antenatal and postnatal women from 34 countries found that the pooled prevalence of anxiety among these participants was 15.2% [25].

We hypothesized that the COVID-19 pandemic may have had a profound impact on the level of anxiety of pregnant women that may be different according to their basal level of anxiety and pregnancy characteristics. We therefore performed a study in the days of maximum spread of COVID 19 in Italy (March 9 – March 10, 2020) close to the day of the total lockdown sanctioned by the Italian government (March 9, 2020) [26].

We sent each woman a questionnaire structured into two sections: section A concentrated on 18 items of maternal characteristics and on testing women's knowledge and concerns about perinatal complications; section B containing 40 items validated the scale for scoring anxiety: state-trait anxiety inventory (STAI).

The STAI is a 40-items scale, which uses a 4-point Likert scale for each item. The scale can be used to measure both trait anxiety (how dispositionally anxious a person is across time and situations) and state anxiety (how anxious a person is feeling at a particular moment) as it consists of two separate sub-scales (STAI-T and STAI-S, respectively) each containing 20 items. An abnormal value of STAI was considered when  $\geq 40$  [27].

The questionnaire was returned filled by 178 women (89%) within 48 h from the shipment and these women were considered for the study.

A fear that COVID-19 could induce fetal structural anomalies was present in 83 women (46.6%; 95% confidence interval [CI] 39.4–53.9), fetal growth restriction in 116 (65.2%; 95% CI 57.9–71.7) and preterm birth in 91 (51.1%; 95% CI 43.8–58.3). The median trait anxiety score (STAI-T) was 37 (interquartile range [IQR] 20–43) and 68 women (38.2%; 95% CI 31.3–45.5) showed a STAI-T score  $\geq 40$ . The psychological impact of COVID-19 outbreaks, measured using the S scale, revealed increased values of STAI-S scale (median 49 IQR 40–56) with a significant increase of 12 points in median values when compared to T scale ( $p \leq 0.0001$ ). Therefore, there is significantly higher prevalence (77.0%; 95% CI 70.1–82.5) of women that surpass the cut-off score of 40 for state of anxiety when STAI-S was applied ( $p \leq 0.0001$ ).

A higher educational status was associated with a significant increase in the prevalence of STAI-S values  $\geq 40$  ( $p = 0.004$ ) but not of STAI-T values ( $p = 0.158$ ). No significant differences in maternal age, gestational age, parity and employment status were evidenced between women with normal ( $< 40$ ) or abnormal ( $\geq 40$ ) STAI-T and S scores.

We also performed a study to estimate the propensity of Italian pregnant women receiving the severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) vaccine during their gestation evaluating the maternal anxiety induced by the vaccination campaign [28, 29]. A questionnaire was sent on the 27th of December, the first day of the initiation of SARS-CoV-2 vaccinations in Italy, to 200 women, which was returned filled by 161 women (80.5%). The questionnaire was structured in two sections: part-A aimed to acquire 16 items on maternal characteristics and to test women's knowledge and concerns about vaccines; part-B containing the STAI.

To evaluate the maternal concern about perinatal complications induced by SARS-CoV-2 vaccination, the following fears were also considered: fetal structural anomalies, growth anomalies, and preterm birth. A fear that the SARS-CoV-2 vaccination could induce fetal structural anomalies was present in 78 women (48.4%; 95% CI 40.5–56.4), fetal growth restriction in 54 (33.5%; 95% CI 26.3–41.4), and preterm birth in 51 (31.6%; 95% CI 24.5–39.4). The median trait anxiety score (STAI-T) was 36 (IQR 31–45), and 61 women (37.9%; 95% CI 30.3–45.8) showed a STAI-T score  $\geq 40$ . The psychological impact of the SARS-CoV-2 vaccine revealed a significant increase in STAI-S values (median 47 IQR 36–56;  $p < 0.0001$ ) with a positive linear correlation between STAI-T and S scores (Pearson  $r = 0.48$ ;  $p < 0.0001$ ).

Of the women considered, 136 (84.5%) felt vaccination was a breakthrough for resolving the pandemic (vaccine positive), while the remaining 25 (25.5%) considered the vaccine not useful (vaccine negative). Among the former group, 72 women (52.9%) were favorable to receiving the vaccine during pregnancy, a percentage significantly higher ( $p = 0.022$ ) when compared to the vaccine negative group (28%). Further women negative to the SARS-CoV-2 vaccine showed a lower educational level ( $p < 0.0001$ ) and a higher prevalence of unemployment ( $p = 0.016$ ) when compared to the vaccine positive group. No differences were found among the other parameters tested. No differences were found between groups in basal anxiety as expressed by the presence of STAI-T values  $\geq 40$  (positive 37.5%; 95% CI 29.3–46.2 vs. negative 40%; 95% CI 21.1–61.3;  $p = 0.813$ ), while there was a significant higher prevalence of abnormal STAI-S values (negative 88.0%; 95% CI 68.7–97.4 vs. positive 63.4%; 95% CI 55.3–72.0) in the group of women negative to a vaccine ( $p = 0.018$ ).

