Research Square

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A latent profile analysis of prenatal depression and anxiety in Chinese women with twin pregnancies

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Abstract

Background

While previous studies have investigated the prevalence and associated factors of prenatal depression and anxiety among women with twin pregnancies, most of these studies have overlooked the substantial variation in symptoms presentation. This study aimed to use latent profile analysis to identify the subgroups and associated factors of prenatal depression and anxiety among women with twin pregnancies.

Method

A cross-sectional study was conducted from October 2024 to October 2025, and a total of 334 women with twin pregnancies were included using convenience sampling. Participants were surveyed using a self-design socio-demographic information, Edinburgh Postnatal Depression Scale, Generalized Anxiety Disorder-7, Perceived Social Support Scale, and Simplified Coping Style Questionnaire. Latent profile analysis was performed to identify prenatal depression and anxiety subgroups among women with twin pregnancies, univariate analysis and multiple logistic regression were used to analyze the related factors.

Result

LPA identified two profiles of prenatal depression and anxiety: “low-risk group” (65.0%) and “high-risk group” (35.0%). Multivariate logistic regression revealed that lack of medical insurance, pregnancy-related complications, low family support, negative coping styles, and absence of positive coping styles significantly influenced high-risk group (all $P < 0.05$).

Conclusion

Two subgroups of prenatal depression and anxiety were identified among women with twin pregnancies. In the future, it would be more meaningful for obstetric primary health institutions to establish stratified management system and standardized interventions based on different subgroups.

1 Introduction

Pregnancy represents a significant life event for women, and maternal mental health has been globally acknowledged as a critical priority in public health[1]. During pregnancy, women are particularly vulnerable to suffer from mental health problems due to significant physical, emotional, and psychological changes, with a prevalence of over 10% in developed countries and over 25% in developing countries[2], among which depression and anxiety are the most common mental health issues[3]. A global meta-analysis investigating the prevalence of mental health issues during pregnancy revealed that the rates of depressive and anxiety symptoms among pregnant women were 27% and 37% respectively[4]. In China, a study involving 1349 pregnant women demonstrated that the proportions of those experiencing prenatal depressive symptoms reached 19.2%, with anxiety symptoms showing a slightly higher prevalence at 23.7%[5]. Numerous studies have confirmed that prenatal depression and anxiety have been linked to increasing risk of maternal complications and poor birth outcomes, as well as an increased risk of cognitive and behavioral development in the offspring[6, 7]. Furthermore, depression and anxiety during pregnancy is also

associated with an increased incidence of postpartum psychological disorders, even lead to suicidal behaviors or infanticide in severe cases[8, 9].

In recent years, with the widespread application of assisted reproductive technology and the growing number of advanced maternal age pregnancies, the incidence of twin pregnancy has increased remarkably[10, 11]. Evidence has shown that the incidence of twin pregnancies has increased by 50% over the last fifty years[12, 13].Specifically, twin pregnancy occurs 1%~2.5% in some developed countries (e.g., America, Poland) [14, 15]and 0.6%~3% in some developing countries[16, 17] (e.g., Asia, Africa). In China, the latest national survey involving 5686 hospitals reported that twin pregnancy accounted for approximately 1.41% of all pregnancies[18]. As a high-risk obstetric condition, twin pregnancy is associated with both increased risk of maternal and neonatal complications[19, 20]. Additionally, compared to those with singleton pregnancies, women with twin pregnancies faced with physiological adaptations, doubled economic burdens and caregiving responsibilities, these all leading to a greater higher prevalence of prenatal depression and anxiety[21, 22]. Previous studies have shown that approximately 34.8% of women with twin pregnancies suffered from prenatal depressive symptoms and 37.1% experienced anxiety symptoms, significantly higher than women with singleton pregnancies[18]. Therefore, prenatal anxiety and depression among women with twin pregnancies have emerged as urgent public health concerns.

