REVIEW ARTICLE

Perinatal Depression and Anxiety during the COVID-19 Pandemic: A Review and Future Direction

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ABSTRACT

Introduction: During the COVID-19 pandemic, a variety of stressful situations have affected perinatal women, including behavioral restrictions due to government lockdown, avoidance of hospital visits due to infection anxiety, and increased partner violence due to economic difficulties. These increased stressors often have impacts on perinatal mental health.

Methods: This review summarizes the prevalence of perinatal depression and anxiety during the COVID-19 pandemic and examines the impact of the pandemic on perinatal mental health around the world.

Results: The prevalence of perinatal depression ranged from 13-58%, and perinatal anxiety ranged from 11-61%, based on simple screening methods. As the prevalence of anxiety and depressive symptoms among perinatal women increases, medical staff availability will decrease. Therefore, receiving medical care is becoming increasingly difficult for perinatal women under pandemic restrictions. A need exists to popularize mobile applications and other online methods for remotely providing mental healthcare to perinatal women.

Conclusion: The important role of medical staffs in caring for pregnant women includes preventing perinatal depression by telemedicine during a pandemic. Clear procedures should be prepared on how medical staffs of obstetrics and gynecology can be involved in telemedicine for perinatal women and the optimal timing for connecting them to psychiatric care.

KEY WORDS

COVID-19, perinatal anxiety, perinatal depression, prevalence, remote medicine

INTRODUCTION

Perinatal mental healthcare importantly includes the prevention and treatment of perinatal depression. The incidence of perinatal depression has been estimated at around 7%. Perinatal suicide is one of the leading causes of maternal mortality[1,2]. Rates of perinatal suicidal ideation have been reported to range from 5-14%[3]. Psychiatric problems, such as perinatal depression, are presumed to cause suicidal ideation and suicide. Establishing perinatal mental health measures in the COVID-19 pandemic is necessary. Previous studies have shown that perinatal distress is common and can cause mental disorders. Perinatal distress adversely affects pregnancy outcomes and the physiological development of the baby.

The socioeconomic impact of COVID-19 throughout the world has also been remarkable. Restrictive measures to limit the pandemic may result in changes in healthcare practices, less social support, and the inability of partners to attend perinatal care. Some reports have indicated that women were more likely than men to experience loss of income. These socioeconomic changes caused by the pandemic will have a negative impact on perinatal mental health. The perinatal psychosocial background in the COVID-19 pandemic needs to be investigated.

We have been prospectively researching the prevalence of and risk factors for perinatal mental health problems for Japanese women since 2011. At the beginning of this research, the Great East Japan Earthquake, the most powerful ever recorded in Japan, occurred on March 11, 2011. A total of 19,747 people died, 6,242 were injured, and 2,556 went missing. Our research group focused on the changes in the incidence of maternal depression and anxiety during this disaster and reported through this prospective study that maternal anxiety increases during disasters, regardless of whether individuals are directly affected by the disaster, resulting in an increased incidence of postpartum depression[4]. In the COVID-19 pandemic, as in other disasters, perinatal women may experience anxiety due to enforced isolation and limited access to professional care and family support. Perinatal mental disorders such as anxiety, depression, and post-traumatic stress disorder (PTSD) occur at a high rate in many countries during periods of restricted access following emergencies. This review examines the impact of the COVID-19 pandemic on perinatal mental health around the world.

PERINATAL PHYSICAL EFFECTS OF COVID-19 INFECTION

COVID-19 infection has a variety of effects on perinatal maternal and neonatal outcomes. Kotlar *et al*. (2021)[5] reviewed studies on the effects of the pandemic on pregnant women and found that COVID-19 did not cause mother-to-child transmission in utero, via breast milk, or during birth. The authors suggested that perinatal women were at the same level of risk for COVID-19 infection, but at a higher risk of more severe symptoms, than non-pregnant women. Chmielewska *et al*. (2021)[6] conducted a meta-analysis of studies on the effects of the COVID-19 pandemic on maternal, fetal, and neonatal outcomes. A significant increase was found in stillbirth and maternal death compared to before the pandemic. Preterm births did not significantly change, but in

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high-income countries, preterm birth and spontaneous preterm birth decreased. Ectopic pregnancies requiring surgical management increased during the pandemic.

