

# Psychological Investigation on Pregnant Women during the Outbreak of COVID-19

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## Research article

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# Abstract

**Background** COVID-19(Corona Virus Disease 2019) outbreaks around the world and is highly infectious, which may cause people prone to anxiety and depression. As a particular group, pregnant women need more attention. The aim of study is to investigate the mental health status of pregnant women during the outbreak of COVID-19, and analyze factors affecting the mental health status of pregnant women.

**Methods** Using a self-designed questionnaire, self-rated anxiety scale(SAS), self-rated depression scale (SDS), we conducted a web-based survey on 1160 pregnant women during the outbreak of COVID-19.

**Results** Compared with general adults in some regions of China, the scores of SAS and SDS were both significantly higher in pregnant women during the outbreak of COVID-19 ( $P < 0.05$ ). The results of multivariate regression analysis unveiled that age, levels of education, and duration of pregnancy were all factors influencing pregnant women's psychological status. In terms of psychological problems, compared with pregnant women aged  $< 30$  years old, the risk of psychological problems in pregnant women aged  $\geq 30$  years old was 0.646 times (95% confidence interval (CI): 0.486–0.858). Moreover, compared with women with a level of high school or below, the risk of psychological abnormalities in women with a level of junior college degree or above was 0.551 times (95% CI: 0.416–0.731). Compared with women during the first trimester, the risk of psychological problems in women during the mid-trimester was 0.543 times (95% CI: 0.398–0.739). In addition, compared with women during the mid-trimester, the risk of psychological problems in women during the last trimester was 0.636 times (95% CI: 0.466–0.867).

**Conclusions** During the outbreak of COVID-19, pregnant women are prone to anxiety or depression, highlighting the necessity of further attention on those subjects. It is of great significance to provide on-time psychological intervention and psychological counseling for pregnant women with poor mental health.

## Background

The novel coronavirus (2019-nCoV, or COVID-19) outbreaks worldwide in succession from the beginning of 2020. It is a highly infectious disease with a long incubation period caused by the virus Sars-Cov-2, which has been confirmed to be transmitted from person to person.<sup>1</sup> A previous research reported that the risk of anxiety in women is 3.01 times higher than that in men during the outbreak of COVID-19 (95% CI 1.39–6.52).<sup>2</sup> Pregnant women, as a particular group of women, are more prone to anxiety and depression. It is globally estimated that 10% of women have experienced prenatal depression, and the proportion is as high as 15.6% in developing countries.<sup>3</sup> Furthermore, a number of studies demonstrated that nearly 80% of depressive symptoms (with an Edinburgh Postnatal Depression Scale (EPDS) score of 14 or higher) occur during pregnancy, rather than postpartum.<sup>4</sup> To our knowledge, pregnant women are susceptible to respiratory pathogens and develop severe pneumonia, which may make them more susceptible to COVID-19 infection than general people. Pregnant women and newborn babies should be

taken as high-risk groups into consideration in strategies focusing on the prevention and management of COVID-19 infection.<sup>5</sup> Therefore, it is highly essential to pay further attention to the mental health of pregnant women, analyze the factors affecting their psychological status, and eventually present effective therapeutic methods.

As people are advised to stay at home during the COVID-19 outbreak, thus, we attempted to collect the data online. In order to understand the mental status of pregnant women during the outbreak of COVID-19, we conducted a web-based survey on February 20, 2020.

## **1. Methods**

### **1.1 Subjects**

Pregnant women could scan the QR code and agree to finish the questionnaire. Inclusion criteria were as follows: (1) subjects aged  $\geq 18$  years old; and (2) pregnant women. A total of 1160 psychological questionnaires were received through an online survey performed on February 20, 2020, and the effective rate was 100%. There were 1160 pregnant women who were aged 18–44 years old. Among them, 691 (59.57%) women were aged 18–30 years old, and 469 (40.43%) women were above 30 years old. According to occupation, there were 422 (36.38%) homemakers and 738 (63.62%) office workers. Besides, 115 (9.91%) women become pregnant through assisted reproductive technology. Levels of education were as follows: 583 (50.26%) pregnant women with a level of high school or below, and 577 (49.74%) pregnant women with a level of junior college degree or above.

### **1.2 Survey tools**

#### **1.2.1 Self-compiled questionnaire**

The questionnaire was designed by the researchers, which included pregnant women's general information during the period of the outbreak. General information included age, levels of education, occupation, type of pregnancy, and delivery times. The investigation on pregnant women during the period of the outbreak also included a total of 13 questions, which were divided into two categories: The first category involved the possible influences on pregnant women during the outbreak (9 items), and the second category covered pregnant women's main worries and solutions (4 items).

