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# The Relationship between Depression and Negative Cognitive Bias in Late Pregnancy Women and Its Influencing Factors

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## ABSTRACT

**Objective:** In recent years, psychological problems in pregnant women have become an important public health problem. Depression is a common psychological problem during pregnancy. At present, most studies focus on prenatal depression in pregnant women, and there is a lack of relevant studies on prenatal negative cognition and its relationship with depression. This study aims to examine the relationship between depression and negative cognitive bias in women in late pregnancy and identify the influencing factors. **Methods:** A total of 829 women in late pregnancy were recruited from a tertiary hospital between April 2023 and October 2023. The survey included the General Information Questionnaire for Women in Late Pregnancy, the Negative Cognitive Processing Bias Scale, and the Edinburgh Postpartum Depression Scale. Descriptive statistics and the  $\chi^2$  test were employed for univariate analysis of depression among these women. Pearson correlation analysis assessed the relationship between depression scores and negative cognitive bias scores. Multiple linear regression analysis, with depression as the dependent variable, was used to identify the influencing factors of depression in late pregnancy. **Results:** The detection rate of depression was 26.3%. Planned pregnancy emerged as a protective factor against depression in the third trimester ( $OR = 0.481$ ). Conversely, negative life events during pregnancy and negative memory bias were identified as significant risk factors ( $OR = 2.880, 1.146$ ). **Conclusion:** The prevalence of depression in the third trimester is notably high, with pronounced negative memory bias. Healthcare providers should prioritize the mental health of pregnant women, particularly those with deep and repetitive recollections of negative events, by enhancing psychological monitoring and treatment.

## KEYWORDS

Depression; influencing factors; late pregnancy; negative cognitive bias

## Introduction

Depression, a prevalent psychological disorder, ranks as the second-largest global health issue [1]. Prenatal depression lacks a unified definition. However, based on DSM-5 diagnostic criteria, researchers [2] described it as a persistent low mood, inability to adjust to pregnancy-induced changes, feelings of loneliness and isolation, and loss of social

functioning, with symptoms persisting for more than two weeks. Reports on the incidence of prenatal depression in China vary widely, ranging from 7% to 36.8% [3,4].

Negative cognitive bias, characterized by a predisposition to focus on, remember, and interpret information negatively, comprises four components: negative attentional bias, negative memory bias, negative interpretational bias, and negative rumination bias [5,6]. This cognitive trait has



garnered substantial attention in psychology research globally. Domestic scholars have extensively explored the causes, effects, and intervention strategies of negative cognition [7]. Studies have examined its relationship with mental health issues such as depression and anxiety disorders, finding that negative cognition is a core feature of these conditions, adversely affecting emotions, behavior, and physiological health [8,9]. This study aims to investigate the relationship between depression and negative cognitive bias in women during late pregnancy and analyze the influencing factors. The objective is to assist healthcare professionals in identifying high-risk groups for negative psychological states during late pregnancy, thereby promoting maternal and infant health.

## Materials and Methodologies

### General information

The study involved 829 pregnant women who attended prenatal examinations at the obstetrics outpatient department from April 2023 to October 2023. Following informed consent, participants completed a questionnaire survey. Inclusion criteria included: ① informed consent; ② gestational age  $\geq 28$  weeks; and ③ singleton pregnancy. Exclusion criteria comprised: ① inability to cooperate; ② known history of mental illness or severe physical disease; and ③ multiple pregnancies. A total of 900 questionnaires, encompassing the General Information Questionnaire for Women in Late Pregnancy, Edinburgh Postnatal Depression Scale (EPDS), and Negative Cognitive Processing Bias Questionnaire (NCPBQ), were distributed. After excluding invalid and inconsistent responses, 829 valid questionnaires were retained, resulting in an effective response rate of 92.1%. The study has been approved by the Medical Ethics Committee of Yingshang County People's Hospital Clinical research subject approval Medical ethics Review document (IRB number 2024-10). Written consent was acquired from the participants.