Infection-like physical symptoms have been reported in some cases, even when the patient was not infected. Carrat et al. (2021)[7] conducted a multi-cohort survey in France to identify the prevalence of and risk factors for COVID-19-like symptoms (CLS) during the lockdown period. CLS was defined as cough, fever, dyspnea, ageusia, or anosmia that suddenly started and lasted more than 3 days. Of 106,848 participants, 3,035 patients with CLS were reported. The cumulative incidence of CLS was 6.2% at day 15 and 8.8% at day 45 of lockdown. The risk factors for CLS were younger age; areas with a higher prevalence of COVID-19; areas with a population of 100,000 or more; living with at least one child; obesity; chronic respiratory disease; anxiety or depression; and chronic diseases other than hypertension, diabetes, cancer, or cardiovascular disease. However, guidelines for labor, delivery, and breastfeeding for COVID-19-infected perinatal women are still not well standardized.

PERINATAL PSYCHOLOGICAL BURDEN OF THE COVID-19 PANDEMIC

The COVID-19 pandemic has had not only a direct impact through the infection but also an indirect impact on perinatal mental health through changed medical, political, and socioeconomic conditions.

Firstly, an increase in stress associated with pandemics has been reported. Boekhorst (2021)[8] conducted a prospective perinatal cohort study in the Netherlands. Before the pandemic, 401 prenatal women participated, 250 of whom also responded postpartum. During the pandemic, 268 prenatal women participated, 59 of whom also responded postpartum. During the pandemic, pregnancy stress increased significantly. Suárez-Rico et al. (2021)[9] conducted a cross-sectional online survey of 293 postpartum women in Mexico. Moderate and high perceived stress were found in 58% and 10.9% of the participants, respectively. The prevalence of perceived stress was higher during the COVID-19 lockdown than before. Moyer et al. (2020)[10] examined the stressors related to the COVID-19 pandemic on 2,740 pregnant women in the US. For prenatal care, 25.8% stopped face-to-face consultations, 15.2% received video consultations, and 31.8% received phone consultations due to the pandemic. Those planning a hospital birth decreased from 96.4% to 87.7% following the lockdown. In addition, 59.2% reported increased stress about running out of food, 63.7% about decreased income, 56.3% about loss of childcare, 37.5% about conflict between household members, and 93% about being infected with COVID-19.

Secondly, an association between health anxiety and avoidance of medical visits has been reported. Shayganfard et al. (2020)[11] examined the relationships between health anxiety, depression, stress, and subjective beliefs with the risk of COVID-19 infections in 66 pregnant and 37 postpartum participants. Having infected acquaintances and strict adherence to safety recommendations were associated with higher health anxiety, depression, and stress. Participants with high health anxiety postponed or canceled appointments for routine health checkups. Inversely, difficulty in connecting to medical care has been reported to result in the development of anxiety. Basu et al. (2021)[12] conducted a cross-sectional online survey of 6,894 perinatal women in 64 countries to determine the impacts of pandemic-related information-seeking, anxiety, and preventive behaviors on mental health during the COVID-19 pandemic. Eighty-six percent of women reported being "somewhat concerned" or "very concerned" about COVID-19. The most reported concerns were inability to visit family after the delivery (59%), the baby being infected with COVID-19 (59%), a lack of social support (55%), and changes in the birth plan due to the pandemic (41%).

Thirdly, the COVID-19 pandemic can indirectly change relationships with partners and children. Xue et al. (2021)[13] conducted a prospective single-center study to assess parental self-efficacy, depressive symptoms, marital satisfaction, and health-related quality of life. Questionnaires were completed by 53 participants during the pandemic and 58 before or after the lockdown. During the pandemic, parental self-efficacy was lower than before and after the pandemic. Parental self-efficacy and quality of life were closely related, and parental self-efficacy was affected by gestational age, birth weight, number of children, and distance from home to hospital. An increase in domestic violence due to economic difficulties caused by the COVID-19 pandemic has also been reported. A scoping review by Kotlar et al. (2021)[5]

highlighted the problems of increasing domestic violence among families with low household income during the COVID-19 pandemic. Muldoon et al. (2021)[14] conducted a cross-sectional study about perinatal intimate partner violence. Of the 216 participants, 24% were found to have experienced some form of perinatal intimate partner violence. The strongest risk factor for perinatal intimate partner violence was having a below-average?household income.

In summary, the stresses caused by COVID-19 include lack of food, reduced income, childcare, family conflicts, and fear of infection. These stressors have increased anxiety, and in some cases, resulted in avoiding seeking medical attention.

