

# Prevalence and Factors Associated With Postpartum Depression During the Covid-19 Pandemic Among Women in Guangzhou, China: A Cross-sectional Study

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## Research article

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# Abstract

**Background:** The 2019 coronavirus disease (COVID-19) epidemic is a public health emergency of international concern. To date, there are limited studies that have investigated the impact of COVID-19 pandemic on mental health among female population. This is especially pertinent with the emotional health vulnerability surrounding pregnancy and childbirth. Therefore, the study aims to investigate the prevalence of PPD and its related factors among women in Guangzhou, China, during the COVID-19 pandemic.

**Methods:** A cross-sectional study was performed from 30th March 2020 to 13th April 2020 using anonymous online questionnaire among 864 women at 6-12 weeks postpartum. The Chinese version of Edinburgh Postnatal Depression Scale and a questionnaire regarding associated factors were administered to all participants. Multivariate logistic regression was used to determine factors that were significantly associated with PPD.

**Results:** The prevalence of PPD among women at 6-12 weeks postpartum was 30.0%. A multivariate logistic regression model identified significant factors as: immigrant women, persistent fever, poor social support, concerns about contracting COVID-19 and certain precautionary measures.

**Conclusions:** The findings suggest the need for policies and interventions to not only mitigate the psychological impacts but also targeting disadvantaged sub-groups of women following childbirth during the COVID-19 pandemic.

## Introduction

The 2019 coronavirus disease (COVID-19) is a highly infectious disease and have posed a global health threat<sup>[1]</sup>. Since the emergence of COVID-19 infection in Wuhan, China on December 2019, it has rapidly spread across China and other countries around the world, despite the massive efforts to contain the disease<sup>[2]</sup>. On January 30th 2020, the World Health Organization (WHO) declared the outbreak of the COVID-19 as a public health emergency of international concern<sup>[3]</sup>. After the outbreak, the Chinese government adopted the most comprehensive, stringent and thorough prevention and control measures in an attempt to bring the virus under control. In the absence of vaccines or treatment protocols, these quarantine measures proved to be the most effective non-medical means to tame the spread of the virus, marking an initial triumph for the country. As of 19th March, zero domestic infection was recorded for the first time since its outbreak in China<sup>[4]</sup>. However, there was a concern about a second wave of infections due to an influx of cases from abroad, with an average of 20,000 people flying into China every day. On 6th April, China National Health Commission reported 698 imported cases in total, mainly in Guangdong province<sup>[5]</sup>. As Guangzhou city is one of the major air transportation hub with more than 130 international flight connecting main countries in the world, the potential impact of global COVID-19 outbreaks is high. Moreover, with the lockdowns eased gradually to ensure smooth resumption of work and production, a large number of internal immigrants who were originally from the poor and rural areas in the western and

central inland provinces migrated to the southern developed regions for better job opportunities and income. Guangzhou is one of the most favorite destinations. The convenience of long-distance travel could increase the incidence of local cases through droplets or direct contact. And the possibility of transmission by asymptomatic carriers could further enhance its spread. Such occurrence of both imported and domestically transmitted cases has significant potential for psychological contagion, resulting in widespread fear, helplessness, and a variety of adverse mental health outcomes<sup>[6]</sup>.

Faced with traumatic events outside the range of common human experience, people are more likely to develop negative emotions and physiological hyper-arousal<sup>[7]</sup>. Previous research have explored such psychological effect during the outbreak of Severe Acute Respiratory Syndrome (SARS), H1N1 influenza and Ebola<sup>[8-10]</sup>. One study reported that 17.3% of health care workers had experienced mental symptoms during SARS epidemic<sup>[8]</sup>. Another study showed 10–30% of general population were worried about the possibility of contracting the virus since one influenza outbreak<sup>[9]</sup>. As to research on the mental impact of COVID-19, Liu et. al reported 7% of residents in Wuhan and surrounding cities (the hardest-hit areas in China )have experienced posttraumatic stress symptoms a month after the outbreak<sup>[7]</sup>. Meanwhile, data from 194 cities in China revealed the prevalence of depression was 30.3% at the initial stage of the epidemic<sup>[11]</sup>. Those who were female, with student status, specific physical symptoms, poor self-rated health status and increased self-blame were more likely to show higher levels of stress, anxiety and depression<sup>[12]</sup>. To date, there are limited studies that have investigated the impact of COVID-19 pandemic on mental health among female population. This is especially pertinent with the emotional health vulnerability surrounding pregnancy and childbirth.

