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ORIGINAL RESEARCH

Family Support Moderates the Relationship Between Pregnancy Stress, Depressive Symptoms, and Insomnia

ShanYan Liu[1], Meijiao Huang[2], FengYing Zhang[2], Jing Tao[1], Dan Wen[1], WeiYuan Deng[1], YaoHua Lin[3], Ping Zhang[2], Min Li[2]

[1]The Affiliated Nanhua Hospital, Department of Obstetrics, Hengyang Medical College, University of South China, Hengyang, Hunan, 421002, People's Republic of China; [2]The Affiliated Nanhua Hospital, Department of Neurology, Hengyang Medical College, University of South China, Hengyang, Hunan, 421002, People's Republic of China; [3]The First Affiliated Hospital, Institute of Obstetrics, Hengyang Medical School, University of South China, Hengyang, Hunan, 421001, People's Republic of China

Correspondence: Ping Zhang; Min Li, The Affiliated Nanhua Hospital, Department of Neurology, Hengyang Medical College, University of South China, Hengyang, Hunan, 421002, People's Republic of China, Email 516387382@qq.com; lim-usc@qq.com

Objective: Insomnia is a common issue that pregnant women often have to deal with. This study seeks to examine the connections between pregnancy stress, depressive symptoms, family support, and insomnia symptoms.

Methods: Convenience sampling was employed to recruit 1049 valid participants. The primary measurement tools utilized were the Pregnancy Stress Scale, the Family Support Subscale, and the Patient Health Questionnaire-2. Data analysis was conducted using SPSS 24.0 software. Using binary logistic regression to verify the independent effects of pregnancy stress, depression symptoms, and family support on insomnia symptoms. PROCESS macro Model 4 was applied to assess the mediating effect, while PROCESS macro Model 5 was used to evaluate the moderating effect.

Results: The overall prevalence of insomnia symptoms and depressive symptoms among pregnant women was 54% (n=572) and 20% (n=207) in this study. Pregnancy stress, depressive symptoms and family support positively affect insomnia symptoms. The indirect effect of depressive symptoms between pregnancy stress and insomnia symptoms was significant, with the mediator proportion of 45.16%. As moderator, family support weakens the impact of pregnancy stress on insomnia symptoms.

Conclusion: Increased pregnancy stress and increased depressive symptoms could trigger insomnia symptoms. Depressive symptoms mediated the path from between pregnancy stress and insomnia symptoms. Family support weakened the link between pregnancy stress and insomnia symptoms. These findings can assist pregnant women in managing stress more effectively and improving their mental well-being.

Keywords: depressive symptoms, family support, insomnia symptoms, pregnancy stress, pregnant woman

Introduction

Pregnant women experience substantial physiological and psychological changes, which can significantly impact their sleep patterns.[1,2] Pregnancy-related sleep disorders refer to the decline in sleep quality that many pregnant individuals encounter.[3] These disorders are primarily characterized by insomnia symptoms, such as increased difficulty maintaining sleep throughout the night and frequent early morning awakenings.[4] Numerous studies have indicated that nearly half of pregnant women experience poor sleep quality.[5–10] The sleep quality of these women is influenced by a myriad of factors, with social and psychological elements garnering significant attention.[7] Pregnancy stress, which denotes the perception of various stressors encountered during pregnancy,[11] encompasses navigating societal and familial expectations, apprehensions about assuming the maternal role, and coping with physical discomforts associated with pregnancy.[12,13] These cumulative pressures can detrimentally affect sleep quality.[14,15] Consequently, this study posits that increased pregnancy stress may precipitate insomnia symptoms in pregnant women.

From the perspective of path relationships, depressive symptoms as core psychological factors may mediate the relationship between pregnancy stress and insomnia. The prevalence of depressive symptoms, one of the most common

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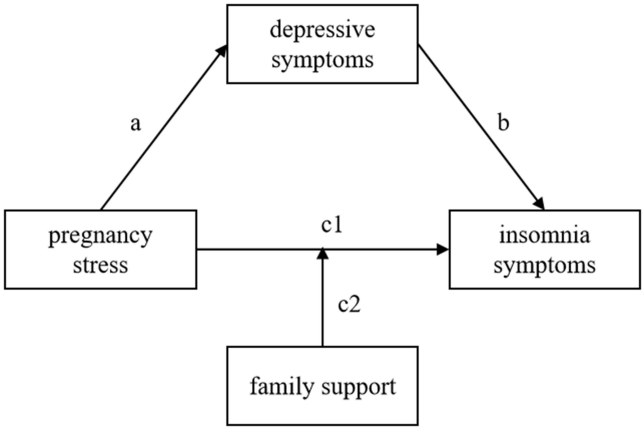

