The impact of the COVID-19 on the mental health of pregnant women in Shanghai, China

Jiali Zhang

Fenglin Community Health Service Center

Hualong Yuan

Fenglin Community Health Service Center

Liping Xu

Fenglin Community Health Service Center

Chuntao Yi

Fenglin Community Health Service Center

Weiming Tang (✉ weiming_tang@med.unc.edu)

The University of North Carolina at Chapel Hill Project-China

Research Article

Keywords: COVID-19, pregnant women, depression, anxiety

Posted Date: February 11th, 2022

DOI: <https://doi.org/10.21203/rs.3.rs-1330362/v1>

License: © ⓘ This work is licensed under a Creative Commons Attribution 4.0 International License.

[Read Full License](#)

Abstract

Background

The COVID-19 has greatly impacted people's health, especially mental health. This study aimed to compare the psychological status of pregnant women before and after the COVID-19 outbreak.

Method

Participants were recruited (from September 29, 2019, to November 5, 2020) and screened by the Patient Health Questionnaire (PHQ-9) and the Generalized Anxiety Disorder Scale (GAD-7). The study participants were categorized into three groups based on two turning-point days: January 23, 2020, when China initiated a locked-down strategy, and May 11, 2020, when Shanghai's COVID epidemic situation became stable.

Results

We recruited 478 pregnant women. After the outbreak, the depression rate ($\text{PHQ-9} \geq 5$) increased 12.3% (from 35.4–47.7%, $P=0.022$), and the anxiety rate ($\text{GAD-7} \geq 5$) was stable (13.3% VS 16.2%, $P=0.46$). The multivariable logistic regression results further confirmed that the odds of depression in pregnant women increased 79% after the outbreak (aOR=1.79, 95%CI: 1.14-2.79). Under the epidemic, the median depression scale score was still statistically higher after the epidemic situation was stable (5.0 vs. 4.0, $P=0.028$).

Conclusion

The depression rate increased among pregnant women after the outbreak and was not recovered after the epidemic turned normal among pregnant women. Health institutes should pay attention to the long-term influence of the pandemic.

Background

By January 6, 2022, 133,304 confirmed cases of COVID-19, and 5,699 deaths had been reported in China¹. Globally, as of 5:13pm CET, January 6, 2022, there have been 296,496,809 confirmed cases of COVID-19, including 5,462,631 deaths². COVID-19 is the second new infectious disease declared the "global pandemic" by the World Health Organization³ and was considered to be the biggest pandemic in the 21st century. The pandemic has strongly shifted the world and greatly impacted people's health, especially mental health.

Pregnancy is a particular period associated with physiological changes, making pregnant women more susceptible to respiratory infections, such as COVID-19⁴. The fear of COVID-19 and its serious consequences (miscarriage, premature birth, low birth weight, stillbirth, and neonatal death)^{4,5} can cause anxiety and depression among pregnant women. During the pandemic period, even if pregnant women are not infected with COVID-19, various prevention and control measures could still affect daily life, antenatal care, and accompanying childbirth arrangements, increasing their psychological burden. The COVID-19 vaccination program does not involve pregnant women in China, further worsening the psychological status. Anxiety and depression in pregnancy affect the pregnancy outcome (premature birth, low birth weight)^{6, 7} and the social and emotional development, cognitive and language development, exercise ability, and adaptive behavior of offspring⁶. Therefore, under the current situation of the COVID-19 epidemic, it is essential to understand the psychological issues of pregnant women during the pandemic period to provide tailored services to mitigate the impact.

This pre-post study aimed to fill the research gap by evaluating the impact of COVID-19 on the mental health of Chinese pregnant women by comparing the psychological scale scores before and after the pandemic outbreak.

Results

Sociodemographic characteristics

A total of 478 pregnant women were included in this study. There were 113 in the control group and 365 in the pandemic group. The age of the participants was 31 ± 4 years old, and Body Mass Index (BMI) was 21.4 ± 3.0 kg/m². The demographic characteristics of the two study groups are shown in Table 1. There was no statistical difference in the age, BMI, nationality, occupation, parity, the number of fetuses, and the conception mode of the two groups. However, the two groups differed in educational level and gestational week.