Postpartum depression (PPD) occurs at any time from a month to a year after childbirth and is characterized by a typical symptom pattern of depressed mood, agitation, disappointment and sleep disorders<sup>[13]</sup>. Since psychological changes caused by public health emergencies can be directly reflected in emotions, we can understand the psychological stress among delivery women during the COVID-19 outbreak. This may assist healthcare professionals in promoting psychological wellbeing of this special group of population in the face of COVID-19 outbreak expansion on Guangzhou, China. Based on our knowledge, most of the research related to this pandemic has focused on the epidemiology and clinical features of infected patients, characteristics of the virus, and mental health of the general population. However, there are scant research exploring the mental health of delivery women in China so far, except that local government of Wuhan has implemented policies to address the mental health issues for medical workers. Moreover, currently, there's no known information on PPD during the COVID-19 outbreak of such unparalleled magnitude.

Therefore, the study aims to investigate the prevalence of PPD among women in Guangzhou, China, and to explore the related factors of the occurrence of PPD during the COVID-19 pandemic.

## Methods

A cross-sectional study was performed from 30th March 2020 to 13th April 2020 using anonymous online questionnaire. A snowball sampling strategy was utilized to recruit delivery women. We recruited women at 6–12 weeks after childbirth, 1) Chinese nationality; 2) be living in Guangzhou, China over a month during the COVID-19 period. The COVID-19 period refers to the period from January 2020 until April 2020; 3) providing informed consent in the online questionnaire. Women who had a history of family history of psychiatric disorders were excluded. Women who left missing data on the questionnaire were also excluded.

As the Chinese government recommended the public to isolate themselves at home, women were asked to complete an online questionnaire through an online survey platform. The Chinese version of Edinburgh Postnatal Depression Scale (EPDS) was employed to assess PPD with a threshold of 10. The sensitivity and specificity of Chinese version have been found to be 0.82 and 0.86 respectively which were comparable to the original scale<sup>[14]</sup>.

Based on literature<sup>[11, 15]</sup> and expert consultation, structured questionnaires consisted of questions that covered information including: 1) socio-demographic factors such as age, employment, annual household income, household registration place; 2) obstetric data and physical symptom variables such as parity, mode of delivery, pregnancy associated diseases, delivery associated diseases, fever, cough, sore throat, as well as persistent fever and cough or difficulty breathing; 3) social factors such as perceived family income sufficiency, family socio-economic status, social support and marital relationship. Social support was ascertained by Likert scale with a range from 12 to 60. The scale consists of three subscales: informational support, emotional support and household activity support. This scale demonstrated acceptable reliability and validity in a previous study<sup>[16]</sup>; 4) concerns about COVID-19 variables such level of confidence in diagnosis, self and other family members contracting COVID-19 and likelihood of surviving if infected with COVID-19; 5) Precautionary measures against COVID-19 variables such as avoidance of sharing of utensils (e.g., chopsticks) during meals, covering mouth when coughing and sneezing, and the average number of hours staying at home per day to avoid COVID-19.

Ethics approval was obtained from the Research Ethics Board of Southern Medical University.

