

Original Article

The mediating role of sleep quality in the relationship between social support and depressive symptoms in early pregnant women

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Abstract: Objective: To explore the mediating effect of sleep quality between social support and depressive symptoms in pregnant woman at the early pregnancy stage. Methods: Pittsburgh sleep quality index (PSQI), social support revalued scale (SSRS), and self-rating depression scale (SDS) were used to investigate the sleep quality, social support status and depression of 269 pregnant women in early pregnancy in Guangxi Zhuang Autonomous Region Maternal and Child Health Hospital from July 2022 to December 2022. Pearson correlation analyses and Bootstrap were used to test the correlation and mediating effect between variables. Results: The social support scores of pregnant women were inversely proportional to the scores of sleep quality and depression ($r = -0.178$ and -0.219 , $P < 0.05$). The sleep quality of pregnant woman score was positively correlated with depression symptom score ($r = 0.139$, $P < 0.05$). The sleep quality of pregnant women in early pregnancy played a partial mediating role between social support and depressive symptoms, and the mediating effect value was -0.029 (95% CI: -0.057 – -0.007). Conclusion: Social support can affect the occurrence of depression in pregnant woman at the early pregnancy stage, and sleep quality plays a partial mediating role.

Keywords: Early pregnancy, social support, sleep quality, depression, mediating effect

Introduction

Pregnancy marks a new stage in a woman's life, which not only promotes the pregnant woman to assume the responsibilities and obligations brought by the new role but also brings her physiological, psychological, family, and social changes [1]. During this special period, almost all women have different types and degrees of psychological disorders for various reasons, among which stress, anxiety, and depression are the most common, and these negative emotions often occur together [2, 3]. Previous studies have focused on women's postpartum psychological problems, especially postpartum depression, and paid relatively little attention to prenatal psychological disorders. With the gradual development of related research, a large amount of literature points out that psychological disorders in pregnant woman at early pregnancy cannot be ignored [4, 5]. Psychological disorders such as stress, anxiety,

and depression in pregnant woman at early pregnancy stages are not only related to fetal development and adverse pregnancy outcomes, such as fetal malformations, low birth weight, premature birth, and stillbirth but also directly or indirectly have a more lasting impact on the growth and development of children [6]. In addition, pregnant women with anxiety, depression, perceived stress, and other psychological disorders in early pregnancy will not only feel more intense pain during childbirth but are also more prone to pregnancy complications [7]. Therefore, psychological disorders in pregnant woman at early pregnancy have attracted more and more attention, and have gradually become the focus of public health research in various countries in recent years.

Effective social support plays a moderating role in maternal self-efficacy and mental health and can reduce the risk of mental or physical diseases under high stress [8]. The sources of

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maternal social support in China are mainly divided into four aspects: family support, medical staff support, community support, and government support. Among them, the popularity of community support and government support is low, which is in the stage of continuous improvement. Current research shows that women's expectations of social support have changed before and after childbirth. Most women expect more subjective support before childbirth and more objective support after childbirth [9]. This suggests that we should focus on improving the types of social support with higher expectations at different stages of maternal pregnancy, so as to help women survive the pregnancy and delivery period.

Sleep is a necessary physiological need for human beings. Sufficient and good sleep during pregnancy is one of the conditions to ensure maternal health and fetal development [10]. However, sleep disorders occur in pregnant women due to hormonal changes during pregnancy [11]. It is a common knowledge that sleep quality is closely related to depression, but the relationship between social support and depression is not yet clear, and whether sleep quality plays a mediating role remains to be explored. At present, the effect of social support on depression in pregnant women in early pregnancy has been studied at home and abroad, but the related mechanism has rarely been reported, and there are few studies exploring the effect of sleep quality on social support and depression. Based on this situation, this study explored the association between social support and depressive symptoms in pregnant woman at early pregnancy through questionnaires, and to explore the possible mediating role of sleep quality in this association, so as provide a basis for reducing depressive symptoms in pregnant women of early stages.

Methods

Study design and patients

In this retrospective analysis, the clinical data of 269 pregnant women in early stages who underwent prenatal examinations in Guangxi Zhuang Autonomous Region Maternal and Child Health Hospital from July 2022 to December 2022 were analyzed. Inclusion criteria: (1) The pregnant women were aged between

20-45 years; (2) Pregnant women with a gestational age of 1-13 weeks; (3) Pregnant women with complete clinical information, including age, gestational age, education level, and income status; (4) Pregnant women who have completed questionnaires related to sleep quality, social support, and depression. Exclusion criteria: (1) Pregnant women with a previous history of mental illness; (2) Pregnant women with severe pregnancy complications; (3) Pregnant women with a history of chronic diseases, such as hypertension, diabetes, asthma and anemia; (4) Pregnant women planning to undergo abortion surgery; (5) Pregnant women with incomplete data. This study was approved by the Ethics Committee of Guangxi Zhuang Autonomous Region Maternal and Child Health Hospital.