### Research methodology

#### General information questionnaire

A General Information Questionnaire for Women in Late Pregnancy was developed after a comprehensive review of relevant literature [2–4] and an analysis of epidemiological factors influencing depression during pregnancy. The primary variables assessed include age, pregnancy and childbirth status, educational level, occupation, spouse's educational level, pregnancy knowledge acquisition, negative life events, adverse obstetric history, planned pregnancy, prenatal exercise habits, monthly *per capita* household income, expectations regarding fetal gender, marital relationship, relationship with mother-in-law, dietary habits, and presence of complications.

#### EPDS

The EPDS is extensively used to evaluate the severity of postpartum depression symptoms and has been proven effective in screening for prenatal depression [10]. The scale

comprises 10 items categorized into three sections: emotional absence, anxiety, and depression. Each item is rated on a 4-point scale (0 to 3) based on symptom severity, with total scores ranging from 0 to 30. Higher scores denote more severe depression. In China, the EPDS was revised by Guo et al. in 2009 [11], achieving a Cronbach's alpha coefficient of 0.76. This version is widely adopted in clinical practice and research for assessing depression in the perinatal population. In this study, a total score of  $\geq 10$  was considered indicative of a positive depression screening, suggesting a depressive state.

#### NCPBQ

Feng et al. [12,13] identified negative cognitive processing bias as a cognitive trait, characterized by a preference for processing negative information. This encompasses four dimensions: negative attention bias, negative memory bias, negative interpretation bias, and negative rumination bias. The reliability analysis of the questionnaire demonstrated a Cronbach's alpha coefficient of 0.893 and a split-half reliability coefficient of 0.866. The NCPBQ comprises 24 items: 6 items assess negative memory bias (score range: 6–24), and 5 items each measure the other three dimensions (score range: 5–20 each). Additionally, 2 lie-detection items and 1 self-evaluation item for response attitude are included. The total score for the scale ranges from 24 to 96, with higher scores indicating more severe negative cognitive processing bias.

#### Statistical methodologies

Data were entered into an Excel database and meticulously verified. Statistical analysis was conducted using SPSS 26.0 software. The employed statistical methods included descriptive analysis, chi-square ( $\chi^2$ ) test, *t*-test, and binary logistic regression for multivariate analysis. Odds ratios (OR) and 95% confidence intervals (95% CI) were calculated, with a *p*-value  $< 0.05$  considered statistically significant.

#### Quality control

Prior to the survey, obstetric nurses and two questionnaire administrators received training. The survey was administered using a one-on-one approach, allowing administrators to provide immediate clarification for any participant inquiries. Questionnaires were collected on-site, reviewed for accuracy, and then entered into an Excel sheet.

#### Covariate description

Pregnant women were categorized by age into childbearing age ( $< 35$  years) and elderly gravida ( $\geq 35$  years). In this study, the oldest participant was 43 years old, and the youngest was 16, with 60% aged between 24 and 32 years. Other covariables are shown in Table 1.

## Results

*Analysis of influencing factors on depression in late pregnancy*  
The completed general survey data for women in late pregnancy totaled 829 forms, as detailed in Table 1.