Our data also showed a high level of trait anxiety with abnormal values in 40% of the pregnant women. We evidenced a subgroup of pregnant women who were negative to vaccination that differs from the positive group for the educational and employment status. Of interest was the fact that, in this group despite the trait anxiety being like the group positive to the vaccine,

the anxiety induced by the potential use of the vaccine resulted significantly higher.

According to a systematic review and meta-analysis of 23 studies, with 20,569 participants (16,797 pregnant women and 3,772 postpartum women), during the COVID-19 pandemic and with 3,677 pregnant women before the COVID-19 pandemic, the prevalence rates of anxiety, among pregnant women during the COVID-19 pandemic was 37% (95% CI 25–49%), with a pooled relative risk of anxiety 1.65 (95% CI: 1.25–2.19) relative to those in pregnant women in the same locations during and before the COVID-19 pandemic. Through subgroup analysis, multigravida women had higher prevalence rates of anxiety than primigravida women, and the prevalence of anxiety decreased during pregnancy [30].

Moreover, H. Yan et al. [30] found several results that contradicted the results of some previous studies and highlighted a higher prevalence of anxiety among pregnant women with a university degree or above than amongst pregnant women with low educational levels [31] and a higher prevalence of anxiety among employed pregnant women than among unemployed pregnant women [32]. High educational level indicates high knowledgeability, which may amplify the adverse effects of mental health during the COVID-19 pandemic, and employed pregnant women may face difficult situations such the loss of jobs and earnings due to the COVID-19 pandemic. These difficult situations have a negative influence on mental health.

## DEPRESSION

A systematic review and meta-analysis including 101 studies discovered that the pooled prevalence of depression among women in the perinatal period was 11.9% [33]. The prevalence of postpartum depression was evaluated at 12.0% in a systematic review and meta-analysis that encompassed 58 studies with 37,294 postnatal women [34].

Y. Wu et al. showed that the prevalence of depressive symptoms amongst pregnant women increased from 26% to 34.2% at the beginning of the pandemic, with the contemporary increase in anxiety symptoms [35].

In a meta-analysis of eight studies on 7,750 women, despite depression through the Edinburgh Postnatal Depression Scale score increasing among women in pregnancy and the perinatal period during the COVID-19 pandemic, it did not reach a statistically significant level compared to the non-pandemic period [36].

A systematic review and meta-analysis conducted with 20,569 participants showed that the prevalence rates of depression among pregnant women during the COVID-19 pandemic was 31% (95% CI 20–42%). The prevalence of postpartum depression during

the COVID-19 pandemic was 22% (95% CI 15–29%). The pooled relative risk of depression in pregnant women was 1.08 (95% CI: 0.80–1.46), relative to those in pregnant women in the same locations during and before the COVID-19 pandemic [30].

Multigravida women had higher prevalence rates of depression than primigravida women during the COVID-19 pandemic, and the prevalence of depression followed a U pattern. Specifically, the prevalence of depression was high in the first and third trimesters and was the lowest in the second trimester.

There is evidence for higher depression scores among pregnant women with longer years of education [37].

U. Akgor et al. [38] observed higher levels of depression in older pregnant women, and especially aged 35 and over. This data is consistent with other studies [39, 40]. However, some studies reported the opposite and concluded that younger pregnant women were more prone to depression during the COVID pandemic [35, 41].

In a survey of 257 participants, the youngest age group (18–25 years) accounts for the largest proportion (10/22, 45.5 %) of people with both depression and anxiety, and this was consistent among depressed people (17/50, 34.0%) [42].

Low socioeconomic status was confirmed as one of several risk factors for depressive symptoms [35].

Pregnant women who worry about their finances were more likely to have higher clinical depression scores (adjusted Odds Ratio: 2.23; 95 % CI = 1.80, 2.77,  $p < 0.001$ , adjusted model  $R^2 = 0.06$ ). Pregnant women with both high and low incomes were at risk of developing depression if they experienced COVID-19-associated financial stress [43].

Women who reported poor social support and social isolation also have higher depressive symptoms at all-time points. Loneliness was also associated with a greater increase in depressive symptoms although not anxiety symptoms, from prior to during the pandemic [44].

According to psychodynamics, depression is a general state of inhibition, where actions are undermined, however, anxiety is a general state of alertness that motivates people toward to actions. The presence of a factor that affects the whole world, such as a pandemic process, where both being in the hospital and not being able to come to the hospital cause concerns, can explain the positive correlation between these two different and almost opposite feelings.

## COPING STRATEGY

Coping is a primary component of an individual's response to stressful events [45]. Several studies have shown that effective coping strategies are associated with better psychological wellbeing during the COVID-19 pandemic, including reduced anxiety and depression [46–50].



