Influencing Factors of Pregnant Women's Anxiety and Depression During the 2019-nCoV Pandemic Based on Logistic Regression Analysis

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Abstract: This research investigates and analyzes the maternal mental health status during the 2019-nCoV pandemic in 2019 based on Maslow's Hierarchy of Needs Theory by conducting a questionnaire survey of 268 women who were pregnant or gave birth during the 2019-nCoV pandemic at Jingwei Women's Slimming Center in Guangrao County, Dongying City, Shandong Province, and analyzing the collected data using the Chi-Square test and the Binary Logistic Regression Analysis. This survey research shows that the detection rate of maternal anxiety and depression during the 2019-nCoV pandemic is high, and factors such as maternal occupation, education level, annual household income, family relationships, frequency of maternity checkups, family accompaniment, and the number of pregnancies and deliveries during the pandemic influence their anxiety and depression status.

1 INTRODUCTION

In December 2019, 2019-nCoV pneumonia spread rapidly worldwide (Baranow 2021). The novel coronavirus is highly infectious with a long incubation period, which threatens the lives of infected individuals and has severe effects on relatives of infected individuals and the surrounding population (Verdecchia et al. 2020). There is no specific drug for this disease, and maternal, as a particularly susceptible group for 2019-nCoV, have a higher probability of serious illness. Therefore, it is even more important for pregnant women to be well protected during the pandemic, have reasonable psychological expectations to cope with the dual stress of the pandemic and pregnancy, and prevent negative emotions such as anxiety and depression. The recurrent and long-term nature of the 2019-nCoV pneumonia pandemic and the strict requirements of the social pandemic prevention policy during the pandemic make maternal psychology more sensitive, which can hurt both the mother and the fetus (Liu et al. 2021). This research investigates maternal anxiety and depression during the 2019-nCoV pandemic using a questionnaire and analyzes the factors that affect maternal mental health based on the Chi-Square test and Logistic Regression.

2 LITERATURE REVIEW

Maternal anxiety and depression can occur during pregnancy due to endocrine, psycho-social and other factors. Individuals' personalities determine their habits and behaviors differently and therefore have individual variability in the degree and direction of social occurrences that cause them to become psychologically stressed, which in turn affects their physiological reactions and the generation of psycho-spiritual emotions. The suddenness and uncertainty of the 2019-nCoV pandemic cause more significant psychological stress to pregnant women. Studies have shown that being unemployed, having an annual household income of less than 80,000 yuan per year, having poor family relationships, family members generally not accompanying maternity visits, and reducing the frequency of maternity visits due to the pandemic hurt maternal mental health during the

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2019-nCoV Pneumonia pandemic. In addition to questionnaire research, previous studies require data science methods to process the collected data, such as Linear Regression or Logistic Regression.

3 METHODOLOGY

3.1 Aims and Objectives

A significant global public health event has an enormous impact on maternal mental health (Lu 2020), and data from previous studies have claimed that the probability of detecting positive maternal anxiety and depression in China is 11.9% and 8.2%, respectively (Zheng et al. 2019). However, few studies have been conducted on maternal anxiety and depression during the 2019-nCoV pandemic. The main question of this research is the factors influencing maternal anxiety and depression at the psychological and spiritual levels in the context of the 2019-nCoV pandemic.

This research aims to identify the factors influencing maternal anxiety and depression during the 2019-nCoV pandemic with the help of data science research methods and provide some theoretical and data support for strategic recommendations to address this issue.

3.2 Research Method

This research is based on Maslow's Hierarchy of Needs Theory (Jegede 1977) to study and analyze the factors influencing maternal anxiety and depression in the 2019-nCoV pandemic. Maslow's Hierarchy of Needs Theory suggests that human needs can be divided into five levels: physiological needs, safety needs, belonging and love, respect and self-actualization.

The basic information of maternal age, occupation, education level, and SAS and SDS scores are collected through a general profile survey, Anxiety Self-Rating Anxiety Scale and Anxiety Self-Rating Depression Scale.