Data collection

The information of pregnant women, including age, gestational age, gravidity, body mass index (BMI) before pregnancy, monthly average income, education level, sleep quality, social support level, and depression were collected from their medical records. The research subject's information was evaluated on the second day after they arrived for examination. The collected data in this study were double checked by two individuals.

Calculation and significance of relevant indicator scores

The significance of the sleep quality, social support, and depression scores of the study subjects is as follows: (1) Pittsburgh sleep quality index (PSQI) [14]: PSQI consists of 19 self-evaluation items and 5 other evaluation items, and all items are scored by a 4-level scoring method (0-3 points). After removing the items not involved in the scoring, the total score was 0-21. The score is inversely proportional to sleep quality. (2) Social Support Revalued Scale (SSRS) [15]: SSRS consists of 10 items, of which 7 single-choice items (items 1-4 and 8-10) used a 4-level scoring method of 1-4, with 1 point indicating no and 4 points indicating strong support. The five options of the multi-choice item (item 5) scores the same as the single-choice item, and the final score of item 5 is the sum of each option. In items 6 and 7, the 'no source' option scores 0, and the remaining options (select A-I) score 1 (no other options

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Table 1. Internal consistency coefficient of each scale

Scale	Consistency coefficient α
Pittsburgh sleep quality index	0.845
Pittsburgh sleep quality index	0.916
Self-rating depression scale	0.894

can be selected when the 'no source' option is selected, and the remaining options can be selected when the 'no source' option is not selected). The total score of SSRS is 12-66, and the score is positively proportional to social support. (3) Self-rating depression scale (SDS) [16]: SDS contains 20 items in 4 dimensions, and each item adopts a 4-level scoring method. The total rough score is 80 points, and the standard score is obtained by multiplying the total rough score by 1.25 and taking the integer part. A standard score < 53 indicates no depressive symptoms, 53-62 indicates mild depression, 63-72 indicates moderate depression, and > 72 indicates severe depression.

Outcome measures and statistical analysis

SPSS was used for data processing in this study. The measurement data that conforms to the normal distribution is represented in the form of ($\bar{x} \pm s$), t test was used for comparison between two groups. Counting data were expressed as n (%), chi-square test was used for comparison between the two groups. Pearson was used for correlation tests. In order to further explore the intermediary effect of sleep quality between social support level and depression symptoms of pregnant women in early pregnancy, this study uses Hayes' intermediary effect test method. The mediating effect was determined using the Process 4.1 plug-in in SPSS. The model used in the mediation effect test is model 4, and the test method is the nonparametric percentage Bootstrap method. The significance of the mediating effect was judged according to the 95% confidence interval. Multiple linear regression analysis was used to further analyze the mediating effect of sleep quality between social support and depressive status in pregnant women. The difference was statistically significant with $P < 0.05$.

Results

Reliability test

The reliability of each scale used in this study was tested by calculating its internal consistency coefficient α . SPSS reliability analysis was used to calculate the consistency coefficient α of each scale, the results showed that the internal consistency coefficient of all test scales was greater than 0.8, with an average value of 0.885 (as shown in **Table 1**). The results show that the reliability of the main research scale in this study is good, reaching the standard of the questionnaire survey.

Basic information of the research subject

Among the 269 pregnant women, the average age was (31.34 ± 4.88) years old, and the average gestational age was (9.60 ± 1.62) weeks. Among them, 142 were in their first pregnancy, 88 were in the second pregnancy, and 39 were in the third pregnancy. The average score of social support was (46.32 ± 8.40), the average score of depressive symptoms was (52.97 ± 7.72), and the score of sleep quality was 6.00 (4.00, 7.00). The incidence of depression in the 269 pregnant women in the first trimester was 52.42% (141/269), and the numbers of mild, moderate, and severe depression were 114, 25, and 2, respectively (**Table 2**).