Figure 1 The research model. The path from pregnancy stress to depressive symptoms was denoted as path a, while the path from depressive symptoms to insomnia symptoms was represented as path b. The direct path from pregnancy stress to insomnia symptoms was labeled as path c1. The indirect effect of pregnancy stress on insomnia symptoms through mediator depressive symptoms was calculated by multiplying path a and path b. The total effect was the sum of the direct effect (c1) and the indirect effect (a*b). The moderation effect of family support between pregnancy stress and insomnia.

psychological problems among pregnant women, ranges from 10 to 20%.[16–18] Many evidences have shown that pregnancy stress is a major risk factor for depressive symptoms during trimester.[18–23] Despite pregnancy stress and its negative influences, previous studies have shown that social support systems have a beneficial impact on mental health.[24–26] Family support, as an integral component of social support, is closely intertwined with the mental well-being of pregnant women.[24,25,27] Evidence suggested that family relationships and social support are negatively correlated with postpartum depression and sleep problems.[28–31] Therefore, this study hypothesized that depressive symptoms as mediator and family as moderator affect the relationship between pregnancy stress and insomnia symptoms.

Overall, existing research provides fragmented evidence indicating that pregnancy stress is positively associated with depressive symptoms and sleep disturbances, while family support exhibits a protective effect, showing a negative correlation with sleep problems. However, to date, no comprehensive studies have integrated these factors to thoroughly examine the relationships among pregnancy stress, depressive symptoms, family support, and insomnia symptoms. To address this research gap, the current study aimed to test: 1) the prevalence of insomnia and depressive symptoms in pregnant women. 2) The effect of pregnancy stress, depressive symptoms, and family support on insomnia symptoms; 3) The mediating effect of depressive symptoms between pregnancy stress and insomnia symptoms; and 4) The moderating effect of family support between pregnancy stress and insomnia symptoms. The research model was showed in Figure 1. Based on findings, this study can offer valuable strategies to address stress during pregnancy, such as psychological support at the family level and conducting relaxation training to enhance sleep quality. The primary goal of this study is to assist pregnant women in managing stress more effectively and improving their mental well-being.

Methods

Participant and Procedure

This study adopted a cross-sectional survey design and was conducted from July to August 2024. This study employed convenience sampling to recruit pregnant women attending obstetrics clinics at three tertiary hospitals in Hengyang, Hunan Province, China, as study participants. The research team contacted the obstetric leaders of three hospitals to explain the research objectives and procedures, and received support from the hospitals.

According to previous research,[32,33] the sample size for a cross-sectional descriptive survey aimed at estimating a proportion can be determined using Equation (1). Prior studies have indicated that the prevalence of insomnia symptoms among pregnant women stands at approximately 45.7%.[7] Assuming an acceptable error margin of 0.05 (e = 0.05) for this proportion, and with an anticipated population proportion of 0.6 (p = 0.6), the required sample size for the survey, at a significance level of 0.05 (α = 0.05) with $Z_{1-\alpha/2}$= 1.96, was calculated to be 381. In addition, previous study

showed that the prevalence of depressive symptoms among pregnant women was about 38.2%,[8] the required sample was calculated to be 363. Combining two variables, the minimum sample size required for this study is 744 participants.

$$n = \frac{z^2_{1-\alpha/2} * p * (1-p)}{e^2} \quad (1)$$

The online questionnaire was meticulously designed and distributed via the Wenjuanxing platform, a widely-used online survey tool in China. Researchers introduced the reasons and purposes of this survey to pregnant women. After obtaining consent and signing the informed consent form, the pregnant women scanned the QR code to fill out the electronic questionnaire. During the filling process, one researcher used a unified guide to explain the items that were confused. The investigation followed guidelines to ensure that the research was voluntary and confidential. If the pregnant women experienced any discomfort during the filling process, they could withdraw from the survey at any time.