The assessment of coping is crucial to understanding the ways in which psychological stress and stressful life events can be buffered partly from being able to control the stressor or relying on support from others (i.e., social support) [45, 51–53]. Sociocultural contexts must be considered in the study of perinatal stress and coping [54]. Coping strategy can also vary depending on race, ethnicity, and socioeconomic status [55, 56].

Research has distinguished between three major types of coping: (1) problem-focused coping, which involves actions aimed at addressing the problem (e.g., planning, seeking instrumental support), (2) emotion-focused coping, which aims to manage negative emotions (e.g., seeking emotional support, cognitive restructuring), and (3) dysfunctional coping, which involves maladaptive strategies that are not helpful in dealing with the stressor (e.g., denial, behavioral disengagement) [57].

J.E. Khoury et al. [58] found that particular COVID-19-related experiences were differentially associated with distinct forms of coping. Specifically, individuals who saw the COVID-19 pandemic as having a greater negative impact engaged in more dysfunctional coping and less emotion-focused coping. In contrast, greater financial difficulties and social isolation were associated with more dysfunctional coping and problem-focused coping, but not emotion-focused coping [58].

### IMPLICATIONS FOR CLINICAL PRACTICE

Increased risk of mental disorders due to COVID-19 requires that policies are developed to address prenatal and postpartum care to promote maternal–child wellbeing outcomes. It is important for health professional working with childbearing women to identify any stressors during prenatal care and provide resources to obtain psychological support to manage and/or reduce their impact [59].

Health professional should increase awareness about the transmission of the disease, explaining the precautions that can be taken for prenatal, postpartum, breastfeeding, and neonatal care; and asking patients for psychiatry consultation to increase the psychiatric well-being of pregnant women [38].

H. Bayrampour et al. [60] showed that the higher the risk perception level of pregnant women, the more severe the anxiety level. Therefore, medical teams should make the risk perception level of pregnant women precise by spreading accurate information to them to reduce their anxiety levels. Social support could regulate anxiety directly and negatively or affect it indirectly through risk perception. Thus, during the epidemic,

health professionals can take two measures to maintain the mental health of pregnant woman and reduce anxiety: actively mobilize the social support system for pregnant women and reduce the risk perception level of pregnant women in relation COVID-19 [61].

Social support includes subjective and objective support, and its utilization. Previous studies have shown that a high level of social support plays a protective role against anxiety during pregnancy [62, 63]. Social support can play a direct protective role in individuals' negative emotions, by helping with behavior and providing emotional support. In addition, social support can also improve the assessment and coping skills of individuals, reduce the perceived severity of stressful events, and thus play an indirect protective role in mental health [64].

Recent meta-analyses of randomized controlled trials have shown that pre- and post-natal exercise can reduce depression and depressive symptoms [65].

During the COVID-19 pandemic pregnant women have shown a significant decrease in engagement in physical activity compared to their lifestyle habits during pregnancy from before the confinement. Physical exercise has been demonstrated to be effective in the treatment of mild to moderate depression in the non-pregnant population [66]. Physical activity is a relatively costless intervention that can improve maternal wellbeing [67, 68].

Moreover, a self-care daily program can be based on the NEST-S principles: Nutrition, Exercise, Sleep, Time for Self, Support can be helpful<sup>3</sup>.

HealthCare providers must have clear evidence-informed guidelines in place for either treating individuals or referring to other professionals, and, in the event of referral, ensuring that patients are assisted [69].

### CONCLUSION

There is a greater psychological impact, as well as higher rates of anxiety and depression, in pregnant women during the COVID-19 outbreak, and this highlights the need for intervention. Meeting the mental health needs of pregnant and postpartum women during the COVID-19 pandemic is a growing concern and a serious issue because a large body of robust evidence suggests that prenatal and postnatal mental disorders induce severe adverse influences on mothers, fetuses, and children.

The identification of high-risk women is crucial in order to be able to suggest the possible implementation of early psychological interventions and prevent some pregnancy stress-related complications.

<sup>3</sup> <https://www.heretohelp.bc.ca/sites/default/files/coping-with-depression-during-pregnancy-and-following-birth-a-cognitive-behaviour-therapy-based-self-management-guide-for-women.pdf> Accessed July 27<sup>th</sup>, 2021.

## AUTHOR CONTRIBUTIONS

Ilenia Mappa developed the general concept of the article, researched and analyzed the literature on the review topic. Flavia Adalgisa Distefano, participated in writing the text of the manuscript and its interpretation. Giuseppe Rizzo developed the general concept of the article and supervised its writing. All authors participated in the discussion and editing of the work. All authors approved the final version of the publication.

## ВКЛАД АВТОРОВ

И. Маппа разработала общую концепцию статьи, исследовала и проанализировала литературу по теме обзора. Ф.А. Дистефано участвовала в написании текста рукописи и его интерпретации. Д. Риццо разработал общую концепцию статьи и руководил ее написанием. Все авторы участвовали в обсуждении и редактировании работы. Все авторы одобрили окончательную версию статьи.

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