TABLE 1

## Descriptive statistics and univariate analysis of general demographic characteristics of women in late pregnancy

Item	Frequency	Proportion (%)	Depression (n = 218)	Depression incidence (%)	$\chi^2/t$ value	p-value
Age (years)						
<35	696	84.0	187	26.9	0.730	0.452
≥35	133	16.0	31	23.3		
Pregnancy status						
Primipara	237	28.6	55	23.2	1.635	0.222
Multipara	592	71.4	163	27.5		
Occupation						
Unemployed	535	64.5	133	24.9	1.607	0.217
Employed	294	35.5	85	28.9		
Maternal education						
Junior high school and below	483	58.3	120	24.8	1.259	0.264
Above junior high school	346	41.7	98	28.3		
Spouse's education						
Junior high school and below	458	55.2	120	26.2	0.005	>0.999
Above junior high school	371	44.8	98	26.4		
Pregnancy-related knowledge						
Not studied	478	57.7	124	25.9	0.074	0.811
Studied	351	42.3	94	26.8		
Negative life events						
No	725	87.5	167	23.0	31.733	<0.001
Yes	104	12.5	51	49.0		
Household <i>per capita</i> monthly income						
≤RMB 3000	510	61.5	122	23.9	3.858	0.052
>RMB 3000	319	38.5	96	30.1		
History of adverse pregnancy outcomes						
No	701	84.6	176	25.1	3.316	0.080
Yes	128	15.4	42	32.8		
Planned pregnancy						
No	250	30.2	90	36.0	17.389	<0.001
Yes	579	69.8	128	22.1		
Prenatal exercise						
No	293	35.3	154	28.7	4.638	0.032
Yes	536	64.7	64	21.8		
Gender preference for the fetus						
No	485	58.5	124	25.6	0.321	0.576
Yes	344	41.5	94	27.3		
Marital relationship						
Fair or poor	145	17.5	47	32.4	3.393	0.077
Good	684	82.5	171	25.0		
Relationship with mother-in-law						
Fair or poor	223	26.9	75	33.6	8.470	0.004
Good	606	73.1	143	23.6		
Dietary habits						
Fair or poor	273	32.9	81	29.7	2.390	0.131

(Continued)

Table 1 (continued)

Item	Frequency	Proportion (%)	Depression (n = 218)	Depression incidence (%)	$\chi^2/t$ value	p-value
Good	556	67.1	137	24.6		
Pregnancy complications						
No	599	72.3	140	23.4	9.527	0.003
Yes	230	27.7	78	33.9		
Negative attention bias total score	829				-6.094	<0.001
Negative memory bias total score	829				-9.540	<0.001
Negative interpretation bias total score	829				-5.687	<0.001
Negative rumination bias total score	829				-4.333	<0.001
Negative cognitive bias total score	829				-8.422	<0.001
Depression						
No	611	73.7				
Yes	218	26.3				

Univariate analysis revealed that experiencing negative life events, whether the pregnancy was planned, prenatal exercise habits, the relationship with the mother-in-law, and the presence of complications were statistically significant factors ( $p < 0.05$ ). Other variables showed no statistical significance ( $p > 0.05$ ), as shown in Table 1.

*t*-test analysis indicated that pregnant women with depression in late pregnancy exhibited negative cognitive biases across all four dimensions: negative attentional bias, negative memory bias, negative interpretation bias, and negative rumination bias.

#### Correlation analysis between depression and negative cognitive bias in late pregnancy

Pearson correlation analysis indicated that the mean EPDS score of pregnant women ( $6.80 \pm 4.76$ ) had statistically significant positive correlations with the mean score of negative cognitive bias ( $46.73 \pm 10.68$ ) and its four dimensions: negative attention bias ( $10.24 \pm 3.34$ ), negative memory bias ( $11.36 \pm 4.05$ ), negative interpretation bias ( $11.24 \pm 3.22$ ), and negative rumination bias ( $13.68 \pm 3.50$ ). The correlation coefficients were  $r = 0.356, 0.320, 0.353, 0.231,$  and  $0.232$ , respectively (all  $p < 0.001$ ). Detailed results are provided in Table 2.

#### Logistic regression analysis of influencing factors for depression in women during late pregnancy

A binary logistic regression analysis was performed with depression status as the dependent variable and statistically significant variables from the univariate analysis, along with negative cognitive bias, as independent variables. The results indicated that planned pregnancy served as a protective factor against depression in late pregnancy ( $OR = 0.481$ ). Conversely, experiencing negative life events during pregnancy and negative memory bias, a dimension of negative cognitive processing bias were identified as risk

factors for depression in late pregnancy ( $OR = 2.880$  and  $1.146$ , respectively). As shown in Table 3.