The primary data was entered into Epidata 3.0 before being exported to SPSS16.0. Chi-square test was used to assess the differences between two independent qualitative data and Student's *t* test was used for quantitative data. Then the multivariate logistic regression was further employed to identify factors that were significantly associated with PPD. A *P* value  $\leq 0.05$  was considered significant in the analysis.

## Results

Of the 864 eligible participants who were invited, 19 respondents did not complete the questionnaire with a response rate of 97.8%. Of all respondents, 42.0% were aged between 25 and 29 years. More than three-quarters (79.7%) of the participants had senior high school or college level education. 73.1% of the

participants were unmarried. 47.2% of participants reported annual household income of 100000–139999 Chinese Yuan. Distribution by place of household registration shows that 52.1% of the participants were immigrants.

Of the 845 women who were enrolled in the assessment, we have reported that 253 women screened positive for PPD with EPDS at a cut-off point of 10, thus resulting in a prevalence of 30.0%.

The association between socio-demographic characteristics and PPD is presented in Table 1. Immigrant women were significantly more likely to report PPD compared with their local counterparts.

Table 1  
Socio-demographic features of women with PPD

Factors	EPDS < 10 (592)		EPDS ≥ 10 (253)		$\chi^2$	P
	n	%	n	%		
Age					0.153	0.985
≤24	95	16.0	41	16.2		
25–29	248	41.9	107	42.3		
30–34	161	27.2	70	27.7		
≥ 35	88	14.9	35	13.8		
Educational level					0.054	0.973
Junior high school or less	121	20.4	50	19.8		
Senior high school	203	34.3	88	34.8		
College or more	268	45.3	115	45.4		
Employment					0.264	0.612
Yes	436	73.6	182	71.9		
No	156	26.4	71	28.1		
Annual household income					0.240	0.971
60000–99999 CNY	141	23.8	58	22.9		
100000–139999 CNY	278	47.0	121	47.8		
140000–179999 CNY	122	20.6	54	21.3		
≥ 180000 CNY	51	8.6	20	7.9		
Household registration in Guangzhou					4.597	0.035
Yes	298	50.3	107	42.3		
No	294	49.7	146	57.7		

Analysis of obstetric data, physical symptoms with the past 14 days and probable PPD was shown in Table 2. Women who reported persistent fever were significantly more likely to develop PPD.

Table 2  
Obstetric data and physical symptoms of women with PPD

Factors	EPDS < 10 (592)		EPDS ≥ 10 (253)		$\chi^2$	P
	n	%	n	%		
Parity					0.000	1.000
1	278	46.9	119	47.0		
≥2	314	53.1	134	53.0		
Mode of delivery					0.070	0.817
Vaginal	364	61.5	158	62.5		
Caesarean	228	38.4	95	37.5		
Pregnancy related disease					0.212	0.632
Yes	109	18.4	50	19.8		
No	483	81.6	203	80.2		
Delivery related disease					0.351	0.607
Yes	91	15.4	43	17.0		
No	501	84.6	210	83.0		
Persistent fever (≥37.4°C for at least one day)					709.1	0.000
Yes	18	3.0	241	95.3		
No	574	97.0	12	4.7		
Cough					0.025	0.867
Yes	163	27.5	71	28.1		
No	429	72.5	182	71.9		
Sore throat					0.072	0.806
Yes	408	68.9	172	68.0		
No	184	31.1	81	32.0		
Persistent fever and cough or difficulty in breathing					1.388	0.235
Yes	36	6.1	21	8.3		
No	556	93.9	232	91.7		

For social profiles, Table 3 showed lower social support was significantly associated with the development of PPD.