A total of 1226 questionnaires were distributed by the researcher across three hospitals, with 503, 379, and 344 questionnaires handed out at each respective hospital. The raw data were screened using the inclusion and exclusion criteria. This study included pregnant women who were 18 years of age or older. Pregnant women were excluded if they had fetal abnormalities, prior diagnosed mental health conditions, or concurrent organic diseases (ie, malignant tumors). This information was gathered via questionnaire. Pregnant women who respond affirmatively to these criteria will be excluded from the study. After data cleaning, this study obtained 1049 valid data, with an effective rate of 85.56%.

Measurement

Insomnia Symptoms (IS)

Insomnia symptoms in pregnant women were evaluated using three items: difficulty initiating sleep (DIS), difficulty maintaining sleep (DMS), and early morning awakening (EMA).[34] Each item is scored with 5 grades, including 1=never, 2= less than once a week, 3= 1–2 times a week, 4= 3–5 times a week, 5= 6–7 times a week. Participants were considered to have insomnia symptoms if they experienced any symptom on three or more occasions (response ≥ 4).[34] In this study, the Cronbach's α for the IS was 0.77.

Pregnancy Stress (PP)

The Pregnancy Stress Scale (PSS) is a self-reported assessment tool used in Taiwan to measure stress levels during pregnancy.[12] This study adopted a sub-scale of "seeking safe passage for mother and child", consisting of eight items like "I worry about abnormal or difficult birth", "I worry about premature labor", and "I worry about unbearable labor pain".[12] The items rated on a 4-point scale (0=none, 1=mild, 2=moderate, 3=severe). It considers China's cultural background during its development. The higher the PPS score, the higher is the level of stress experienced during pregnancy. In this study, Cronbach's α of the PSS was 0.92.

Family Support (FS)

This study used the Family Support sub0scale (FSS) of the Perceived Social Support Scale[35] to evaluate family support in pregnant women. This sub-scale consists of four items, such as "My family really tries to help me", all of which are scored on a four-point Likert 4-level scoring method. The scores ranged from "strongly disagree" to "strongly agree", with 1–4 points. The higher the score, the higher the individual's understanding of the family support. In this study, Cronbach's α of the FSS was 0.96.

Depressive Symptoms (DS)

This study adopted 2 items from the Patient Health Questionnaire-2 (PHQ-2)[36] to measure depressive symptoms of pregnant woman. Pregnant women need to answer questions "Over the past 2 weeks, how often have you been bothered by any of the following problems?" with 4-point Likert scale ranging from 0= "not at all" to 3= "nearly every day". Item 1 was "Little interest or pleasure in doing things", while Item 2 was "feeling down, depressed or hopeless". A total score greater than or equal to 3 indicates that an individual has clinical depressive symptoms.[36] The higher the total item score, the higher the total level of depressive symptoms. In this study, Cronbach's α for the PHQ-2 was 0.78.

This study also collected demographic information on pregnant women, including age (years), educational level, monthly family income, residence, medical insurance, and trimester (1^{st} = [0, 13 weeks], 2^{nd}= [14 weeks, 27 weeks], 3^{rd}= [28 weeks, 40 weeks]).[6,23]

Data Analysis

The survey data was used SPSS 24.0 software to the main analysis. This study used n (%) to represent the count data and performed the χ^2 tests. This study used M±SD to represent metric data with normal distribution and homogeneity of variance and performed a *T*-test or ANOVA. This study tested the relationship between pregnancy stress, depressive symptoms, family support, and insomnia symptoms using Pearson's correlation and binary logic regression analyses. The bias-corrected percentile bootstrap method was used to analyze the mediating effect of depressive symptoms, and the PROCESS MODEL was used to test the mediation and moderation models. $p<0.05$, indicating that the difference in the data was statistically significant. The PROCESS macro, developed by Andrew F. Hayes for SPSS, is a specialized tool designed to handle a wide range of mediation and moderation analyses.[37] It enables researchers to examine models with single or multiple mediators, moderators (including moderated mediation), and provides comprehensive output including bootstrap confidence intervals and effect size estimates for mediated effects.