Table 1
Descriptive analysis of the demographic characteristics, 2019-2020 (N=478)

Characteristic	Control Group (n=113)	Pandemic Group (n=365)	Chi-square	P
	September 29 2019 - January 23 2020	January 31 2020 - November 5 2020		
	n (%)	n (%)		
Age			2.111	0.15
<35 years old	97 (85.8)	291 (79.7)		
≥35 years old	16 (14.2)	74 (20.3)		
BMI before pregnancy			0.952	0.62
<18.5	13 (11.5)	55 (15.1)		
18.5-23.9	82 (72.6)	251 (68.8)		
≥24	18 (15.9)	59 (16.1)		
Nation			1.662	0.20
Han	113 (100.0)	356 (97.5)		
Ethnic minority	0 (0.0)	9 (2.5)		
Educational level			6.754	0.034
High school or below	12 (10.6)	34 (9.3)		
Bachelor degree	81 (71.7)	221 (60.5)		
Master degree or above	20 (17.7)	110 (30.1)		
Occupation			4.634	0.33
Professional	36 (31.9)	113 (31.0)		
Clerk	26 (23.0)	101 (27.7)		
Commercial service personnel	30 (26.5)	78 (21.4)		
Other occupation	19 (16.8)	53 (14.5)		
Unemployed	2 (1.8)	20 (5.5)		
Parity			0.029	0.87
Primiparity	88 (77.9)	287 (78.6)		
Multiparity	25 (22.1)	78 (21.4)		

Characteristic	Control Group (n=113)	Pandemic Group (n=365)	Chi-square	P
	September 29 2019 - January 23 2020	January 31 2020 - November 5 2020		
	n (%)	n (%)		
Number of fetuses			0.624	0.43
Single birth	112 (99.1)	355 (97.3)		
Twins	1 (0.9)	10 (2.7)		
Mode of conception			2.754	0.097
Naturally reproduction	108 (95.6)	331 (90.7)		
Assisted reproduction	5 (4.4)	34 (9.3)		
Gestational week			4.959	0.026
<13 week	99 (87.6)	285 (78.1)		
≥13 week	14 (12.4)	80 (21.9)		

Psychological scales

The median depression scale score in the control group was 3.0 (6.0), and the median anxiety scale score was 0.0 (2.0). The median depression scale score was 4.0 (5.0) for the pandemic group, and the median anxiety scale score was 0.0 (3.0). With a depression cutoff score of 5 for PHQ-9, 40 (35.4%) pregnant women were considered to be depressed in the control group, and 174 (47.7%) participants were supposed to be depressed in the pandemic group. The depression rate was higher in the pandemic than in the control group ($P=0.022$). With an anxiety cutoff score of 5 for GAD-7, 15 (13.3%) pregnant women were anxious in the control group, and 59 (16.2%) people were anxious in the pandemic group. The rates were similar in the two study groups ($P=0.46$). Besides, 12.9% of the participants in the pandemic group were in moderate and severe depression ($\text{PHQ-9} \geq 10$). Detailed scores were presented in Table 2.

Table 2
Distribution of scores on the psychological scales, 2019-2020 (N=478)

Scales	Control Group (n=113)	Pandemic Group (n=365)	Outbreak group (n=125)	Back-to-normal group (n=240)
	n (%)	n (%)	n (%)	n (%)
PHQ-9				
0~4 (depression-free)	73 (64.6)	191 (52.3)	74 (59.2)	117 (48.8)
5~9 (mild depression)	27 (23.9)	127 (34.8)	40 (32.0)	87 (36.3)
10~14 (moderate depression)	9 (8.0)	36 (9.9)	8 (6.4)	28 (11.7)
15~27 (severe depression)	4 (3.5)	11 (3.0)	3 (2.4)	8 (3.3)
GAD-7				
0~4 (anxiety-free)	98 (86.7)	306 (83.8)	110 (88.0)	196 (81.7)
5~9 (mild anxiety)	14 (12.4)	48 (13.2)	10 (8.0)	38 (15.8)
10~14 (moderate anxiety)	0 (0.0)	7 (1.9)	3 (2.4)	4 (1.7)
15~21 (severe anxiety)	1 (0.9)	4 (1.1)	2 (1.6)	2 (0.8)