#### **1.2.2 Self-rating anxiety scale (SAS) and self-rating depression scale (SDS)**

The psychological status of respondents was evaluated according to the Zung self-rating anxiety scale (SAS) and the self-rating depression scale (SDS). The negative words were graded in order of grade 1–4, while the positive words were graded in reverse order of grade 4–1. A total of 20 questions were related to both SAS and SDS, with the scaled score range of 0 to 100. According to the SAS and SDS scoring criteria, the respondents were divided into 2 groups: good mental health and poor mental health. In the

present study, women with SAS  $\leq$  50 and SDS  $\leq$  53 were assigned to good mental health group, and the rest of the respondents were allocated to poor mental health group.

### 1.2.3 Statistical methods

Data were presented as number and percentage. Group comparisons were carried out with t-test and Chi-square test.  $P < 0.05$  was considered statistically significant. The variables with  $P < 0.05$  were imported into the multivariate logistic regression model. Statistical analysis was performed using SPSS 16.00 software (IBM, Armonk, NY, USA).

## 2. Results

### 2.1 Comparison analysis between adults and pregnant women during the epidemic.

According to the SAS and SDS, the SAS standard score was  $40.69 \pm 7.83$  points, and the SDS standard score was  $46.06 \pm 11.47$  points. Compared with the scores of adults in some regions in China,<sup>2</sup> the scores of anxiety and depression in pregnant women during the COVID-19 outbreak were significantly higher, and the difference was statistically significant ( $P < 0.05$ ) (Table 1).

Table 1  
Comparison analysis between adults and pregnant women during the epidemic.

	Anxiety scores	Depression scores
Pregnant women	$40.69 \pm 7.83$	$46.06 \pm 11.47$
Adults	$36.92 \pm 7.33$	$40.50 \pm 11.31$
t value	9.783	9.686
P value	$< 0.05$	$< 0.05$

### 2.2 Factors associated with antenatal anxiety and depression during the COVID-19 outbreak

According to the anxiety and depression scores, 361 (31.12%) respondents had poor mental health. Among them, 120 (10.34%) had anxiety, 332 (28.62%) had depression, and 91 (7.84%) had both anxiety and depression. Thus, there were 361 women in poor mental health group, and 799 women in good mental health group.

Results of chi-square test showed that the rate of poor mental health was higher for women who were aged 18–30 than those who were aged above 30 years old ( $\chi^2 = 11.250$ ,  $P = 0.001$ ). The rate of poor mental health was higher for women with a level of high school or below than those with a level of junior

college degree or above ( $\chi^2 = 30.534, P < 0.05$ ). The rate of poor mental health was higher for homemakers than that for office workers ( $\chi^2 = 16.340, P < 0.05$ ). Additionally, the proportion of poor mental health was higher for women during the first trimester than that for women during the middle or third trimester ( $\chi^2 = 15.159, P = 0.001$ ). The differences in other general information were not statistically significant. In the multivariate logistic regression model, age, levels of education, and duration of pregnancy were related to pregnant women's psychological status. Besides, the risk of psychological problems in women who were aged 31–44 years old was 0.646 times that of women who were aged 18–30 years old (95% confidence interval (95%CI): 0.486–0.858,  $P = 0.003$ ). Compared with women with a level of high school or below, the risk of psychological abnormalities in women with a junior college degree or above was 0.551 times (95%CI: 0.416–0.731,  $P < 0.05$ ). Compared with women in early pregnancy, the risk of psychological problems in middle pregnancy was 0.543 times (95%CI: 0.398–0.739,  $P < 0.05$ ). Compared with women in mid-pregnancy, the risk of psychological problems in last pregnancy was 0.636 times (95% CI: 0.466–0.867,  $P = 0.004$ ). Further details are presented in Table 2.

Table 2  
Multiple logistic regression analysis of factors associated with anxiety and depression during the COVID-19 outbreak.