Table 3  
Social profiles of women with PPD

Factors	EPDS < 10 (592)		EPDS ≥ 10 (253)		$\chi^2/t$	P
	n	%	n	%		
Perceived family income sufficiency					0.066	0.967
Not enough	232	39.2	100	39.5		
Just enough	318	53.7	134	53.0		
More than enough	42	7.1	19	7.5		
Family socio-economic status					0.187	0.911
Low	108	18.2	45	17.8		
Middle	264	44.6	110	43.5		
High	220	37.2	98	38.7		
Social support	41.03 ± 6.78		38.70 ± 9.16		-18.004	0.000
Marital relationship					0.271	0.873
Poor	89	15.0	36	14.2		
Moderate	367	62.0	155	61.3		
Satisfying	136	23.0	62	24.5		

Table 4 represented the relationship between concerns about COVID-19 and PPD. Variables were not associated with PPD, with the exception of concerning on contracting COVID-19 during the current outbreak which was significantly associated with PPD.

Table 4  
Association between concerns about COVID-19 and PPD

Factors	EPDS < 10 (592)		EPDS ≥ 10 (253)		$\chi^2$	P
	n	%	n	%		
Level of confidence in doctor's ability to diagnose or recognize					1.129	0.569
High	314	53.1	136	53.8		
Middle	228	38.5	101	39.9		
Low	50	8.4	16	6.3		
Likelihood of contracting COVID-19 during the current outbreak					104.1	0.000
High	105	17.7	112	44.3		
Middle	174	29.4	96	37.9		
Low	313	52.9	45	17.8		
Concerns about other family members contracting COVID-19					0.103	0.960
High	211	35.6	90	35.6		
Middle	200	33.8	88	34.8		
Low	181	30.6	75	29.6		
Likelihood of surviving if infected with COVID-19					0.438	0.803
High	479	80.9	206	81.4		
Middle	94	15.9	41	16.2		
Low	19	3.2	6	2.4		

Regarding the precautionary measures adopted by the respondents, avoiding the sharing of utensils (e.g, chopsticks) during meals was significantly associated with the lower rates of PPD (Table 5).

Table 5  
Association between precautionary measures and PPD

Factors	EPDS < 10 (592)		EPDS ≥ 10 (253)		$\chi^2$	P
	n	%	n	%		
Covering mouth when coughing or sneezing					0.501	0.778
Always	409	69.1	178	70.4		
Sometime	140	23.6	60	23.7		
Occasionally	43	7.3	15	5.9		
Washing hands with soap					0.255	0.881
Always	396	66.9	170	67.2		
Sometime	168	28.4	73	28.8		
Occasionally	28	4.7	10	4.0		
Wearing a mask regardless of the presence or absence of symptoms					0.089	0.967
Always	486	82.1	209	82.6		
Sometime	95	16.0	40	15.8		
Occasionally	11	1.9	4	1.6		
Avoiding sharing of utensils (e.g, chopsticks) during meals					145.3	0.000
Always	318	53.7	41	16.2		
Sometime	173	29.2	75	29.6		
Occasionally	101	17.1	137	54.2		
Average number of hours staying at home per day to avoid COVID-19					0.399	0.819
20-24 hours	189	31.9	82	32.4		
10-19 hours	293	49.5	120	47.4		
0-9 hours	110	18.6	51	20.2		

Table 6 shows the factors associated with PPD during COVID-19 pandemic in the study site. Immigrant women were 3.1 times significantly more likely to develop PPD compared to local women (OR = 3.135, 95%CI: 2.759-3.428). In relation to physical symptoms, women who reported persistent fever were 2.1 times significantly more likely to develop PPD compared to women who had no fever (OR = 2.084, 95%CI:

1.737[2.539]). Similarly, women who had lower social support were at greater risk of PPD (OR = 3.478, 95%CI: 2.259[3.701]). In relation to concerns about COVID-19, women who perceived higher likelihood of contracting COVID-19 during the current outbreak were 3.3 times significantly more likely to develop PPD compared to women who perceived their likelihood of contraction was low (OR = 3.276, 95%CI: 2.611[3.589]). The likelihood of PPD is also varied by their dining customs. Women who preferred to using serving utensils (e.g, chopsticks) during meals were 37% significantly less likely to develop PPD compared to those who used sharing utensils (OR = 0.672, 95%CI: 0.251[0.907]).