After further categorizing the pandemic group into the outbreak and back-to-normal group, there were no statistical differences in age, BMI, nationality, occupation, education, gestational week, parity, fetal number, and conception mode between the two groups. Overall, 51 (40.8%) pregnant women were in depression in the outbreak group, and 123 (51.3%) participants were in depression in the back-to-normal group ($P=0.058$). The Mann-Whitney U test showed the median depression scale score of the back-to-normal group [5.0 (5.75)] was statistically higher than that in the outbreak group [4.0 (4.5)] ($U=12911.000$, $P=0.028$). Forty-four (18.3%) people were considered anxious in the back-to-normal group, and fifteen (12.0%) were supposed to be anxious in the outbreak group, and the percentages were similar in the two study groups ($P=0.12$).

Factors associated depression and anxiety

The results of the multivariable analysis indicated that participants with a gestational week less than 13 weeks were more likely to have depression, with an adjusted OR (aOR) of 1.78 (95% CI:1.10-2.90). In addition, participants recruited during the pandemic period were more likely to be determined to be in depression, with aOR of 1.79 (95% CI: 1.14-2.79). There were no statistical differences in anxiety status

before and after the outbreak of COVID-19 among pregnant women (Chi-square=0.945, P=0.918). Details are presented in Table 3.

Table 3
Logistic regression analysis of depression and anxiety, 2019-2020 (N=478)

	Depression		Anxiety	
	Adjusted OR (95%CI)	P	Adjusted OR (95%CI)	P
Educational level				
High school or below	Reference		Reference	
Bachelor degree	1.41 (0.72-2.75)	0.31	1.22 (0.48-3.09)	0.68
Master degree or above	1.25 (0.61-2.56)	0.54	1.35 (0.50-3.62)	0.56
Gestational week				
<13 week	1.78 (1.10-2.90)	0.019	0.95 (0.51-1.79)	0.88
≥13 week	Reference		Reference	
COVID-19 effect				
Pre-pandemic	Reference		Reference	
Pandemic	1.79 (1.14-2.79)	0.011	1.24 (0.67-2.29)	0.50

Discussion

Our study indicated that the risk of depression significantly increased among pregnant women after the pandemic. Our finding is consistent with a multi-centered study conducted in 10 Chinese provinces, which reported an increased depression risk in pregnant women after the outbreak of COVID-19⁷. Several reasons could explain this situation. On the one hand, pregnant women may worry about COVID-19's effects on their health and offspring, increasing their risk of depression. Pregnant women would fear that the COVID-19 infection will likely affect placental function^{5,8} and seriously impact offspring, mainly abortion, premature birth, fetal embarrassment, low birth weight, fetal death, and neonatal death^{4,5}. On the other hand, the COVID-19 control measures seriously impact pregnant women's daily life and routine antenatal examination, exposing them to the stress of "the epidemic is around the corner," which further increases their risk of depression.

We found that the psychological status of pregnant women did not improve during the back-to-normal period. Several reasons would have led to this phenomenon. First, the epidemic has not completely subsided globally, leading to the concern that the pandemic may come back in Shanghai at any time. Even Shanghai and the whole of China had recovered from the pandemic. The international epidemic is intensifying, and a port city, Shanghai, continues to have imported cases, making pregnant women think

that the pandemic is still there. Second, the prevention and control measures had not been erased during the back-to-normal period, which continues to impact the daily life of pregnant women. For example, reducing the amount of prenatal exercise can increase the risk of prenatal depression⁹. Thirdly, the future direction of the epidemic is uncertain, and the ending time of control measures is not determined, so neonatal protection will make mothers feel overwhelmed after delivery. Therefore, under the normalization of the epidemic prevention and control, we should actively pay more attention to pregnant women's psychological status to reduce the long-term impact on maternal psychology and recover from the pandemic.

The study also found that pregnant women in early pregnancy have an increased risk of depression. This finding is also consistent with a survey conducted in Shanxi, China¹⁰. This study reported that the incidence of depression in early pregnancy was about 47.3%, much higher than 34.0% in middle and late pregnancy. Early pregnancy is a critical period for fetal development. Pregnant women in early pregnancy experience intensive diet, behavioral activities, and health care changes, which cause psychological imbalance. Some pregnancies are accidental, and the feelings of powerlessness on living changes lead to a growth in depression.