	Good mental health (n = 799)	Poor mental health (n = 361)	$\chi^2$	P value	Multiple logistic regression analysis	
					OR(95% CI)	P value
<b>Age</b>						
18–30	450	241	11.250	0.001	0.646	0.003
31–44	349	120			(0.486–0.858)	
<b>Education level</b>						
High school or below	358	225	30.534	0.000	0.551	0.000
Junior college or above	441	136			(0.416–0.731)	
<b>Occupation</b>						
Homemakers	260	162	16.340	0.000	0.781	0.090
Office workers	539	199			(0.588–1.039)	
<b>Delivery times</b>						
Primipara	424	180	1.023	0.312		
Multipara	375	181				
<b>Way of pregnancy</b>						
Assisted production	82	33	0.350	0.554		
Natural conception	717	328				
<b>Trimester of pregnancy</b>						
First	435	271	15.159	0.001	0.543	0.000
Middle	381	284			(0.398–0.739)	
Third	344	244			0.636	0.004

	Good mental health (n = 799)	Poor mental health (n = 361)	$\chi^2$	P value	Multiple logistic regression analysis	
					OR(95% CI)	P value
					(0.466–0.867)	

## 2.3 Influences of COVID-19 outbreak on pregnant women

The results uncovered that compared with pregnant women with good mental health and pregnant women with poor mental health, there were significant differences in the following aspects, which included the degree of concern about the domestic epidemic, the extent of epidemic's impacts on life and families' concerns, the preparation of protective supplies and being a mother, and the need for psychological counseling ( $P < 0.05$ ) (Table 3).

Table 3  
Comparison of the epidemic's impacts in two groups of pregnant women.

	<b>Good mental health (n = 799)</b>	<b>Poor mental health (n = 361)</b>	$\chi^2$	<b>P value</b>
Degree of concern about the domestic epidemic				
Very	107(13.39%)	81(22.44%)	15.182	0.001
A little	514(64.33%)	204(56.09%)		
Not	178(22.28%)	76(21.05%)		
The extent of prevalence's impacts on life				
No	52(6.51%)	15(4.16%)	22.429	0.000
Hardly any	84(10.51%)	55(15.24%)		
A little	581(72.72%)	226(62.60%)		
A lot	82(10.26%)	65(18.01%)		
Are the protective supplies adequate?				
No	72(9.01%)	54(14.96%)	9.083	0.003
Yes	727(90.99%)	307(85.04%)		
Production inspections on time.				
No	312(39.05%)	141(39.06%)	0.000	0.998
Yes	487(60.95%)	220(60.94%)		
Whether to change the hospital if the original hospital is designed for COVID-19?				
Yes	237(29.66%)	127(35.18%)	3.516	0.061
No	562(70.34%)	234(64.82%)		
The extent of the family's concern.				
Indifferent	1 (0.13%)	7 (1.94%)	61.497	0.000
Average	62 (7.76%)	80 (22.16%)		
Very concerned	736 (92.12%)	274 (75.90%)		
The preparation of being a mother.				
Can not	18 (2.25%)	32 (8.86%)	28.105	0.000



	<b>Good mental health (n = 799)</b>	<b>Poor mental health (n = 361)</b>	$\chi^2$	<b>P value</b>
May can	294 (36.80%)	138 (38.23%)		
Totally can	487 (60.95%)	191 (52.91%)		
<b>Is there any need for psychological counseling?</b>				
No	195 (24.41%)	32 (22.71%)	11.790	0.003
Yes	214 (26.78%)	138 (36.57%)		
Not to matter	390 (48.81%)	191 (40.72%)		
<b>Is there any need for ultrasonic electronics?</b>				
No	132 (16.52%)	49 (13.57%)	2.228	0.135
Yes	667 (83.48%)	312(86.43%)		

## 2.4 Main worries and solutions

### 2.4.1 The current main worries

Of the participants, the majority of pregnant women worried about whether their children can be born healthily and smoothly. The popularizing rate was as high as 72.67% (Table 4).

Table 4  
The penetration of main worries.

Main worries at present	Penetration(%)
Whether children can be born healthily and Smoothly	72.67%
Fear of labor pain	38.10%
Changes in figure and activity	18.79%
Possibility of being infected with the virus	18.62%
Economic pressure after the childbirth	18.02%
Unable to combine work and pregnancy	16.98%
No worry at present	10.26%

### 2.4.2 Desired knowledge

During the outbreak, respondents tended to obtain the following relevant knowledge: self-protection during pregnancy, pregnant women's susceptibility to COVID-19, and intrauterine transmission. The corresponding proportions were 64.31%, 54.40%, and 49.40%, respectively. Further details are summarized in Table 5.

Table 5  
The penetration of desired knowledge.