EPIDEMIOLOGY OF PERINATAL DEPRESSION AND ANXIETY DURING THE COVID-19 PANDEMIC

This section summarizes epidemiological reports during the COVID-19 pandemic, focusing on perinatal depression and anxiety.

1) Prevalence of depression and anxiety in perinatal women

Table 1 shows the prevalence of depression, anxiety, and other mental conditions related to these symptoms in perinatal women during the COVID-19 pandemic. Depression was found in 11-58% and anxiety in 10-61%, showing an increased prevalence during the pandemic in most of the surveys. Importantly, however, in most of these studies, perinatal depression was evaluated using simple screening methods such as the EPDS instead of structured clinical interviews.

The EPDS notably does not have a high positive predictive value for depression. It has been reported to reflect the symptoms of both depression and anxiety factors. Anxiety factor scores have often been observed to increase due to external influences such as disasters. Our previous study also showed that EPDS scores, especially for the anxiety factor, increased in pregnant women after the Great East Japan Earthquake, even those not directly affected by the earthquake itself. Therefore, the increase in EPDS scores during the current pandemic may reflect an increase in the anxiety component from the pandemic disaster, rather than any increase in the depressive component compared to non-disaster situations.

Liu et al. (2021)[15] reported that women with pre-existing mental health diagnoses based on their self-reported history were 1.6-3.7 times more likely to score at clinically significant levels for depression, generalized anxiety, and PTSD.

Shorey et al. (2021)[16] conducted a meta-analysis of 26 studies to determine the prevalence of perinatal anxiety and depressive symptoms during the COVID-19 pandemic. The prevalence of anxiety was higher than that of depression throughout the perinatal period. The prevalence of depressive symptoms was reported to be higher during pregnancy than in the postpartum period. The pooled prevalence was 40% for anxiety symptoms and 27% for depressive symptoms.

2) Comparison of prevalence before and during the COVID-19 pandemic

Table 2 summarizes comparisons of the prevalence of perinatal depression and anxiety before and during the COVID-19 pandemic.

The prevalence of perinatal depression and anxiety was found to increase during the pandemic in 3 studies[17-19]. In contrast, studies by Pariente et al. (2020)[20] and Wu et al. (2020)[21] found that the prevalence decreased. McFarland et al. (2021)[22], who examined the severity of depression and anxiety in perinatal women in New Jersey, showed that those who gave birth during the pandemic had higher levels of depressive than those who gave birth before it. Fallon et al. (2021)[23] reported that the prevalence of clinically relevant maternal depression and anxiety during the pandemic were extremely high compared to self-reported current diagnoses of depression (11%) and anxiety (18%) and to a meta-analytic review (depression assessed by the EPDS 16%; anxiety assessed by the STAI-S 14%) during the non-pandemic period.

3) Factors affecting perinatal depression and anxiety

Epidemiological studies have reported various risk factors and protective factors that could affect the development of perinatal depression and anxiety during the COVID-19 pandemic. In the study by Wu et al. (2020)[21], the risk factors for developing depressive and anxiety symptoms during the pandemic period were low body weight, first birth, age

Table 1: Prevalence of risk factors for perinatal depression and anxiety during the COVID-19 pandemic

References	Study design	Participants	N	Area	Prevalence anxiety	Prevalence depression
Zeng et al. (2020)[39]	cross-sectional	perinatal women	625	China	31%	19%
Farrell et al. (2020)[40]	cross-sectional	prenatal women	288	Qatar	34%	39%
Sun et al. (2020)[41]	cross-sectional	prenatal women	2,883	Wuhan, China	33.7% (27% mild, 5.2% moderate, 1.5% severe)	27%
Fallon et al. (2021)[23]	cross-sectional	women up to 12 weeks postpartum	614	UK	61% STAI ≥ 40	43% EPDS ≥ 13
Liu et al. (2021)[32]	cross-sectional	perinatal women	1123	US	23%	36%
Ravaldi et al. (2020)[42]	web-based, cross-sectional	pregnant women	737	Italy	22% (STAI-Y1 > 49)	
Ceulemans et al. (2021)[44]	web-based, cross-sectional	pregnant women	3,907	Ireland, Norway, UK Switzerland, Netherlands	11% (GAD ≥ 10)	15% (EPDS ≥ 13)
		breast-feeding women up to 3 months postpartum	5,134		10% (GAD ≥ 10)	13% (EPDS ≥ 13)
Chaves et al. (2021)[43]	web-based, cross-sectional	prenatal women	450	Spain	51%	58%
		postnatal women	274			
Liu et al. (2021)[15]	web-based, cross-sectional	pregnant womeøøn	715	US	22%	36%
Løpez et al. (2021)[45]	multicenter study	confined perinatal women	514	Spain	43% trait anxiety 44% state anxiety	35% EPDS ≥ 10 21% EPDS ≥ 13
Parra-Saavedra et al. (2020)[31]	web-based, cross-sectional	perinatal women	946	7 cities in Columbia	50%	25%

