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

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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. Pregnant women, as a particular group, need more attention. The aim of this study is to investigate the mental health status of pregnant women during the outbreak of COVID-19, to analyze factors affecting their mental health status, to get wise to their cognition, behavioral responses and to provide solution guidance for psychological problems.

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 during the outbreak of COVID-19, the scores of SAS and SDS of pregnant women were both significantly higher ($P<0.05$). The results of multivariate regression analysis unveiled that age, levels of education, and duration of pregnancy were 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 ≥ 30 years old was 0.646 times (95% CI:0.486-0.858). Besides, compared with women with a level of high school or below, those with a junior college degree or above had a poor mental health risk of 0.551 times (95%CI: 0.416-0.731). Compared with women in early pregnancy, women in middle pregnancy and in last pregnancy had a risk of 0.543 times (95% CI:0.398-0.739) and 0.636 times (95% CI: 0.466-0.867) in poor mental health.

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

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.[1] 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).[2] Pregnant women, as a particular group of women, are more prone to anxiety and depression. It was globally estimated that 10% of women have experienced prenatal depression, and the proportion was as high as 15.6% in developing countries.[3] Furthermore, a number of studies demonstrated that nearly 80% of depressive symptoms (with an Edinburgh Postnatal Depression Scale (EPDS) score of 14 or higher) occurred during pregnancy, rather than postpartum.[4] 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 high-risk groups into consideration in strategies focusing on the prevention and

management of COVID-19 infection.[5] The purpose of our survey is to collect information of psychological states of pregnant women during the COVID-19 pandemic, to analyze the factors affecting their psychological status and to provide specific guidance. Such guidance should be grounded in a thorough understanding of the pregnant women's cognition, behavioral responses, and psychological status. We conducted an investigation into these contents. Additionally, lessons learned should not forgotten through SARS, and awareness of psychological influence of COVID-19 can be increased. Thus, social and family attention and psychological health support are crucial for pregnant women during the COVID-19 outbreak.

As people are advised to stay at home during the COVID-19 outbreak, thus, we conducted a web-based survey on February 20, 2020 to get wise to the mental status of pregnant women during the outbreak of COVID-19.

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 ≥ 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%.

1.2 Survey tools

1.2.1 Self-compiled questionnaire

The questionnaire was designed by researchers, which incorporated pregnant women's general information and investigation during the period of the outbreak. General information included age, levels of education, occupation, type of pregnancy, ,delivery times and duration of pregnancy. The investigation on pregnant women during the period of the outbreak included 13 questions in total, which were divided into two categories: The first category involved cognitive and behavioral responses of pregnant women during the outbreak (9 items(1) Are you concerned about the domestic epidemic? (2) How much has the epidemic affected your life? (3) Have you prepared adequate protective equipment? (4) During the epidemic period, have you checked in on time? (5) If the original hospital were a designated hospital for admission to COVID-19, would you choose to change the hospital for production inspection during the epidemic period? (6) How much did your family care about you during pregnancy? (7) Do you think you are qualified for the role of being a mother? (8) Do you need psychological counseling? (9) Do you need handheld ultrasound electronics?). Besides, the second category covered pregnant women's main worries and solutions (4 items(1)What are your current main worries? (2) What kind of knowledge do you desire? (3) What services do you expect to be provided by hospitals? (4) How do you relieve psychological discomfort?)

1.2.2 Self-rating anxiety scale (SAS)

The Zung Self-Rating Anxiety Scale was used. Fifteen items are expressed as negative words, and scores are on the basis of the frequency of a anxious symptom (1 to 4). Affirmative terms are used to indicate 5 items, and according to the frequency of symptoms (4 to 1). The scores of all items are added up to the total score. The standard score is multiplied by 1.25 and rounded off. The score of SAS < 50 means normal and the score ≥50 means anxiety.[6] In the present study, the Cronbach α coefficient was 0.81.

1.2.3 Self-rating depression scale (SDS)

The Zung Self-Rating Depression Scale was used. The scale comprises 20 items with 4 scoring grades and includes 10 negative symptoms and 10 positive symptoms. On the grounds of the frequency of positive symptoms, numbers from 1 to 4 are used for scoring. Based on the frequency of negative symptoms, a raw score is acqueired using the reverse score method (4 to 1). The standard score is the score multiplied by 1.25 and is rounded off. The score of SDS≥53 means depression.[7] In the present study, the internal consistency coefficient was 0.88.