Our study indicated that after the outbreak of COVID-19, 12.9% of the participants were in moderate and severe depression ($\text{PHQ-9} \geq 10$). This high moderate and severe depression rate is a risk signal, and providing health education timely and effectively could help pregnant women to cope with their challenges. Thus, prenatal clinics should offer tailored services to help pregnant women handle their adverse situations to improve their psychological status during pregnancy. At the same time, it is necessary to carry out psychological state evaluation among pregnant women and make intervention timely. CHCs can provide psychological therapists to pay more attention to mental health during the maternal period and carry out tertiary prevention according to "Consensus on maternal mental health management (2019)"¹¹, compiled by the Psychosomatic Health Society of China Preventive Medicine Association, and Committee of Women Mental Health Care of China Maternal and Child Health Association.

Our study has several limitations. First, the sample size was limited in this study, and the participants were the pregnant women from Fenglin Community, which can not represent Shanghai as a central part. Second, the factors influencing the mental health status included in this study are not yet comprehensive, and many of the potential confounders were not taken into consideration. Third, although the psychological assessment scales (PHQ-9 and GAD-7) used in this study are internationally recommended, the self-reported scales can not be diagnostic basis because of subjective effects.

In conclusion, pregnant women have an increased risk of depression after the COVID-19 outbreak. After the epidemic situation was stable, the psychological status of pregnant women did not recover. Maternal health care institutions should pay close attention to the long-term impact on pregnant women's psychology under the COVID-19 epidemic situation, strengthen the promotion of mental health of

pregnant women, monitor the psychological status of pregnant women, offer timely intervention and carry out an effective referral.

Materials And Methods

This study is the baseline survey of a birth cohort study. This study was registered to the Chinese Clinical Trial Registry (ChiCTR2000029022), and ethical approval was obtained from Shanghai Ethics Committee for Clinical Research (SECCR/2019-43-01). All methods were performed in accordance with the relevant guidelines and regulations. Informed consent was obtained from all participants. Pregnant women who visited Fenglin Community Health Service Center (CHC) in Shanghai to make a pregnancy register between September 29, 2019, and November 5, 2020, were eligible and recruited.

Measures

Participants were asked to fill in the study survey electronically to collect information on age, gestational week, the number of fetuses, conception mode, education level, occupation, height, weight, etc. Patient Health Questionnaire-9 items (PHQ-9), a nine-item questionnaire designed to screen for depression, was used to measure whether a participant has depression. PHQ-9 measures depression based on the frequency of symptoms in nearly two weeks and is graded at 0 to 3 for each item, with a total score range of 0~27. It can be used to assess the severity of depressive symptoms: 0~4 depression-free, 5~9 mild, 10~14 moderate, and 15 or above severe. PHQ-9 has good confidence effectiveness and is the most common tool for screening depression in primary health care institutions at home and abroad^{12,13}. Generalized Anxiety Disorder Scale-7 items (GAD-7), a seven-item questionnaire designed to screen for anxiety, was also used in our survey. GAD-7 has seven items, and each item can be graded at 0 to 3, with a total score range of 0~21. It can be used to assess the severity of anxiety symptoms: 0~4 anxiety-free, 5~9 mild, 10~14 moderate, 15 or above severe. Studies support the reliability and validity of the GAD-7^{12,14}. In this study, five was used as a cutoff score to determine both anxiety and depression¹².

Participants categorization

Based on the time the participants were recruited, we categorized the participants into pre-pandemic (control group) and pandemic groups. Participants recruited before January 23, 2020 (The date that China issued the first-grade public health response towards COVID-19) were categorized into the control group. The participants recruited since this time point were classified into the pandemic group. We further categorized the pandemic group into the outbreak and back-to-normal group, with the breaking point of May 11, 2020, when Shanghai Meteorological Bureau announced Shanghai entered summer officially. Studies on climate impact on COVID-19 in China and 166 countries worldwide showed that increased temperature and humidity might inhibit the COVID-19 pandemic^{15,16}. As expected, there was no new confirmed local transmitted COVID-19 case in Shanghai during the back-to-normal study period.