After collating the questionnaire results, data pre-treatment is performed to screen out the questionnaire data that met the inclusion criteria and group the data results, such as maternal age greater than or equal to 35 years and less than 35 years, SAS score showing anxiety positive and SAS score showing anxiety negatively. The Chi-Square independence test is performed on the pretreated data to investigate the correlation between individual factors such as age, occupation, and education level and positive maternal

anxiety or depression detection. The Binary Logistic Regression Analysis is performed on the pretreated data to investigate the effect of all factors investigated in the questionnaire on positive detection of maternal anxiety or depression and determine the risk factors leading to positive detection of maternal anxiety or depression.

3.3 Data collection - A Questionnaire Survey

3.3.1 Survey Population

Women can become pregnant or give birth during the 2019-nCoV pandemic who participate in the Jingwei Women's Slimming Center program in Guangrao County, Dongying City, Shandong Province, from September 2021 to February 2022. Eligible women are invited offline to fill out the online questionnaire by scanning the "Questionnaire Star" app on WeChat, and each cell phone terminal could only be filled out once. After the questionnaires are collected to a sufficient number (statistically significant), the questionnaires with qualified quality are counted as valid questionnaires according to the content of the completed questionnaires.

Valid questionnaire criteria:

Inclusion criteria: (a)women in pregnancy; (b)filling out the questionnaire by themselves; (c)answering time $\geq$ 180s.

Exclusion criteria: (a)the answers are missing; (b)similar questions are not logically consistent; (c)a recent major stressful event.

3.3.2 Questionnaire Research Method

This research designs the general situation questionnaire combined with the internationally used Self-Rating Anxiety Scale (SAS) and Self-Rating Depression Scale (SDS). It creates a QR code through Questionnaire Star. Women who meet the criteria scan the QR code to obtain the questionnaire scale, complete it on the specified occasion, and submit it anonymously. The data are exported through the Questionnaire Star system, and the data that does not meet the survey criteria and invalid data is removed semi-manually. The data of the valid questionnaires are processed and analyzed. The final quantitative analysis results are obtained.

General Survey. It includes primary maternal conditions such as age, occupation, education level, annual household income, place of residence, family relationships, frequency of maternity checkups,

accompanying family members, number of pregnancies and deliveries, and gestational weeks.

The Self-Rating Anxiety Scale. The Self-Rating Anxiety Scale (SAS) is developed by William W.K. Zung, a Duke University, U.S.A professor. The SAS scale uses a 4-point scale consisting of 20 different entries, mainly assessing the frequency of symptoms. The criteria are: "1" means no or very little of the time; "2" means sometimes; "3" means most of the time; "4 " indicates most or all of the time. According to the Chinese normative results, the cut-off value of the standard score is 50, where 50-59 is mild, 60-69 is moderate, and 70 or more is severe (Wu et al. 2021).

The Self-Rating Depression Scale. The Self-Rating Depression Scale (SDS) (Chen et al. 2020) is developed by the same William W.K. Zung and consists of 20 different entries with a total of 1, 2, 3 and 4 scores for each admission and a total score of 20 to 80 for each subscale. Depression severity = the cumulative score/80 for each entry, where those below 0. 5 are considered not depressed; those above 0. 5 are considered depressed.

3.3.3 Clinical Validity of the Scale

When the SAS is used with the HAMA scale, the Pearson correlation coefficient for the total score of the two scales is 0.365, and the Spearman correlation coefficient is 0.341, which shows that the validity of the SAS is very high (Wang & Chi 1984).

When the SDS is used with the HAMA scale, the Pearson correlation coefficient for the total score of the two scales is 0.778, and the Spearman correlation coefficient is 0.783, confirming the clinical validity of the SDS (Wang & Chi 1984).

4 DATA ANALYSIS

During the survey period, 268 questionnaires were collected, 28 invalid questionnaires were eliminated by pretreatment, and 240 valid questionnaires meeting the research criteria were finally obtained. Using SPSS26.0 statistical software, the measurement data are expressed as percentages. The test is used for comparison between groups; the count data are expressed as percentages, and the 2 test is used to compare groups.

4.1 Detection of Depressive and Anxiety Symptoms

240 pregnant women are aged 20-37 years, with an average of (26.55±3.913) years. The average gestational age is 216 cases of primigravida and 24 cases of transnational. According to the Self-Rating Depression Scale (SDS), the index is ≥0.5 in 74 cases, accounting for 30.83%. According to the Self-Rating Anxiety Scale (SAS), there are 81 cases (33.75%) with an index ≥0.5.