Abbreviation: GAD, Generalized Anxiety Disorder seven-item scale; EPDS, Edinburgh Postnatal Depression Scale; STAI, State-Trait Anxiety Inventory; NSESSS

Table 2: Comparison of the prevalence of perinatal depression and anxiety during and before the COVID-19 pandemic

References	Study design	Participants	N	Area	Positive diagnosis of perinatal depression	Prevalence of perinatal depression during pandemic	before pandemic
Pariente et al. (2020)[20]	cohort	healthy women with a singleton pregnancy	346	Negev area, Israel	EPDS ≥ 10	17% (n = 223)	31% (n = 123)
					EPDS ≥ 13	7% (n = 223)	15% (n = 113)
Wu et al. (2020)[21]	multicenter, cross-sectional	pregnant women	4124	China	EPDS ≥ 10	26% (n = 2839)	30% (n = 1285)
Zanardo et al. (2020)[7]	non-concurrent, case-control	women giving birth	192	Northeastern region, Italy	EPDS ≥ 12	29% (n = 91)	12% (n = 101)
Hiiragi et al. (2021)[18]	retrospective	postpartum women	618	Yokohama, Japan	EPDS ≥ 9	14% (n = 279)	10% (n = 339)
King et al. (2021)[19]	cohort	pregnant women	817	San Francisco Bay Area, USA	EPDS ≥ 11	42% (n = 729)	25% (n = 88)

Abbreviation: EPDS, Edinburgh Postnatal Depression Scale

under 35 years, full-time work, middle income, and adequate housing before pregnancy.

Korukcu et al. (2021)[24] conducted a cross-sectional study to determine the impact of the COVID-19 pandemic on antenatal depression in Turkey. The most significant predictors of depressive symptoms were fear about safe delivery, social media and news programs related to COVID-19 increasing levels of concern, fear of hospitalization before delivery, having nightmares during the COVID-19 pandemic, the request for an elective cesarean delivery because of fear of catching COVID-19, fear about breastfeeding the infant, concerns about the mother's own health.

Masters et al. (2021)[25] conducted a cross-sectional study in Massachusetts in the US to determine the association between psychiat-ric symptoms and the COVID-19 pandemic. The participants were pregnant to 3 months postpartum and had a history of depression. During the pandemic, 80.8% of the 163 participants had worsening depressive symptoms, and 88.8% had worsening anxiety. The risk factors for pandemic depression and anxiety were positive screening for depression, anxiety, and PTSD; high education; and high income.

Kinser et al. (2021)[26] conducted a cross-sectional online observational study of 524 pregnant to 6-months postpartum women in the US during the COVID-19 pandemic. Exacerbating factors for depressive symptoms, anxiety, and PTSD were anxiety about job or family, along with use of social media or news media. Protective factors were eating comfort foods, resilience, adaptability, and sleep.

Harrison et al. (2021)[27] investigated the relationship between social

support, anxiety, and depression in 205 pregnant women in the UK during the COVID-19 pandemic. The more perceived social support, the lower the scores for depression and anxiety. Repetitive negative thoughts and loneliness were mediating variables.

Ionio et al. (2021)[28] investigated the impact of COVID-19 on the perinatal mental health of 75 participants in Italy. Perinatal depressive symptoms were more prevalent in women who perceived the pandemic as a significant event, experienced frequent intrusive and hyperarousal symptoms, and had poor planning.

Sakalidis et al. (2021)[29] conducted a cross-sectional online survey of postpartum women in Australia and New Zealand to determine their breastfeeding practices and mental health during the pandemic. Of the women, 82% were fully breastfeeding. Partial breastfeeding was associated with a decrease in the amount of breast milk produced and longer periods of pregnancy during the pandemic. Stress scores were also higher in areas with higher rates of COVID-19 infection and in women who felt that their milk supply was low.