Model 4 from the PROCESS Macro is simple mediation. By default, PROCESS employed bootstrapped confidence intervals to estimate the indirect effect. The ratio of the indirect effect (a*b) and total effect (a*b + c) represents the mediator proportion.[37] Based on Model 4, Model 5 added a moderator of direct independent variable-dependent variable path only. In this study, family support was the moderator between pregnancy stress and insomnia symptoms. If the moderation effect (the multiply of pregnancy stress and family support) is significant, then it is necessary to conduct simple slope tests. Simple slope tests are conditional hypothesis tests of whether the relationship between independent variable and dependent variable is significant at a particular value of the moderator, usually one standard deviation above and below the mean (M±SD).[37]

Results

Sample Characteristics

Among the participants (Table 1), the overall prevalence of insomnia symptoms and depressive symptoms among pregnant women was 54.5% (n=572) and 19.7% (n=207). 75.1% pregnant women were aged 25–34 (n=788); 74.2% pregnant women had a bachelor's degree (n=778); 42.8% pregnant women had a monthly family income of 3000–10000 yuan (n=449), while 51.9% pregnant women had a monthly income greater than 1000 yuan (n=544); 72.2% pregnant women residing in the city (n=757); 86.8% pregnant women with medical insurance (n=911); 10.4% pregnant women were in 1^{st} trimester (n=109), 27.5% pregnant women were in 2^{nd} trimester (n=288), and 62.2% pregnant women were in 3^{rd} trimester (n=652).

The Binary Logistic Regression Model

In the unadjusted model (Table 2), higher levels of pregnancy stress are associated with an increased likelihood of insomnia symptoms in pregnant women (OR=1.49, 95% CI= [1.28, 1.74]). Similarly, more severe depressive symptoms also correlate with a greater propensity for insomnia symptoms during pregnancy (OR=1.50, 95% CI= [1.29, 1.75]). Conversely, pregnant women are less likely to have insomnia symptoms with higher levels of family support (OR=0.88, 95% CI= [0.77, 0.99]). After controlling for the effect of trimester, although the coefficients decreased slightly, the relationships remained significant. These results indicate that pregnancy stress and depressive symptoms are risk factors for insomnia symptoms, whereas family support is a protective factor for having insomnia symptoms.

The Mediating Effect of Depressive Symptoms

According to correlation analysis, the relation between pregnancy stress and insomnia symptoms (r=0.33, $p<0.01$), pregnancy stress and depressive symptoms (r=0.48, $p<0.01$), family support and insomnia symptoms (r=−0.07, $p<0.05$), and depressive symptoms and insomnia symptoms (r=0.36, $p<0.01$) were significant.

Table 1 Demographic characteristics Among Pregnant Women

Prevalence N (%)	N (%)	Insomnia Symptoms			Depressive Symptoms		
		Score ≥ 4	Score < 4		Score ≥ 3	Score < 3	
		572 (54.5)	477 (45.5)		207 (19.7)	842 (80.3)	
		M±SD	*t*/*F*	*p*	M±SD	*t*/*F*	*p*
Age (years old)			0.10	0.903		0.54	0.582
<25	69 (6.6)	5.22±2.69			1.90±1.53		
25–34	788 (75.1)	5.36±2.55			1.74±1.30		
≥35	192 (18.3)	5.33±2.72			1.71±1.34		
Educational level			0.46	0.630		3.26	0.039
High school or below	155 (14.8)	5.52±2.89			1.96±1.44		
Bachelor degree	778 (74.2)	5.33±2.54			1.73±1.32		
Graduate degree or above	116 (11.1)	5.25±2.44			1.56±1.14		
Monthly family income			0.54	0.653		2.09	0.100
<3000¥	56 (5.3)	5.39±2.74			2.14±1.72		
3000–6000¥	192 (18.3)	5.28±2.70			1.77±1.32		
6000–10000¥	257 (24.5)	5.20±2.60			1.77±1.28		
>10000¥	544 (51.9)	5.44±2.52			1.69±1.30		
Residence			0.71	0.495		2.63	0.073
City	757 (72.2)	5.39±2.57			1.72±1.33		
Town	169 (16.1)	5.32±2.43			1.69±1.22		
Rural area	123 (11.7)	5.10±2.87			2.00±1.44		
Medical insurance			1.28	0.202		2.64	0.008
No	138 (13.2)	5.61±2.66			2.02±1.64		
Yes	911 (86.8)	5.31±2.57			1.70±1.27		
Trimester			20.85	0.000		2.39	0.092
1st trimester	109 (10.4)	4.30±2.62			1.98±1.34		
2nd trimester	288 (27.5)	4.90±2.52			1.66±1.34		
3rd trimester	652 (62.2)	5.72±2.53			1.74±1.32		

Note: N (%) = number (percent), M±SD = Mean ± Standard Deviation, *t*/*F* = *T*-Test or F-Test, $p<0.05$ means statistically significant.