Table 6  
Multivariate logistic regression analysis of impact factor of PPD

<b>Covariates</b>	<b><i>B</i></b>	<b><i>S.E</i></b>	<b><i>Wald</i></b>	<b><i>P</i></b>	<b><i>OR</i></b>	<b><i>95%CI</i></b>
Household registration place in Guangzhou						
Yes	—	—	21.049	—	—	—
No	0.067	0.236	28.730	0.000	3.135	2.759[3.428]
Persistent fever ( $\geq 37.4^{\circ}\text{C}$ for at least one day)						
Yes	0.018	0.225	11.341	0.000	2.084	1.737[2.539]
No	—	—	8.709	—	—	—
Social support	0.615	0.349	35.012	0.000	3.478	2.259[3.701]
Likelihood of contracting COVID-19 during the current outbreak						
High	0.541	0.133	21.085	0.000	3.276	2.611[3.589]
Middle	0.677	0.435	18.018	0.721	1.549	0.608[2.133]
Low	—	—	26.547	—	—	—
Avoiding sharing of utensils (e.g, chopsticks) during meals						
Always	0.097	0.169	15.044	0.013	0.627	0.251[0.907]
Sometime	0.008	0.136	29.820	0.156	1.349	0.886[1.835]
Occasionally	—	—	31.472	—	—	—

## Discussion

To our knowledge, this study was among one of the first studies with respect to the psychological responses of the delivery women in mainland China. Since the pandemic is not over yet and there's a further spread of the pandemic to cities in China such as Guangzhou, we hypothesized that the COVID-19

pandemic would cause excessive anxiety in this vulnerable group because of the increasing number of imported cases in Guangzhou, China. However, interestingly, the prevalence of PPD during this period was 30.0%, which was comparable to the level observed in our previous study<sup>[17]</sup>. One possible reason for this finding is that a special tradition in China after childbirth could help promote the psychosomatic recovery of the mother. This tradition, called 'doing the month' is a cultural imperative in China and includes a set of practices involving prescribed diet, clothing, cleanness and other cautions. It's a highly valued ritual that requires the support of a woman's mother, mother-in-law and other female relatives. Additionally, the COVID-19 outbreak in Guangzhou may not be regarded as severe despite the number of imported cases is increasing during the time the study was conducted. Our city, Guangzhou was not locked down as had happened in Wuhan. The focus of epidemic control and prevention in our city was constantly adjusted to meet new challenges such as preventing imported cases and domestic re-infections. A joint-work mechanism comprising different departments such as aviation, customs, public security, health, foreign affairs, border inspection and airports was established to prevent transmission of the virus at the point of first entry. Therefore, these factors might have helped to reduce the stressful impact of the COVID-19 pandemic during the postpartum period. Considering the mortality rate is still increasing around the world, it's impact on mental health of delivery women needs further study.

The findings of this study show that immigrant women were significantly more likely to develop PPD compared to local women, which is consistent with the findings of previous studies that immigrant women were at increased risk of depression prenatally and postnatally<sup>[18]</sup>. Because the utility and allocation of public resources are based on household registration policy, immigrants do not have the same rights and benefits as local residents in a variety of areas, such as healthcare, social services, offspring education and housing. Social exclusion resulting from this policy as well as other economic and cultural factors contribute to the adverse mental health consequences of immigrants. We also reported a strong association between social support and PPD which is consistent with previous reviews focused on the overall postpartum population<sup>[19]</sup>. One possible reason was that during the pandemic, the pace of the whole society was slowed down. This could have been created more opportunities and time among family member to support and care for each other. In addition, there was increased communication with community members and friends because people were asked to avoid going to public places and stay at home. These positive impacts may have helped women cope with the challenges surrounding the postpartum period.