Desired knowledge	Penetration(%)
Self- protection during pregnancy	64.31%
The pregnant women's susceptibility to COVID-19	54.40%
Intrauterine transmission	49.40%
Nutrition and health care during pregnancy	48.79%
Whether to terminate a pregnancy if infected with the virus	35.78%
How to exercise for pregnant women during the epidemic	32.33%
How to adjust psychological change during pregnancy	30.78%

### 2.4.3 Services expected to be provided by hospitals

The majority of pregnant women expected that they could make appointments by schedule for production inspection. Moreover, they hoped that hospitals could provide online consultation by public account or App, and popularize the protection knowledge related to COVID-19 during pregnancy. The corresponding proportions were 90.34%, 61.64%, and 49.66%, respectively (Table 6).

Table 6  
The penetration of services expected to be provided by hospitals.

Services	Penetration (%)
Make appointments by schedule for production inspection	90.34%
Provide online consultation by public account or App	61.64%
Popularize the protection knowledge of COVID-19	49.66%
Reschedule for prenatal care and fetal ultrasound	37.93%

#### 2.4.4 Ways of relieving psychological discomfort

The majority of the respondents relieved their psychological discomfort by relaxing themselves and chatting with their family members or friends. The popularizing rates were 80.17% and 71.38%, respectively (Table 7).

Table 7  
The penetration of ways to relieve psychological discomfort.

Ways	Penetration (%)
Self-entertainment (such as listening to music, read books.)	80.17%
Chat with family members or friends	71.38%
Search for a solution online	25.26%
Consult obstetricians	22.41%
Consult a professional psychological counselor	4.48%

### 3. Discussion

After the outbreak of COVID-19, people showed more negative emotions and less positive emotions, which was supported by the broaden-and-build theory (i.e., people exhibited more negative emotions for self-protection).<sup>6</sup> The results revealed that the SAS and SDS standard scores of pregnant women during the COVID-19 outbreak were markedly higher than those of general adults ( $P < 0.05$ ). It means that pregnant women are more likely to develop anxiety and depression during the outbreak. Therefore, we should pay further attention to the mental health conditions of pregnant women during the COVID-19 pandemic.

#### 3.1 Factors influencing pregnant women's psychological status

We found that during the COVID-19 pandemic, age, levels of education, and trimester of pregnancy were factors influencing pregnant women's psychological status. Women who were aged 18–30 years old were

at a higher risk of psychological problems than women who were aged above 30 years old. A number of scholars demonstrated that childbirth was a stressor, and all the pregnant women would show various degrees of anxiety or depression symptoms before delivery. In addition, a lower level of education was associated with a higher prevalence of anxiety and depression status,<sup>7</sup> which is consistent with results of the present study. It is likely because people with a higher degree of education have keen self-protection awareness, and they may actively collect relevant information and knowledge of the epidemic in various ways. Therefore, they have a less cognitive bias towards the epidemic diseases and make corresponding psychological preparations in advance. The results disclosed that as gestational age increased, the risk of anxiety or depression decreased, which might be due to morning sickness and lack of pregnancy experience in early pregnancy. Additionally, the maternal immune system in early pregnancy is very sensitive, and the fetus is also in a crucial stage of organ development.<sup>8</sup> The risks of mental illness in the middle and third trimesters may gradually reduce as gestational age and the number of production inspections increase.

## **3.2. Influences of COVID-19 outbreak on pregnant women**

The quality of life model of depression and related disorders (Frisch, 1998, 2006) indicated a direct inverse relationship between life satisfaction and anxiety.<sup>9</sup> Thus, if a person has always been in a low emotional state, he/she may gradually feel less hopefulness and happiness in life. The findings of the present study showed that during the COVID-19 outbreak, pregnant women with anxiety or depression tended to be more worried about the domestic epidemic. They thought that the epidemic had a great impact on their lives, and they felt that they did not prepare adequate protective supplies. Besides, the majority of pregnant women with negative emotions thought that their family members cared a little about them, and they were not ready to be a mother as well. To improve the outcome of childbirth, we should lead pregnant women actively to set up a correct concept of disease and keep a good state of mind in the face of the epidemic. For pregnant women with symptoms of anxiety or depression, they needed psychological counseling. Therefore, psychological intervention is highly essential for pregnant women with poor mental health. High levels of pregnancy-related anxiety have been found to be associated with preterm birth and low birth weight.<sup>10</sup> Furthermore, prolonged depression during pregnancy may elevate the risks of adverse birth outcomes, including premature birth, low birth weight, and delayed development.<sup>3</sup> These adverse outcomes indicate that a comprehensive assessment of mental health is of great significance to identify pregnant women who have anxiety or depression during the epidemic.