Table 2 The Effect of Pregnancy Stress, Depressive Symptoms, and Family Support on Insomnia Symptoms

	Unadjusted Model			Adjusted Model		
	OR	*p*	95% CI	OR	*p*	95% CI
Pregnancy stress	1.49	0.000	(1.28, 1.74)	1.41	0.000	(1.21, 1.65)
Depressive symptoms	1.50	0.000	(1.29, 1.75)	1.57	0.000	(1.34, 1.84)
Family support	0.88	0.049	(0.77, 0.99)	0.87	0.031	(0.76, 0.99)

Note: $p<0.05$ means statistically significant.
Abbreviation: OR, odds ratio; CI, confidence interval.

Next, this study used PROCESS MODEL 4 to test the mediating effect of depressive symptoms on the relationship between pregnancy stress and insomnia symptoms. As shown in Table 3 and Figure 2, increased pregnancy stress was significantly associated with increased depressive symptoms (β=0.50, 95% CI= [0.44, 0.55]) and increased insomnia symptoms (β=0.16, 95% CI= [0.10, 0.23]); increased depressive symptoms significantly influenced increased insomnia symptoms (β=0.28, 95% CI= [0.22, 0.35]). The indirect effect of depressive symptoms between pregnancy stress and insomnia symptoms was significant (β=0.14, 95% CI= [0.11, 0.18]), with mediator proportion of 45.16%.

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Table 3 The Mediating Effect of Depressive Symptoms on the Relationship Between Pregnancy Stress and Insomnia Symptoms

Result Variables	Predictive Variable	*β*	*p*	95% CI	*R*	R^2	*F*
DS	Trimester	−0.01	0.003	(−0.02, −0.01)	0.49	0.24	165.71***
	PP	0.50	0.000	(0.44, 0.55)			
IS	Trimester	0.02	0.000	(0.01, 0.03)	0.44	0.20	85.48***
	PP	0.16	0.000	(0.10, 0.23)			
	DS	0.28	0.000	(0.22, 0.35)			
Total effect		0.31	0.000	(0.25, 0.36)			
Direct effect		0.17	0.000	(0.10, 0.23)			
Indirect effect	PP→DS→IS	0.14	0.000	(0.11, 0.18)			

Note: $p<0.05$ means statistically significant, *** means p is less than 0.001, and is statistically significant, R = correlation coefficient, R^2 = coefficient of determination, F= F-test.
Abbreviations: DS, Depressive symptoms; IS, Insomnia symptoms; PP, Pregnancy stress; *β*, Beta coefficient.

The Moderating Effect Test

Taking the trimester as the control variable, this study adopted PROCESS MODEL 5 to test the moderating effect of family support on the relationship between pregnancy stress and insomnia symptoms. As shown in Table 4 and Figure 3, the interaction effect of pregnancy stress and family support negatively affected insomnia symptoms (β=−0.10, $p < 0.001$, 95% CI= [−0.15, −0.04]). Next, this study divided the values of family support into high and low groups and selected the high family support group (SD+1) and low family support group (SD-1) for a simple slope test. As shown in Figure 3, when family support was low, pregnancy stress positively affected insomnia symptoms (β_simple=0.23, p<0.001, 95% CI= [0.16, 0.30]), whereas when family support was high, pregnancy stress did not significantly affect insomnia symptoms (β_simple=0.06, p>0.05, 95% CI= [−0.02, 0.14]). This result indicated that family support weakens the impact of pregnancy stress on insomnia symptoms.

Discussion

First, this study found that the prevalence of insomnia symptoms among pregnant women was 54% and the prevalence of depressive symptoms was 20%. The prevalence of insomnia symptoms in this study was higher than that in a recent meta-analysis, which found that the prevalence of insomnia symptoms in pregnant women was 38.2%.[8] Furthermore, this study revealed that 20% of pregnant women experienced depressive symptoms, which is consistent with previous research. Evidence indicates that the prevalence of depressive symptoms in pregnant women ranges between 10% and 20%.[16–18]