Table 1: Univariate analysis of anxiety and depression in pregnant women (n=240).

Categories	Anxiety		$\chi 2$	P	Depression		$\chi 2$	P
	Ratio	Percentage (%)			Ratio	Percentage (%)		
Occupation								
On-the-job	7/109	6.4	66.699	0.000	6/109	5.5	60.073	0.000
Awaiting employment	74/131	56.5			68/131	51.9		
Education								
High School and below	64/144	44.4	18.414	0.000	57/144	39.6	12.924	0.000
College and above	17/96	17.7			17/96	17.7		
Annual household income								
＜80,000 yuan per year	58/116	50.0	26.515	0.000	54/116	46.6	26.010	0.000
≥80,000 yuan per year	23/124	18.5			20/124	16.1		
Residence								
Urban	69/223	30.9	11.104	0.001	68/223	30.5	0.171	0.679
Rural	12/17	70.6			6/17	35.3		
Family relationships								
Harmonious	38/162	23.5	23.620	0.000	32/162	19.8	28.695	0.000

Unharmonious	43/78	55.1			42/78	53.8		
Frequency of maternity checkups								
Not affected by the pandemic	57/199	28.6			56/199	28.1	3.960	0.047
Delayed delivery due to the pandemic	24/41	58.5	13.587	0.000	18/41	43.9		
Family Accompaniment								
Generally accompanied	61/213	28.6	22.124	0.000	53/213	24.9	31.437	0.000
Generally unaccompanied	20/27	74.1			21/27	77.8		
Maternity								
Primigravida	57/216	26.4	52.346	0.000	50/216	23.1	59.820	0.000
PMS	24/24	100.0			24/24	100.0		
Week of pregnancy								
<28 weeks	69/192	35.9	2.055	0.152	62/192	32.3	0.957	0.328
≥28 weeks	12/48	25.0			12/48	25.0		
Age								
≥35 years old	7/18	38.9	0.230	0.632	8/18	44.4	1.690	0.194
<35 years old	74/222	33.3			66/222	29.7		

4.2 Univariate Analysis of Anxiety and Depression in Pregnant Women

Univariate analysis of age, education, occupation, annual household income, and week of pregnancy is performed by applying Chi-Square analysis. The Chi-Square test can be used for the analysis of count data for multiple classifications of two or more factors, i.e., to study the correlation between two variables, with $p < 0.05$ as a statistically significant difference, indicating that there is a significant difference between groups and that the variable is associated with depression, and There is an association between positive anxiety detections (table 1).

According to the Chi-Square test results, covering the needs of pregnant women on the five levels of Maslow's theory, it can be seen that *Maslow's Hierarchy of Needs Theory* can explain the data results well from a theoretical perspective.

4.3 Multi-Factor Analysis of Pregnant Women with Anxiety and Depression

Logistic Regression Analysis is performed at a = 0.05 to investigate the effect of the above factors on the detection of positive anxiety or depression (including whether there is a statistically significant effect and the specific direction and degree of the effect), using single factors such as age, occupation, and annual household income as independent variables and anxiety and depression scores as dependent variables. A difference of $p < 0.05$ is considered statistically significant, indicating that a 0.05 level of significance is presented and that this variable affects the positive detection of anxiety and depression (table 2 and table 3).

Table 2: Logistic regression analysis of factors influencing maternal anxiety.

Influencing Factors	β	Standard Error	Waldχ²	P	OR (95%CI)
Awaiting employment	2.491	0.535	21.648	0.000	0.403 (0.152~1.068)
Poor family relationships	1.046	0.424	6.092	0.014	2.845 (1.240~6.526)
Family members generally do not accompany maternity visits	1.932	0.758	6.496	0.011	6.903 (1.562~30.501)

*p<0.05 **p<0.01

Table 3: Logistic regression analysis of factors influencing maternal depression.