## Discussion

#### Analysis of depression prevalence and influencing factors in women during late pregnancy

In the current era of rapid globalization and socioeconomic progress, the material foundation of humanity has become more abundant and stable, leading to a global increase in psychological disorders. Recently, there has been a growing focus on prenatal depression in both domestic and international reports. However, most previous research has concentrated on postpartum depression, with relatively few studies addressing prenatal depression, particularly in late pregnancy. Late pregnancy is a critical period when female organ function reaches its gestational peak, and childbirth is imminent. Factors such as hormonal changes, physical transformations, and concerns about the newborn can contribute to the onset and exacerbation of depressive symptoms [14]. In this study, 829 pregnant women were examined, among whom 218 were identified as having depression in late pregnancy (EPDS score  $\geq 10$ ), yielding a detection rate of 26.3%. This result aligns with Zhou et al.'s [15] findings of 26.9% but is lower than Chen et al.'s [16] reported 32.2%. It exceeds the depression rates observed in Suzhou (15.9%) [17] and Beijing (20%) [18] for late pregnancy. Bisetegn et al.'s research [19] revealed depression prevalence rates of 9.2%, 7.4%, and 15.5% in early, middle, and late pregnancy, respectively. Zhang et al.'s study [20] reported depression detection rates of 5.97%, 8.51%, and 15.56% for early, middle, and late pregnancy, respectively, indicating that late pregnancy depression rates surpass those of early and mid-pregnancy. Variability in reported depression detection rates across regions can be attributed

TABLE 2

Correlation analysis (r) between EPDS scores and negative cognitive scores in late pregnancy ( $\bar{x} \pm s$ )

Negative cognitive dimension/ EPDS score	Score	r	p
EPDS score	6.80 ± 4.76		
<b>Total score</b>	46.73 ± 10.68	0.356	<0.001
Negative attentional bias	10.24 ± 3.34	0.320	<0.001
Negative memory bias	11.36 ± 4.05	0.353	<0.001
Negative interpretational bias	11.24 ± 3.22	0.231	<0.001
Negative rumination bias	13.68 ± 3.50	0.232	<0.001

to differences in research tools, assessment criteria, cultural contexts, living environments, family atmospheres, and individual variations. The 26.3% detection rate of depression in late pregnancy observed in this study significantly exceeds the incidence of other pregnancy-related complications.

pregnancy. Pregnant women who experienced negative life events were 2.88 times more likely to develop depression than those who did not. Xu et al. [22] also identified negative life events during pregnancy as an independent risk factor for depression, consistent with the present findings. However, their research reported a higher risk, with a 4.02-fold increase in depressive symptoms. Biaggi et al. [23] found that negative life events such as domestic violence, childhood or pregnancy abuse, divorce, or loss of a close relative are closely associated with prenatal depression. Xu Yao's study similarly highlighted the strong link between prenatal depression and negative life events. Increased psychological sensitivity and vulnerability during pregnancy can amplify the impact of negative events, leading to heightened negative emotions and behaviors, and exacerbating adverse psychological reactions. Therefore, healthcare professionals should assess the association between depressive symptoms and life events experienced by pregnant women and develop personalized intervention measures to promote psychological well-being.

In the field of negative cognition, negative attention bias is a core component of cognitive models. This bias refers to the inability to appropriately allocate attention to emotional cues. While most individuals focus on positive stimuli, susceptible individuals often excessively attend to negative stimuli, lacking selective attention to positive or neutral stimuli [24]. During

TABLE 3

Binary logistic regression analysis of influencing factors for depression in women during late pregnancy (n = 829)