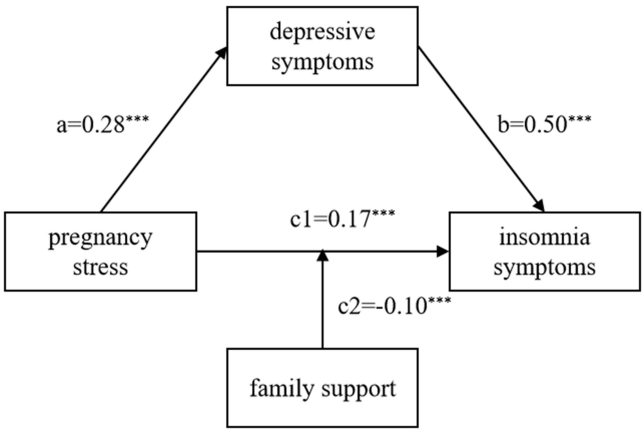

Figure 2 The test model. *** means p is less than 0.001, and is statistically significant. Increased pregnancy stress was significantly associated with increased depressive symptoms and increased insomnia symptoms. Increased depressive symptoms significantly influenced increased insomnia symptoms. The interaction effect of pregnancy stress and family support negatively affected insomnia symptoms.

Table 4 The Moderating Effect of Family Support Between Pregnancy Stress and Insomnia Symptoms

Result Variables	Predictive Variable	*β*	*p*	95% CI	*R*	R^2	*F*
Insomnia symptoms	Trimester[a]	0.02	0.000	(0.01, 0.03)	0.46	0.21	56.10***
	Pregnancy stress	0.17	0.000	(0.11, 0.24)			
	Depressive symptoms	0.27	0.000	(0.21, 0.33)			
	Family support	−0.11	0.000	(−0.17, −0.05)			
	PP×FS[b]	−0.10	0.000	(−0.15, −0.04)			

Note: ***$p<0.001$, [a]Covariates, [b]PP×FS=Pregnancy Stress× Family support.

Second, this study found that pregnancy stress was a risk factor for insomnia symptoms among pregnant women. This finding echo previous studies such as those by Gao et al and Mei et al, which reported that poor sleep quality in pregnant women is affected by pregnancy stress.[14,15] The *Stress Response Model* explains how people respond to stressors and how their actions affect physical and mental health.[38] From a physiological perspective, stress hormones such as cortisol may increase during pregnancy. Increased hormone levels may result in activation of the arousal system, increased alertness, and consequently, sleep. In addition, stress reactions may lead to physiological discomfort,[38] such as increased heart rate, muscle tension, frequent urination, and heartburn, which may increase pressure on pregnant women and affect sleep quality. From the perspective of behavioral responses, pregnant women may adopt inappropriate coping strategies to cope with pregnancy stress and insomnia,[39] such as excessive use of mobile phones or irregular sleep habits, which may exacerbate sleep problems.

Third, this study illustrates that depressive symptoms mediated the relationship between pregnancy stress and insomnia symptoms in pregnant women. Previous studies have shown that pregnancy stress alone affect depressive symptoms, while depressive symptoms trigger insomnia.[21–23] This study provides direct evidence of the relationship between pregnancy-related stress and insomnia symptoms, with depressive symptoms acting as a mediating factor. According to *Stress-Emotion Theory*, individuals exposed to high-pressure environments—such as the stress associated with childbirth—may experience psychological and physiological responses that lead to negative emotions, including depressive symptoms.[40] These emotional states can subsequently impact physiological functions, notably sleep. Depressive symptoms are known to induce significant physiological changes, such as reduced physical activity and heightened nighttime distress, both of which are directly associated with insomnia.[34] Therefore, it is crucial to conduct early screening for depressive symptoms during pregnancy and evaluate pregnant women who exhibit these symptoms. Implementing effective interventions, such as psychological counseling and education on healthy sleep practices, can help alleviate psychological pressure and negative emotions during pregnancy, ultimately improving sleep quality.