Relationship between social support, sleep quality, and depressive

As shown in **Table 3**, according to Pearson correlation analysis scores, the scores of social support of pregnant women in early pregnancy were inversely proportional to their sleep quality scores ($r = -0.178$, $P = 0.003$). The score of social support of pregnant women in early pregnancy was inversely proportional to the score of depression symptoms ($r = -0.219$, $P < 0.001$). The score of sleep quality is directly proportional to the score of depression symptoms ($r = 0.139$, $P = 0.022$), that is, the worse the sleep quality, the more serious the depression symptoms.

Bootstrap test of sleep quality, social support and depression

The results of Bootstrap analysis showed that the social support score could negatively pre-

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Table 2. Basic information of research objects

Basic information	Specific situation
Average age (year)	31.34 ± 4.88
Average gestational age (week)	9.60 ± 1.62
Number of pregnancies	
The first pregnancy	142 (52.79)
The second pregnancy	88 (32.71)
The third pregnancy	39 (14.50)
The score of sleep quality	6.00 (4.00, 7.00)
The average score of social support	46.32 ± 8.40
The average score of depressive symptoms	52.97 ± 7.72
Body mass index before pregnancy (kg/m ²)	21.85 ± 1.47
Monthly average income (yuan)	
< 5000	113 (42.01)
≥ 5000	156 (57.99)
Education level	
Junior college or below	108 (40.15)
Bachelor's degree or above	161 (59.85)

Table 3. Relationship among sleep quality, social support and depressive of pregnant women

	Social support	Sleep quality	Depressive symptoms
Social support	1		
Sleep quality	-0.178*	1	
Depressive symptoms	-0.219*	0.139*	1

Note: * indicates $P < 0.05$.

Table 4. Bootstrap test of sleep quality, social support and depressive

		β	SE	95% CI
Sleep quality	Depressive symptoms	0.527	0.181	0.171~0.882
Social support	Sleep quality	-0.055	0.019	-0.091~-0.018
	Depressive symptoms	-0.191	0.056	0.081~-0.300

Table 5. The mediating effect of sleep quality

	Effect value	SE	95% CI
Total effect	0.162	0.055	0.053~0.271
Direct effect	0.191	0.056	0.813~0.300
Indirect effect	-0.029	0.013	-0.057~-0.007

dict the score of depression ($\beta = -0.191$, $P < 0.05$), and the depressive symptoms of early pregnant women with high social support levels were lower (Table 4). At the same time, social support scores negatively predicted sleep quality scores ($\beta = -0.055$, $P < 0.05$), and pregnant

women with higher levels of social support could obtain better sleep quality. Higher sleep quality scores may report higher depressive symptom scores ($\beta = 0.527$, $P < 0.05$).

The mediating effect of sleep quality

As shown in Table 5 and Figure 1, sleep quality plays a potential mediating role in the association between social support and depressive symptoms ($\beta = -0.029$), and its 95% CI (-0.057--0.007) does not include 0. This result shows that sleep quality can play a partial mediating role between social support and depression in pregnant women at early trimester, and the mediating effect was -0.029 (17.90%).

Multiple linear regression

As shown in Table 6, the results of multiple linear regression show that when sleep quality, social support, and depression are factored into equations, social support would have an impact on the depression of pregnant women, and its impact may be related to the mediating effect of sleep quality. When the baseline data of pregnant women are included in the equation, the social support level of pregnant women still has an impact on their depression state, and its impact may still be related to the mediating effect of sleep quality.

Discussions

This study revealed the relationship between sleep quality, social support, and depressive symptoms. The social support of pregnant women in early pregnancy is closely related to their depressive symptoms, and pregnant women with poor social support have a higher risk of depressive symptoms. Sleep quality plays a partial mediating role between social support and depressive symptoms.

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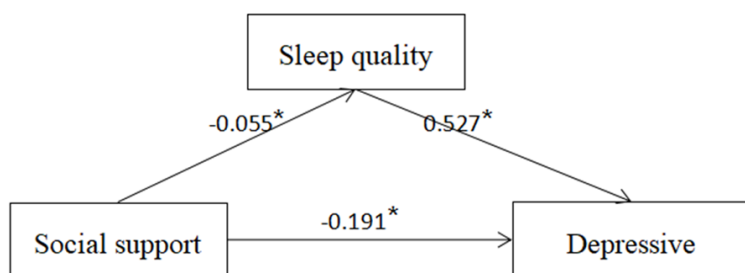


Figure 1. The mediating effect of sleep quality.