Variables	$\beta$	$S_{\beta}$	Wald $\chi^2$	p	OR	95% CI
Negative life events	1.058	0.242	19.179	<0.001	2.880	1.794–4.624
Planned or unplanned pregnancy	-0.732	0.190	14.781	<0.001	0.481	0.331–0.698
Prenatal exercise status	0.252	0.189	1.781	0.182	1.287	0.889–1.863
Mother-in-law relationship	-0.272	0.198	1.888	0.169	0.762	0.517–1.123
Presence or absence of complications	0.269	0.195	1.909	0.167	1.308	0.894–1.916
Negative attentional bias	0.039	0.031	1.606	0.205	1.040	0.979–1.106
Negative memory bias	0.136	0.028	24.326	0.001	1.146	1.086–1.210
Negative interpretation bias	0.034	0.029	1.362	0.243	1.035	0.977–1.095
Negative rumination bias	0.030	0.027	1.225	0.268	1.030	0.977–1.085
Constants	-3.637	0.546	44.292	0.000	2.880	

Note: After controlling for variables such as gender, age, adverse pregnancy history, and educational level among women in late pregnancy, the independent variables in the general demographic factors of pregnant women were referenced to 0. Specifically, 0 = experiencing adverse life events, 0 = unplanned pregnancy, 0 = no exercise during pregnancy, 0 = poor relationship with mother-in-law, and 0 = no pregnancy complications.

Without timely intervention, this could potentially lead to adverse effects on both mother and child.

#### Risk factors for depression in women during late pregnancy

Negative life events, including work-related stress, strained interpersonal relationships, loss of loved ones, and adverse pregnancy history, can trigger anxiety and depression in pregnant women. These stressors demand significant coping resources, and prolonged exposure can harm both physical and mental health [21]. This study found a positive correlation between experiencing negative life events during pregnancy and the occurrence of depression in late

late pregnancy, individuals frequently remember and recall negative experiences or aspects of events [24], leading to a negative cognitive processing bias in memory processing among pregnant women, who are considered a susceptible population. These findings suggest that cognitive therapy could be an effective intervention for pregnant women prone to repetitive thinking, rumination, and negative emotions, potentially preventing the exacerbation of depressive symptoms.

#### Protective factors against depression in late pregnancy

Unplanned pregnancy refers to an unexpected conception that occurs without prior planning or preparation by the



couple, often causing confusion, anxiety, or stress. This study found that planned pregnancy is negatively correlated with depression in late pregnancy, indicating a higher depression rate among women with unplanned pregnancies. Conducted in a county town in Northern Anhui Province, the study highlighted the influence of regional, cultural, and economic factors on thinking patterns. Modern families often plan for childbearing; hence, unplanned pregnancies, as unexpected events, may result in insufficient support and care from husbands or mothers-in-law, leading to feelings of being unwanted and undervalued. This emotional isolation can increase the likelihood of developing depressive symptoms. Xu et al. [22] identified unplanned pregnancy as an independent risk factor for depression in late pregnancy ( $OR = 1.38$ ). Families experiencing unplanned pregnancies often lack financial readiness and knowledge about pregnancy, disrupting family order and life plans. Zhu et al. [25] found unplanned pregnancy to be an independent risk factor for prenatal depression in Tianjin, while Yang et al.'s [26] survey in the Pearl River Delta region confirmed it as a major factor influencing depression among first-time pregnant women. These findings suggest the importance of medical staff providing comfort, guidance, and encouragement to pregnant women and their families to promote a positive attitude toward the baby's arrival. Offering relevant medical knowledge and advice can help families understand pregnancy risks and precautions, protecting the health of both mother and fetus. Encouraging informed decision-making and planning among pregnant women and their spouses ensures appropriate arrangements and preparations, including financial, career, and family planning aspects.

At the same time, medical staff should regularly assess the psychological status of pregnant women, and provide timely psychological support. Psychological monitoring of pregnant women during pregnancy can follow both population-wide strategies and high-risk population strategies. The whole population strategy is to evaluate the mental health level, especially depression, of all pregnant women at different regular prenatal checkups and gestational weeks during pregnancy. The high-risk population strategy is to provide early intervention and closer testing for pregnant women with low negative cognitive bias and a high risk of depression. High-risk factors include low cultural level, poor economic conditions, strained mother-in-law and daughter-in-law relationship, unplanned pregnancy, low education level, low social support, adverse pregnancy history, pregnancy complications, and negative memory bias in this study [15,17,25,27]. For pregnant women with high-risk factors, early intervention can be carried out by establishing psychological testing clinics and maternity schools.