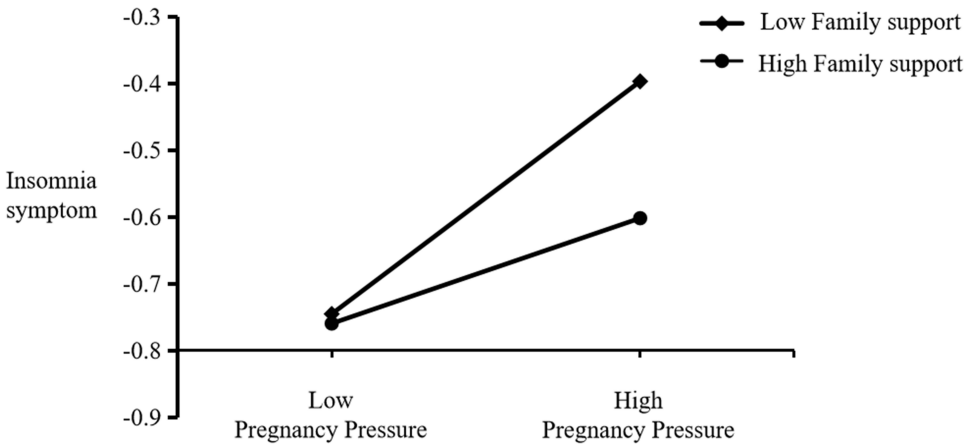

Figure 3 The simple slope plot of moderating effect. When family support was low (M-SD), pregnancy stress positively affected insomnia symptoms, whereas when family support was high (M+SD), pregnancy stress did not significantly affect insomnia symptoms.

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Fourth, this study reveals that family support weakens the relationship between pregnancy stress and insomnia symptoms. Women often rely on family support during pregnancy.[24] Previous studies have confirmed that family support plays a crucial role in the mental health of pregnant women.[24,25,28] This study extends this relationship to the sleep health of pregnant women. According to *the buffering model*, comprehending family support can mitigate the effects of stressful conditions or situations on an individual's physical and mental health.[41] Previous studies have found that individuals with better family support, such as an understanding from family members and support from friends and peers, are less likely to experience mental health problems.[27] For pregnant women, strong family support can substantially ease psychological stress and mitigate its influence on sleep disturbances. When these women perceive low levels of family support, their insomnia symptoms tend to increase markedly with rising stress levels. Conversely, as stress escalates, the rate of increase in insomnia symptoms slows down if pregnant women feel they have good family support. Therefore, it is necessary to improve pregnant women's understanding of family support levels, promote family and important relatives to provide more care and attention to pregnant women during pregnancy, and enhance family support levels, thereby reducing the occurrence of insomnia and promoting good maternal and infant outcomes.

Finally, this study validated the impact of demographic and pregnancy factors on insomnia symptoms in pregnant women. Unlike previous studies,[5,9,10] this study did not find significant differences in insomnia symptoms among pregnant women in terms of age, education level, monthly family income, residence, or medical insurance. This study found that the trimester is a symptom of insomnia in pregnant women; the later the pregnancy, the more severe the insomnia symptoms of pregnant women. This finding is consistent with those of most studies.[6,23] This may be because the uterus significantly enlarges during late pregnancy, leading to increased nocturia, restricted respiratory function (shortness of breath, difficulty breathing), and other discomfort, thereby reducing the quality of nighttime sleep. In addition, most pregnant women in their third trimester are more concerned about the safety of their mother and baby during vaginal or cesarean delivery, which also leads to increased sleep problems. To prevent negative consequences for both mothers and babies, it is recommended that relevant institutions conduct early screening and interventions for sleep disorders in pregnant women.

This study has several limitations. For one thing, the data were derived from a cross-sectional survey conducted in three hospitals in a southern Chinese city, with participants being conveniently selected pregnant women. This sampling method may limit the generalizability of findings. For another, while this study examined both mediation and moderation effects, it did not delve into in-depth causal relationships, which should be addressed in future research. This study did not classify pregnant women and failed to consider internal heterogeneity, such as a lack of attention to unmarried pregnant women.

Conclusion

This study revealed that increased pregnancy stress and increased depressive symptoms can lead to insomnia symptoms. Specifically, depressive symptoms act as a mediator in the relationship between pregnancy stress and insomnia. Moreover, family support plays a crucial role in weakening the impact of pregnancy stress on insomnia. For future research, longitudinal tracking surveys are recommended to further examine the causal relationships among these variables. Such studies could provide more comprehensive insights and allow for refinements and expansions of the current findings.

IRB Statement

The study protocol has been approved by the Research Ethics Committee of The Affiliated Nanhua Hospital, under the code 2024-ky-095, as laid out in the 1964 Declaration of Helsinki and its later amendments or comparable ethical standards.

Data Sharing Statement

The data supporting the findings of this study are available from the corresponding author upon reasonable request.

Consent to Participate

Informed consent was obtained from all the participants.

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Disclosure

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

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