1.2.4 Statistical Analyses

Statistical analysis was performed using SPSS 16.00 software (IBM, Armonk, NY, USA). In the present study, respondents with SAS ≤ 50 and SDS ≤ 53 were assigned to good mental health group, and the rest of the respondents were allocated to poor mental health group. The internal consistency was evaluated by using Cronbach alpha. Counting data are expressed by the number of people (%). Measurement data are expressed as mean±standard deviation (x±s). Wang et al. found that in some areas of China, the scores of anxiety and depression in general adults during COVID-19 were 36.92±7.33 points and 40.50±11.31 points, respectively. [2] Comparison of the SAS and SDS standard scores of pregnant women and general adults during the COVID-19 were carried out with t-test. P<0.05 was considered statistically significant. The analysis of the relationship between age, education level, occupation, delivery times, type of pregnancy, trimester of preganancy, and poor mental health initially used the chi-square test. All the variables were imported into the multivariate logistic regression model. The analysis of cognition, behavioral responses and poor mental health also used the chi-square test. And P < 0.05 was statistically significant.

2. Results

2.1 General characteristics of the respondents

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 became pregnant through assisted reproductive technology and 1045 (90.09%) respondents conceived

naturally. Levels of education were as follows: 583 (50.26%) pregnant women had a level of high school or below, and 577 (49.74%) pregnant women had a level of junior college degree or above.

2.2 Questionnaire results of anxious and depression of pregnant women and its comparison with general adults during the epidemic.

According to our research, the SAS standard score was 40.69 ± 7.83 points, and the SDS standard score was 46.06 ± 11.47 points. On the basis of the anxiety and depression scores, 799 (68.88%) were no-anxious and non-depressed. Besides, 120 (10.34%) had anxiety, 332 (28.62%) had depression, and 91 (7.84%) had both anxiety and depression. Thus, according to our criteria, there were 361 women in poor mental health group, and 799 women in good mental health group.

Compared the SAS and SDS standard scores of pregnant women with general adults in some regions of China during the COVID-19 by t-test, the scores in pregnant women were both significantly higher, and the difference was statistically significant ($P< 0.05$) (Table 1).

2.3 Analysis of factors associated with antenatal anxiety and depression during the COVID-19 outbreak

Table 2 showed the result of single-factor chi-square test, it indicated that the rate of poor mental health was higher in the 18-30 age group than above 30 age group ($\chi2=11.250$, $P<0.05$). The rate of poor mental health was higher in respondents with a level of high school or below than those with a level of junior college degree or above ($\chi2=30.534$, $P<0.05$). The rate of poor mental health was higher for homemakers than that for office workers ($\chi2=16.346$, $P=0.001$). Additionally, the proportion of psychological problems was higher for women during the first trimester than that for women during the middle or third trimester ($\chi2=15.159$, $p=0.001$). 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. Furthermore, the risk of psychological problems in women aged 31-44 years old was 0.646 times that of women aged 18-30 years old (95 %CI: 0.486-0.858). Compared with women with a level of high school or below, those with a junior college degree or above had a poor mental health risk of 0.551 times (95%CI: 0.416-0.731). Compared with women in early pregnancy, women in middle pregnancy and in last pregnancy had a risk of 0.543 times (95%CI: 0.398-0.739) and 0.636 times(95% CI: 0.466-0.867) in poor mental health respectively. Further details are presented in Table 2.

2.4 Comparison of cognitive and behavioral responses of pregnant women with different mental states during the COVID-19 outbreak

In table 3, we still divided pregnant women into 2 groups similarly. The results uncovered that compared good mental health group with poor mental health group, there were significant differences in cognitive and behavioral responses during the COVID-19 outbreak. The differences included the degree of concern about the domestic epidemic, the extent of epidemic's impacts on life, and families' concern. Besides, the

differences also incorporated the preparation of protective equipments and being a mother, and the need for psychological counseling (P<0.05) (Table 3).

2.5 Pregnant women's main worries and solutions during the COVID-19 outbreak

2.5.1 The current main worries

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

2.5.2 Solutions

2.5.2.1Desired 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.

2.5.2.2 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).

2.5.2.3 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).

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).[8] The SARS outbreak in 2003 was not only deemed as a medical incident but as a mental health catastrophe with a response compatible to that of other main disasters.[9] In the same way, the mental impact of COVID-19 pandemic deserves equal attention. Our 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 in some regions of China (P<0.05). It uncovered that pregnant women were more likely to develop anxiety and depression during the outbreak. Thus, it is of great practical significance to

analyze the affecting factors, their cognition, behavioral responses and to provide specific guidance that meet their psychological needs during the COVID-19 pandemic.

3.1 Factors influencing pregnant women's psychological status

In our research, we found that age, levels of education, and trimester of pregnancy were all factors relevant to pregnant women's psychological status during the COVID-19 pandemic. We also found that the rate of poor mental health was higher in the 18-30 age group than above the 30 age group. In addition, a study showed that a lower level of education was associated with a higher prevalence of anxiety and depression status,[10] which was consistent with the results of our study. It is likely because people with a higher degree of education and age have keen self-protection awareness, and they may collect relevant information and knowledge of the epidemic on their own initiative in various ways. Therefore, they have a less cognitive bias towards the epidemic diseases and make corresponding psychological preparations in advance. The results also disclosed that pregnant women in early pregnancy were more likely to develop mental health problems, which might be due to morning sickness and their lack of pregnancy experience in early pregnancy. Additionally, the maternal immune system in early pregnancy is very sensitive,[11] which also makes them more likely to develop anxious and depressive symptoms.