In addition, we explored the relationship between mental health and physical symptoms as well as concerns about COVID-19 among delivery women during the pandemic. The presence of a persistent fever was significantly associated with PPD. Similarly, a higher perceived likelihood of contracting COVID-19 during the current outbreak was significantly associated with PPD. Amid this moment, women were bombarded with various discomfoting network information about COVID-19, including clinical signs, routes of transmission, medicines or vaccines, et al. After presentation to the clinic with a fever, they may be sent home, hospitalized for further observation, or quarantined. Some evidence suggests that up-to-date and accurate information during the pandemic are responsible for lower levels of stress, anxiety and

depression<sup>[11]</sup>. Moreover, higher satisfaction with the health information received by the whole population is contributing to reduce the impact of rumors and this may avoid adverse psychological reactions.

Also, our findings suggest that precautionary measures adopted to prevent the spread of COVID-19 have had a positive psychological effect. Women who had avoided the sharing of utensils (e.g, chopsticks) during meals were significantly less likely to develop PPD. There has been no evidence to suggest the reason for the difference, but saliva is one of the most common ways for food-borne diseases to spread. Communal eating habits have been a part of Chinese culture for centuries. Chinese people prefer to use chopsticks to pick up food commonly shared in the table during meal times to show their respect and cleanness. The experiences of the SARS-COV epidemic in 2013 may have changed the perception of the general public towards precautionary measures. Many cities in China have already launched initiatives to order separate meals. As this healthy habit is related to people's health and safety during the pandemic, it's not unexpected that avoidance of sharing utensils during meals is significantly associated with less psychological impact on women.

Our findings will provide vital guidance for health care professionals to tackle mental health issues among delivery women during a pandemic. First, health authorities need to identify high-risk groups such as immigrants for early intervention. Second, accurate and up-to-date health information during the pandemic need to be provided, especially on the number of recovered individuals to alleviate the concern and reduce the impact of rumors. Third, government and health authorities need to expand public awareness of healthy lifestyle.

This study has several limitations. First, the cross-sectional study using snowballing sampling strategy did not allow for establishing causal relationships between PPD and the factors associated with it. Second, a self-reported scale was employed to define PPD instead of clinician administered structured interview. Participants might have provided responses they feel socially desirable. Third, the short time frame might not allow us to observe it's long-term impacts on mental health among delivery women.

## **Conclusion**

During the COVID-19 pandemic in China, about one-third of the women reported PPD. Immigrants, persistent fever, lower social support and higher level of concerning about contracting COVID-19 were associated with higher risk of PPD. Certain precautionary measures was associated with a lower risk of PPD. Since the COVID-19 is going on, our findings can be used to formulate psychological interventions to minimize depression and improve psychological resilience among women following childbirth.

## **Abbreviations**

COVID-19

2019 Coronavirus Disease; PPD:postpartum depression; EPDS:Edinburgh Postnatal Depression Scale; WHO:World Health Organization; SARS:Severe Acute Respiratory Syndrome

## Declarations

## Ethics approval and consent to participate

Ethical approval was obtained from the Research Ethics Board of Southern Medical University on March 10th, 2020. Participants were provided with online information sheet and asked to sign a consent form prior to the investigations being undertaken.

## Consent for publication

Not applicable

## Availability of data and materials

The datasets used and/or analyzed during the current study are available

## Competing interests

The authors declare that they have no competing interests.

## Funding

Not applicable

## Authors' contributions

Conceptualization, Yan Liu, Peiqin Liang and Ribo Xiong; Data curation, Yan Liu, Peiqin Liang and Ribo Xiong; Formal analysis, Yan Liu, Peiqin Liang and Ribo Xiong; Methodology, Yan Liu; Project administration, Ribo Xiong; Resources, Yiding Wang; Supervision, Yan Liu and Ribo Xiong; Visualization, Si Shi; Writing – original draft, Peiqin Liang; Writing – review & editing, Ribo Xiong.

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