Data analysis

The participants filled the survey electronically, and then the questionnaire was reviewed immediately by the gynecologist and directly exported by the background process. Continuous variables were presented as means and standard deviations or median and interquartile ranges. Descriptive statistics were used to describe the sociodemographic information of the participants. The Mann-Whitney U test, chi-square test were used to compare the differences between the study groups. Multivariable logistic regression was used to determine the factors associated with depression and anxiety in pregnant women. $P < 0.05$ was considered as the differences statistically significant. Analyses were conducted using SPSS 17.0.

Declarations

Acknowledgments: The authors thank all the participants who participated in this study. The authors thank the Youth Project of Shanghai Xuhui District Health Commission and Xuhui District Science and Technology Commission (SHXH201948), and the Joint Research Project of Shanghai Xuhui District Health Commission (XHLHGG201805) for their support.

Data availability statement: The data is available upon sending the request to the corresponding author.

Additional Information: All authors declared that there are no conflicts of interest.

Author contributions: JZ and WT conceived the idea and analyzed the data, JZ, HY, LX and CY collected the data, JZ and WT drafted the manuscript, while HY, LX and CY commented on the manuscript.

References

1. National Health Commission of the People's Republic of China. COVID-19 update as of 24: 00 on January 6, 2022. Vol. 2022 (2022).
2. World Health Organization. WHO Coronavirus Disease (COVID-19) Dashboard. Vol. 2022 (2022).
3. Liu, Y.L., *et al.* Controlling COVID-19 and "Wuhan Lockdown": a literature review. *Journal of Chinese Research Hospitals* **7**, 72–76 (2020).
4. Smith, V., *et al.* Maternal and neonatal outcomes associated with COVID-19 infection: A systematic review. *PLoS One* **15**, e0234187 (2020).
5. Golden, T.N. & Simmons, R.A. Maternal and neonatal response to COVID-19. *Am J Physiol Endocrinol Metab* **319**, E315-E319 (2020).
6. Rogers, A., *et al.* Association Between Maternal Perinatal Depression and Anxiety and Child and Adolescent Development: A Meta-analysis. *JAMA Pediatr* **174**, 1082–1092 (2020).
7. Wu, Y.T., *et al.* Perinatal depressive and anxiety symptoms of pregnant women during the coronavirus disease 2019 outbreak in China. *Am J Obstet Gynecol* **223**, 240 e241-240 e249 (2020).
8. Wastnedge, E.A.N., *et al.* Pregnancy and COVID-19. *Physiol Rev* **101**, 303–318 (2021).
9. Davenport, M.H., *et al.* Impact of prenatal exercise on both prenatal and postnatal anxiety and depressive symptoms: a systematic review and meta-analysis. *Br J Sports Med* **52**, 1376–1385

(2018).

10. Qi, J., Wang, C.H., He, X. & Bai, R.B. Effects of different coping styles and social support on mental health status of pregnant women during the pandemic. *Chinese Journal of Woman and Child Health Research* **v.31;No.183**, 869-875 (2020).
11. Psychosomatic Health Society of China Preventive Medicine Association & Committee of Women Mental Health Care of China Maternal and Child Health Association. Consensus on maternal mental health management (2019). *Chinese Journal of Woman and Child Health Research* **30**, 781–786 (2019).
12. Zhang, M.Y. & He, Y.L. *Psychiatric Assessment Scale Manual*, (Hunan Science and Technology Press, Changsha, 2015).
13. Levis, B., Benedetti, A. & Thombs, B.D. Accuracy of Patient Health Questionnaire-9 (PHQ-9) for screening to detect major depression: individual participant data meta-analysis. *BMJ* **365**, l1476 (2019).
14. Lowe, B., *et al.* Validation and standardization of the Generalized Anxiety Disorder Screener (GAD-7) in the general population. *Med Care* **46**, 266–274 (2008).
15. Wu, Y., *et al.* Effects of temperature and humidity on the daily new cases and new deaths of COVID-19 in 166 countries. *Sci Total Environ* **729**, 139051 (2020).
16. Liu, J.T., *et al.* Impact of meteorological factors on the COVID-19 transmission: A multi-city study in China. *Sci Total Environ* **726**, 138513 (2020).