3.2.Cognitive and behavioral responses of pregnant women during the COVID-19 outbreak

A number of scholars demonstrated that childbirth was a stressor, and all the pregnant women would show diverse degrees of anxiety or depression symptoms before delivery. Besides, the quality of life model of depression and related disorders indicated a direct inverse relationship between life satisfaction and anxiety.[12] 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 pregnant women with anxiety or depression tended to more worry about the domestic epidemic during the COVID-19 outbreak. Most of them considered that the epidemic had a great impact on their lives, and they worried that they had not prepared adequate protective supplies. Additionally, compared with pregnant women with good mental health, a higher proportion of those who with negative emotions thought that their family members cared a little about them, and they were not ready to be a mother as well. Gan, Liu, and Zhang compared how Beijing university students coped with the SARS epidemic with how they disposed daily stressful events, indicating that individual had a propensity to be less flexible to handle the SARS epidemic than in their usual practice of handling stress. And they tended to use more emotion-focused coping to handle such events.[13] Therefore, It is very necessary to have proper guidance in this case. For pregnant women with symptoms of anxiety or depression, they really needed psychological counseling and proper intervention. High levels of pregnancy-related anxiety have been found to be associated with preterm birth and low birth weight.[14] Futhermore, prolonged depression during pregnancy may elevate the risks of adverse birth outcomes, including premature birth, low birth weight, and delayed development.[3] These adverse outcomes indicated that a comprehensive assessment

of mental health was of great importance to identify pregnant women who had anxiety or depression early 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 suggested that knowledge and attitudes towards infectious diseases were associated with a level of anxiety among the population.[15] Anxiety and depression, exacerbated by uncertainties and intensification of the information flow, will increase vastly. Negative physiological impact of stress will come out.[16] Therefore, improving cognition and knowledge is conductive to enhance the ability of stress responses. 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.[17] Besides, Chen et al. found no evidence of Sars-Cov-2 virus particles in pregnant products or newborns. Moreover, clinical symptoms of pregnant women with confirmed COVID-19 infection are similar to those non-pregnant women with confirmed COVID-19 infection, demonstrating that the clinical process and results are more optimistic than Sars-Cov-1 infection.[5]

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 occurred in approximately 3-5% of pregnancies. Cancellation of a visit may reduce the possibility of viral infection, while sequelae may leave a greater impact.[18] To solve this problem, from the results, we 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 to analyze the relevant factors. There are some shortcomings in the current research. First, we conducted the survey by means of online questionnaires, which might ignore those pregnant women who did 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. Furthermore, it is of great importance to provide timely psychological support for pregnant women with mental disorders, to enhance their confidence in being a good mother, and to help them pull through such peculiar time smoothly.

Abbreviations

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

Declarations

Abbreviations

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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 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 pregnant 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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Tables

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

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

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)	χ^2	P value	Multiple logistic regression analysis	
					OR(95% CI)	P value
Age						
18-30	450	241	11.250	0.001	0.646	0.003
31-44	349	120			(0.486-0.858)	
Education level						
High school or below	358	225	30.534	0.000	0.551	0.000
Junior college or above	441	136			(0.416-0.731)	
Occupation						
Homemakers	260	162	16.340	0.000	0.781	0.090
Office workers	539	199			0.588-1.039)	
Delivery times						
Primipara	424	180	1.023	0.312		
Multipara	375	181				
Way of pregnancy						
Assisted production	82	33	0.350	0.554		
Natural conception	717	328				
Trimester Of preganancy						
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
					(0.466-	

	0.867)

Table 3 Comparison of cognitive and behavioral responses of pregnant women with different mental states during the COVID-19 outbreak.

	Good mental health (n=799)	Poor mental health (n=361)	χ^2	P value
Are you concerned 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%）		
How much has the epidemic affected your 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%）		
Have you prepared adequate protective equipment?				
No	72（9.01%）	54（14.96%）	9.083	0.003
Yes	727（90.99%）	307（85.04%）		
During the epidemic period, have you checked in 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 were designed for COVID-19?				
Yes	237（29.66%）	127（35.18%）	3.516	0.061
No	562（70.34%）	234（64.82%）		
How much did your family care about you during pregnancy?				
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%)		
Do you think you are qualified for the role of being a mother?				
Can not	18 (2.25%)	32 (8.86%)	28.105	0.000
May can	294 (36.80%)	138 (38.23%)		
Totally can	487 (60.95%)	191 (52.91%)		
Do you need psychological counseling?				
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%)		
Do you need handheld ultrasound electronics?				
No	132 (16.52%)	49 (13.57%)	2.228	0.135
Yes	667 (83.48%)	312 (86.43%)		

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%

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%

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%

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%