Influencing Factors	β	Standard Error	Waldc²	P	OR (95%CI)
Awaiting employment	2.593	0.598	18.798	0.000	0.075 (0.023~0.241)
Annual household income of less than 80,000 yuan	1.903	0.871	4.770	0.029	0.149 (0.027~0.823)
Poor family relationships	1.223	0.441	7.675	0.006	3.397 (1.430~8.069)
Family members generally do not accompany maternity visits	2.216	0.735	9.080	0.003	9.170 (2.170~38.758)

*p<0.05 **p<0.01

4.3.1 Logistic Regression Analysis of Positive Anxiety Detection in Pregnant Women

According to the results of the Logistic Regression Analysis, the factors of occupation, family relationships, and family accompaniment are related to anxiety during the pandemic, and non-employment, poor family relationships, and family members generally not accompanying the maternity check-ups are the high-risk factors for anxiety among pregnant women during the pandemic. These influencing factors reflect the needs of pregnant women on the third level (belonging and love), fourth level (respect), and fifth level (self-actualization), and are higher and do not trigger anxiety due to economic conditions or lack of personal security.

4.3.2 Logistic Regression Analysis of Positive Detections of Depression in Pregnant Women

The dependent variables of occupation, annual family income, family relationships, and family accompaniment are associated with depression, non-employment, annual family income less than 80,000 yuan per year, poor family relationships, and family members generally not accompanying the delivery of high-risk factors for depression.

5 DISCUSSION

The 2019-nCoV pneumonia pandemic has caused varying degrees of psychological and mental stress since its occurrence. The maternal population is more sensitive to mental and psychological levels as a particular group. Due to the hormonal changes in the body during pregnancy, the impact on maternal behavioral habits caused by changes in the social environment during the 2019-nCoV pandemic, and concerns about the fetus' health in the womb. Maternal psychology can be affected by the 2019-nCoV pandemic, a significant global public health event. According to statistics, the global probability of depression in women during pregnancy is approximately 25% (Silveira et al. 2015), while the overall incidence of depression in China is 8.5-23.5% (Shen et al. 2021). Due to the uncertainty and suddenness of the 2019-nCoV pandemic and the prevention and control policies during the pandemic. In order to better understand the psychological condition of pregnant women during this particular period, it is necessary to select a certain number of pregnant women as a sample for data analysis.

Moreover, because of the differences in material and spiritual needs of different families, people's habits and requirements for life that are developed before the pandemic is not met, and the social atmosphere during the pandemic prevention and control period causes changes in people's psychological expectations for their future lives, which aggravates people's worries, produce different levels of stimulation. The survey data of this research shows that the self-reported detection rate of maternal anxiety is 33.75%. The survey data of this research shows that the self-reported detection rate of maternal anxiety is 33.75%. The self-reported detection rate of depression is 30.83%, higher than the detection rate of maternal anxiety measured using SAS in China, which is 15.4% (Liu et al. 2020) and the detection rate of maternal depression mentioned above, which is 25%. Maternal psychological stress is more significant than usual in the period of the 2019-nCoV pandemic, which is reflected in this research

specifically in the detection of anxiety and depression.

According to the Chi-Square test, there is a direct relationship between maternal occupation and annual household income and their anxiety and depression status during the neonatal pandemic. Women who are unemployed or have an annual household income of less than 80,000 yuan per year are more likely to experience anxiety and depression during the 2019-nCoV pandemic. Possible reasons for this result are: pregnant women with job security during the 2019-nCoV pandemic have a stable source of economic income to meet their material needs and do not need to overthink about food and clothing; pregnant women are more worried about their return to work after delivery during the 2019-nCoV pandemic due to the downturn in the job market, and are therefore more nervous and anxious; stable employment itself provides an excellent social circle for pregnant women before the pandemic and delivery. The stable occupation offers an excellent social circle for pregnant women before the pandemic and pending delivery, allowing them to maintain a relatively good frequency of communication with the society. (Guo et al., 2020).

The family rapport of pregnant women during the 2019-nCoV pandemic is also a highly correlated factor in triggering their anxiety and depression. According to this research data, women with poor family relationships are more likely to experience anxiety and depression. This may be because the 2019-nCoV pandemic is a psychological burden for women. During the pandemic, limited contact with the outside world may lead to a lack of care and companionship if women do not have good family relationships. At the same time, the atmosphere created by disharmonious family relationships can cause more psychological stress for pregnant women in the 2019-nCoV pandemic, making it difficult for them to seek relief from their loved ones, resulting in anxiety and depression.