#### *Positive correlation between negative cognition and depression in late pregnancy*

The study results indicate a significant positive correlation between maternal depression in late pregnancy and negative memory bias. Higher scores in negative memory bias correspond to higher rates of depression, consistent with previous research [28,29]. It has been reported that

individuals with depression exhibit excessive negativity in autobiographical memory, tending to recall more self-related sad events when recollecting personal experiences [30].

Analyzing the causes among the pregnant women in this group, those experiencing depression may exhibit cognitive narrowing, extremism, and obsessive thinking after encountering pathological, physiological, or psychological stress. Following stressful events, individuals might excessively emphasize potential negative consequences, leading to persistent anxiety and behavioral disorders. This aligns with findings from a study of 829 women in late pregnancy, which identified negative life events and pregnancy complications as independent risk factors for depression. Literature [31] indicated that cognitive factors play a crucial role in the development of depression as an affective disorder. External information and life events influence an individual's emotions only through subjective cognitive appraisal. Distorted cognition or systematically negative biases inevitably lead to an accumulation of negative emotions. Pregnant women may involuntarily engage in repetitive thinking about stressful events, often with obsessive-compulsive characteristics. This process can hinder adaptive coping strategies and impede adjustment. Subsequently, pregnant women may involuntarily recall or experience sudden intrusive thoughts of distressing situations or content that persist. Negative memory bias can adversely affect pregnant women's mental health, potentially leading to emotional disorders, anxiety, and depression. This underscores the importance of identifying and managing negative cognitive biases in mental health. Additionally, these findings suggest valuable recommendations for healthcare professionals. Psychological interventions such as cognitive behavioral therapy or mindfulness-based therapy could help pregnant women identify and modify negative cognitions, thereby improving their mental health.

Research has found that coping strategies such as sitting meditation and mindfulness yoga can improve pregnant women's mindfulness awareness, prevent or alleviate prenatal anxiety, and improve their mental health during pregnancy [32–34]. This also provides good advice for medical staff to use cognitive behavioral therapy and mindfulness therapy in psychotherapy to help pregnant women identify and change negative cognition.

#### **Limitations**

This study explored the relationship between pregnancy depression and negative cognitive bias from a psychological perspective, providing empirical evidence for theoretical research on psychological interventions during the perinatal period. However, this study also had certain limitations. It investigated the real psychological state of women during pregnancy in representative counties and districts in Northern Anhui, China. However, China is a multi-ethnic country with cultural differences between the North and South. A study conducted only in one hospital can only reflect the research results of a middle population, and there are limitations in the sample size. Subsequent studies would focus on expanding the sample size to meet sample diversity; This article was a survey based on a scale and can

only be used for screening depressive symptoms, not for diagnosing depression.

### Conclusion

In conclusion, a high prevalence of depression was detected among women in late pregnancy in the northern Anhui region of China, with a significant positive correlation to negative cognitive bias. Depressive symptoms in late pregnancy were closely associated with negative memory bias. When depression occurs in late pregnancy, pregnant women tend to exhibit negative cognitive bias, further exacerbating their depressive state. Specifically, this study found that negative memory bias in pregnant women intensified depressive symptoms. Consequently, healthcare professionals should regularly assess the psychological state of pregnant women and provide timely psychological support. Establishing a trusting relationship is crucial to help pregnant women navigate this unique period, ensuring the health of both mother and infant during the perinatal period.

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**Availability of Data and Materials:** The data that support the findings of this study are available on request from the corresponding author upon reasonable request.

**Ethics Approval:** The study has been approved by the Medical Ethics Committee of Yingshang County People's Hospital Clinical Research Subject Approval Medical Ethics Review document (IRB number 2024-10). Written consent was acquired from the participants.

**Conflicts of Interest:** The authors declare no conflicts of interest to report regarding the present study.

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