De Arriba-García et al. (2021)[30] studied the effect of confinement on perinatal depression and anxiety in 754 perinatal women, of whom 58% screened positive for depression and anxiety. The mean duration of confinement was 55 days. The risk factors were poor health, more sadness, and more nervousness. The protective factors were a high Apgar score and induction of labor.

According to the cross-sectional study by Parra-Saavedra (2020)[31], risk factors other than anxiety for perinatal depression included lack of social or family support, concerns about family and friendships, low body weight, first childbirth, smoking, and employment. The disagreement has existed on how to view income, with some studies viewing high income as a risk factor and others viewing low income as a risk factor. Protective factors for perinatal depression and anxiety included having a partner, being physically healthy, breastfeeding, working from home, eating comfort food, getting enough sleep, and being aware of having adequate support.

PERINATAL MENTAL HEALTHCARE BY REMOTE MEDICINE DURING THE COVID-19 PANDEMIC

Epidemiological studies have shown that the prevalence of anxiety and depressive symptoms among perinatal women has increased during the COVID-19 pandemic. Pregnant and nursing mothers have always found frequent hospital visits difficult for childcare and other reasons, and the pandemic makes face-to-face care even more difficult due to limited transportation and restricted access. Liu et al. (2021)[32] reported that depression was more prevalent among women who canceled or reduced medical appointments and that strict social distancing was associated with depression. Zanard et al. (2021)[17] conducted a case-control study on the breastfeeding practices of women who gave birth during the COVID-19 lockdown in Italy and reported that the lockdown group showed significantly higher depression and anhedonia scores. Perinatal mental healthcare requires developing not only the skills of medical staffs and public health professionals, who are considered the core of perinatal psychological care, but also methods of care that do not require direct contact, using the latest remote information technology, such as online consultation systems and internet applications for psychological education.

Nanjundaswamy et al. (2020)[33] conducted an online survey of 118 obstetricians to identify the concerns of perinatal women during the COVID-19 pandemic in India. Their most common concerns were hospital visits (73%), how to protect themselves from COVID-19 (60%), infant safety (52%), social media messages (41%), and infection (40%). Obstetricians suggested the need for appropriate video and website information for perinatal women, as well as practitioner training on counseling skills to deal with COVID-19-related anxiety.

A lack of evidence still exists for online counseling and application-based care. Therefore, intervention studies are beginning to be conducted to determine whether these are as effective as face-to-face care by professionals. Kubo et al. (2021)[34] conducted a 6-week mindfulness meditation program using a mobile application for pregnant women with depression who were not regularly engaged in mindfulness meditation. Significant improvements were found in participants depressive symptoms, stress, sleep, and mindfulness scores. Participants appreciated the convenience of the application, which allowed receiving treatment whenever they chose. Gopalan et al. (2021)[35] studied the effectiveness of remote consultation liaison in perinatally hospitalized women from their medical records over the past year. A total of 85 remote psy-

chiatric interviews were conducted, mainly for managing depression, anxiety, and medication. As a result, 63 patients received bedside psychotherapeutic intervention and education, 32 were commenced on medication, and 47 were referred to outpatient services. These results indicate that remote consultation liaison can successfully engage mothers at risk of mental illness in psychiatric treatment. Schwank et al. (2020)[36] have commenced an intervention study of online psychosocial peer-to-peer support among pregnant women in metropolitan urban settings. This intervention aims to reduce the risk and severity of perinatal psychiatric disorders and prevent adverse pregnancy outcomes. Singla et al. (2021)[37] evaluated the efficacy of brief behavioral activation therapy for perinatal depression and anxiety, comparing specialists versus non-specialists and telemedicine versus face-to-face treatment. If these studies demonstrate the effectiveness of telemedicine and application-based remote treatments, and if these become more widely available, access to treatment for depression and anxiety could be improved for perinatal women during the COVID-19 pandemic.

Remote medicine is expected to become more widespread during pandemics in the future, and the role of medical staffs in caring for pregnant women is undoubtedly important in preventing perinatal depression. Wang et al. (2021)[38] used a meta-analytic approach to show that psychological interventions provided by nurses and midwives had a significant effect on reducing depressive symptoms in the perinatal period. Clear procedures should be prepared on how medical staffs of obstetrics and gynecology can be involved in telemedicine for perinatal women and the optimal timing for connecting them to psychiatric care.

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CONFLICT OF INTEREST

The authors declare no conflict of interest.

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