There is also a correlation between maternal psychological status during the 2019-nCoV pandemic and their literacy level. According to the data of this research, maternal anxiety and depression during the 2019-nCoV pandemic are less likely to occur in women with higher education (college and above) than those with lower education (high school and below). This result is possible because women with higher education can make more reasonable judgments about the pandemic trends combined with a more comprehensive perspective, thus maintaining a relatively optimistic attitude (Yan et al. 2021). Pregnant women with higher education have a broader knowledge base and a more rational and objective perspective on issues, thus finding more ways to vent their emotions in the face of problems arising from the 2019-nCoV pandemic.

Data analysis shows that the absence of family members during maternity checkups during the 2019-nCoV pandemic is also a high-risk factor for maternal psychological problems. Women their families accompanied during labor and delivery are less likely to experience anxiety and depression than those they do not accompany during labor and delivery. This may be because family members make pregnant women feel more secure and aware of a stable attachment. During this particular period of the 2019-nCoV pandemic, the presence of family members allows for the timely resolution of negative psychological emotions, which is more conducive to the long-term psychological health of pregnant women.

This research found a correlation between the frequency of maternity checkups and maternal anxiety and depression during the pandemic. Women who do not delay their delivery due to the pandemic are less likely to have anxiety and depression than women whose delivery is affected by the 2019-nCoV pandemic. This result may be explained by the fact that the pandemic affects the regular order of the hospital, and women are more worried about whether going to the hospital for maternity checkups would affect their health and that of their fetuses (Zhang et al. 2021).

According to the results of the Chi-Square test, the factors that have an impact on pregnant women's anxiety and depression cover the needs of pregnant women on the five levels of Maslow's theory, which shows that *Maslow's Hierarchy of Needs Theory* can explain the data results well from a theoretical perspective.

According to the results of the Logistic Regression Analysis, the factors of occupation, family relationships, and family accompaniment are related to anxiety during the pandemic, and non-employment, poor family relationships, and family members generally not accompanying maternity checkups are the high-risk factors for anxiety among pregnant women during the pandemic. These influencing factors reflect the needs of pregnant women in terms of belonging, love, respect, and self-actualization, and the higher level of needs, which do not trigger anxiety due to economic conditions or lack of personal security.

6 CONCLUSION

In conclusion, the data analysis of this study suggests that maternal mental health issues during the 2019-nCoV pandemic cannot be ignored. The social status of pregnant women and their current physiological characteristics determine that they are in a compassionate state, and the 2019-nCoV pandemic has undoubtedly increased their psychological stress. Currently, pregnant women have specific needs on each of Maslow's five significant levels, emphasizing the higher levels of belonging and love, respect, and self-actualization. In light of this reality, government departments and hospitals should introduce timely policies to ensure that the necessary maternal examinations are not affected by the pandemic to the greatest extent possible. The family members of pregnant women should give them proper care and enhance effective communication so that their negative emotions can be relieved in time. Pregnant women themselves should maintain an optimistic attitude and participate in social activities to maintain interaction with the outside world while strictly following the pandemic prevention and control policy. At the same time, they should promptly communicate with their relatives when they find problems with their psychological condition and seek professional help from relevant institutions. Only through the joint efforts of many parties can we promote the long-term and stable psychological health of pregnant women under the 2019-nCoV pandemic.

This research is based on Maslow's Hierarchy of Needs Theory and the Binary Logistic Regression Analysis. It has implications for alleviating maternal anxiety and depression during the 2019-nCoV pandemic and suggesting more targeted strategies for coping with maternal mental health problems in the post-pandemic era. However, this research inevitably has some limitations that do not exclude pregnant women's geographical limitations in the selected regions. Meanwhile, the sample size is small, and some of the findings need further corroboration by extensive data. In addition, this research provides theoretical and data support for investigating maternal psychological conditions and timely interventions in a significant global public health event such as the 2019-nCoV pandemic. It also provides a reference for the model mechanism of regular pregnancy checkups and special triage in public settings carried out by relevant government departments and medical systems during the prevention and control of the 2019-nCoV pandemic.

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