Table 6. Multiple linear regression

Variable	Unstandardized coefficient		Standardized Coefficient	t	P
	β	SE	B'		
Model 1					
Sleep quality	0.189	0.056	0.206	3.412	0.001
Social support	0.529	0.180	0.177	2.933	0.004
Constant	41.197	2.968	-	13.880	0.000
Model 2					
Sleep quality	0.189	0.056	0.205	3.377	0.001
Social support	0.524	0.182	0.176	2.873	0.004
Age	0.001	0.095	0.001	0.009	0.992
Gestational age	0.080	0.286	0.017	0.281	0.779
BMI	0.154	0.315	0.029	0.489	0.625
Constant	37.101	8.299	-	4.471	0.000

Note: Model 1 indicates that only sleep quality, social support, and depressive state are equations; Model 2 indicates that the baseline data of the patient also enters the equation.

According to the classification standard of SSRS, a score of ≤ 22 indicates a low level of social support, a score of 23-44 indicates a medium level, and a score of ≥ 45 indicates a high level. In this study, only 1 (0.37%) was at a low level, 107 (39.78%) were at a moderate level, and 161 (59.85%) were at a high level. The results of this study show that most pregnant women in early pregnancy can perceive a higher level of social support. Bedaso et al. [17] said that high levels of social support can help alleviate the negative emotions of pregnant women during pregnancy. According to the grading standard of PSQI, a score below 5 indicates that the sleep quality of the subjects is good. This study showed that only 18.96% (51/269) of pregnant women could reach this level, indicating that the sleep quality in early pregnancy needs to be improved. Lu et al. [18] have found that poor sleep during pregnancy is easily overlooked in clinical work, but the con-

sequences of poor sleep quality are very serious. Among the 269 respondents, 141 (52.42%) had a depression score of 53 or more, and the numbers of mild, moderate, and severe depression were 114, 25, and 2, respectively. The results of this survey show that most pregnant women in early pregnancy have different degrees of depression, and medical staff and family members of pregnant women should pay attention to that. At present, in the study of the depression in pregnant women at early pregnancy, the incidence of depression in pregnant women fluctuates greatly, which may be related to the differences in the study area, race, age, and weight [19-21]. The incidence of depression in this study was 52.42%, which was at a high level. The preliminary speculation may be related to the age, parity, and weight of the subjects in this study. However, the specific reasons for the differences still need to be confirmed by further research.

Previous studies have initially revealed the impact of lower levels of social support on the occurrence of depression in the pregnant stage [22, 23]. In early pregnancy, pregnant women usually have different degrees of early pregnancy reaction, which brings physiological discomfort to pregnant women, at the same time, most pregnant women have strong anxiety due to lack of pregnancy experience at early pregnancy [24]. During this period, the needs of pregnant women for social support are mainly manifested in the affirmation, recognition, praise and encouragement of their behaviors and views by family members, relatives, and friends. A high level of support is the key to alleviating the negative emotions of pregnant women in early pregnancy [3]. This study found that social support scores are reversely associated with sleep quality scores. The results of this study are consistent with the results of Chen [25]. The sleep quality of pregnant women in early

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pregnancy is related to the level of social support they perceive. Higher levels of social support can help pregnant women alleviate negative emotions in early pregnancy, thus better promoting sleep.

A number of current studies [26-28] have shown that the psychological state can be improved by improving the sleep quality. However, the above studies only found a relationship between the two and did not find a relationship between social support, sleep quality and depressive symptoms. This study confirmed that sleep quality was a mediating variable between social support, and depression in pregnant women at early pregnancy, which played a partial mediating role. As an intermediary factor, the score of sleep quality is inversely proportional to the score of social support and positively proportional to the score of depression. The social support of pregnant women in early pregnancy has a certain impact on depression through sleep quality, that is, the lower the social support, the worse the sleep quality, and the more serious the depressive symptoms.

Conclusion

In summary, our study shows that low levels of social support and poor sleep quality can aggravate depressive symptoms in pregnant women. In addition, sleep quality plays a mediating role between social support and depressive symptoms. Our study reveals the possible pathways between social support and depression and may have implications for reducing depressive symptoms in pregnant women at early pregnancy, providing a basis for clinical prevention of diseases.

Limitations

This study revealed that the lower the level of social support of pregnant women, the worse the sleep quality, and the more serious the depressive symptoms. However, this study still has some limitations. The research subjects of this study are from the same hospital, and the extension of the research results is limited. Secondly, as this study belongs to a cross-sectional study, although a correlation was found among the three, it is difficult to determine the causal relationship. In future research, it can be verified through multiple-factor analysis.

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Disclosure of conflict of interest

None.

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