## **3.3 Measures to improve pregnant women's psychological health**

### **3.3.1 Popularized knowledge about COVID-19**

Lessons learned from the SARS outbreak in 2003 suggest that knowledge and attitudes towards infectious diseases are associated with a level of anxiety among the population.<sup>11</sup> Therefore, improving cognition is conducive to enhance the ability of stress response. We found that the majority of pregnant women worried to know whether their children could be born healthily and smoothly. Thus, most of pregnant women would like to acquire relevant knowledge: personal protection during pregnancy, the pregnant women's susceptibility to COVID-19, and intrauterine transmission. Fortunately, there is no evidence of Sars-Cov-2 transmission in utero or placenta from infected pregnant women to fetuses in the global pandemic of COVID 19 at present.<sup>12</sup> Besides, Chen et al. found no evidence of Sars-Cov-2 virus particles in pregnant products or newborns. Moreover, the clinical symptoms reported by pregnant women with confirmed COVID-19 infection are similar to those reported for non-pregnant adults with confirmed COVID-19 infection in the general population, demonstrating that the clinical process and results are more optimistic than Sars-Cov-1 infection.<sup>5</sup>

### **3.3.2 Provision of health care services**

To avoid further spread of the epidemic, people are advised to stay at home, causing difficulty for numerous pregnant women to go to the hospitals. Although hospital visits may increase the risk of infection, the lack of medical care during pregnancy may be further detrimental. Importantly, intrauterine pregnancy and prenatal testing are significant. Statistics showed that more than 2% of pregnancies are ectopic, and congenital disabilities or genetic disorders occur in approximately 3–5% of pregnancies. Cancellation of a visit may reduce the possibility of viral infection, while sequelae may leave a greater impact.<sup>13</sup> To solve this problem, from the survey results, we can recommend hospitals to take the following measures: (1) make appointments by schedule for production inspections, (2) provide online consultation by public account or App, (3) popularize the protection knowledge related to COVID-19 during pregnancy.

### **3.3.3 Relieving negative emotions**

The results showed that 80.17% of pregnant women would relax themselves (i.e., listening to music, watching movies, etc.) to relieve their negative emotions, and 71.38% of pregnant women would choose to chat with their family members or friends. During the outbreak of COVID-19, residents are advised to stay at home. Hence, it is necessary to create a better family atmosphere and care more about pregnant women, which can reduce the incidence of depression and anxiety.

## **3.4 Limitations of the survey**

We conducted a timely investigation among pregnant women during the outbreak of COVID-19. This cross-sectional study aims to reflect the psychological condition of pregnant women during the outbreak and analyze the relevant factors. There are some shortcomings in the current research. First, we

conducted the survey by means of online questionnaires, which may ignore those pregnant women who do not have access to the Internet. Secondly, the limitation of the regions involved may cause information bias.

## **Conclusion**

Pregnant women are prone to anxiety and depression during the COVID-19 outbreak. Their psychological status is related to age, cultural levels, and trimester of pregnancy. A healthy psychological status during pregnancy is highly crucial to prenatal development. Therefore, we should pay further attention to the psychological status of pregnant women during the outbreak of COVID-19. It is of great importance to provide timely psychological support for pregnant women with mental disorders, and enhance their confidence in being a good mother.

## **Abbreviations**

SAS  
Self-rating Anxiety Scale; SDS:Self-rating Depression Scale; COVID-19:Corona Virus Disease 2019;  
EPDS:Edinburgh Postnatal Depression Scale

## **Declarations**

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### **Authors' contributions**

All authors have contributed to the study. XRT was responsible for conception of the study; QZC collected the data; SQC and JMZ analyzed the data and draft manuscript. All authors read and approved the final manuscript.

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### **Availability of data and materials**

The datasets generated and/or analyzed during the current study are not publicly available due to the presence of identifiable information but are available from the corresponding author on reasonable request.

### **Ethics approval and consent to participate**

This study was approved by the ethics committee of the First Affiliated Hospital of Shantou University Medical College. All women participating in this study were asked to indicate their willingness to partake in the study by selecting yes/no at the beginning of the online survey.

### **Consent for publication**

Not applicable.

### **Conflict of Interest**

The authors declare that there are no conflict of interest.

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