Previous research on prenatal depression and anxiety mainly focus on women of singleton pregnancies, women with twin pregnancies have rarely been investigated. Existing a few researches have investigated the level of prenatal depression and anxiety among women with twin pregnancies in different regions, and analyzed the relationship between prenatal depression and anxiety and other factors[23–25]. However, these studies defined the level of prenatal depression and anxiety of women with twin pregnancies only based on the total score of the scale or scale boundary values[23–25], ignored the significant substantial variation in symptoms presentation among heterogeneous groups of individuals. Previous studies have proven that even individuals present similar levels of anxiety or depression, there still exists differences among individuals regarding to symptom patterns and outcomes[26, 27]. This variable-centered classification not only causes the results of these studies couldn't truly reflect the symptoms of depression and anxiety among women pregnant with twins, but also makes it difficult to develop precise interventions with different risk characteristics and affects the effectiveness of interventions. As an "individual-centered" approach, latent profile analysis (LPA) is well-suited to focus on the group heterogeneity and categorize subgroups with shared characteristics according to the response patterns, and analyzed the characteristics of different groups[28, 29]. In recent years, LPA has been widely applied to classify subgroups of anxiety and depression in different populations[30–32]. However, to the best of our knowledge, there has no study has employed LPA to investigate prenatal depression and anxiety among women with twin pregnancies in China. To address this gap, this study aims to identify the latent profiles of prenatal depression and anxiety among women pregnant with twins, and explore their influencing factors, so as to provide a basis for developing targeted interventions to improve mental health in women pregnant with twins.

2 Methods

2.1 Study design

This was a cross-sectional descriptive design, which followed the Strengthening the Reporting of Observational Studies in Epidemiology (STROBE) guidelines (Supplementary 1).

2.2 Participants and procedures

Participants were recruited from a tertiary hospital in Henan Province through a convenience sampling method from October 2024 to October 2025. Women who received routine prenatal checkups at the obstetric clinic were invited to

participate in this study according to the inclusion criteria. The inclusion criteria was presented as follows: (1) age ≥ 18 years old; (2) be diagnosed with twin pregnancy by B-scan ultrasonography; (3) agreed to participant. The exclusion criteria was presented as follows: (1) women with severe medical complications; (2) women with cognitive impairment and severe mental disorders. Before the start of the survey, participants were informed the purpose of the survey and signed the informed consent. This study was conducted in accordance with the Declaration of Helsinki. A total of 340 questionnaires were initially collected, with 6 questionnaires excluded because of erroneous or logically inconsistent responses, 334 questionnaires were included in this study, the effective collection rate was 98.2%. This study was approved by the Ethics Committee of the Third Affiliated Hospital of Zhengzhou University (2024-Y106).

2.3 Measurements

2.3.1 Socio-demographic information

The socio-demographic information was collected through a self-design instrument developed for this study. The socio-demographic information included demographic data (e.g., age, education level, spouse's education level, marital status, family household income, employment status, spouse's employment status, medical insurance payment, history of mental health) and obstetrical information (e.g., gestation age, conception, parity, relationship with spouse, whether had obstetric complications, whether had adverse obstetric history).

2.3.2 Depressive symptom

The Edinburgh Postnatal Depression Scale (EPDS) is a 10-item self-report instrument designed to assess depressive symptoms among women with twin pregnancies[33]. Women were asked to answer how frequently they experienced certain feelings over the past week using a 4-point Likert scale (0–4), corresponding to the frequency categories of "never," "occasionally," "often," and "always." The total scores of EPDS ranged from 0 to 30, with higher scores indicating more severe depressive symptoms. A score of 9 or above suggests the presence of depressive mood, scores 9 ~ 12, 13 or above indicate mild depression and severe depression respectively[34]. EPDS demonstrates satisfactory sensitivity and specificity with Cronbach's α coefficients reported 0.81 ~ 0.87, has been widely used in screening for depression among pregnant women[35]. In this study, the Cronbach's α of EPDS was 0.821.

2.3.3. Anxiety symptom

Anxiety symptoms among women with twin pregnancies was measured using the Generalized Anxiety Disorder-7 (GAD-7), a 7-item self-report scale developed by Spitzer was used to assess the frequency of generalized over the past two weeks[36]. The GAD-7 includes seven questions answered on a 4-point Likert scale from 0 ("not at all") to 3 ("nearly every day"), yielding a total score ranging from 0 ~ 21. A total score of 5 or higher is generally considered the clinical threshold for anxiety, with scores of 5 ~ 9, 10 ~ 14, 15 or above indicating mild anxiety, moderate anxiety, and severe anxiety respectively. The GAD-7 has been widely used for anxiety screening during both pregnancy and the postpartum period due to its brevity, reliability, and validity. In this study, the Cronbach's α of EPDS was 0.919.

2.3.4. Social support

The Perceived Social Support Scale (PSSS), revised and localized by Zhang[37], was used to assess the multiple sources of social support perceived by women with twin pregnancies. The scale comprises three dimensions with a total of 12 items: family support, friend support, and other support. Responses are recorded on a 7-point Likert scale ranging from 1 ("strongly disagree") to 7 ("strongly agree"), with higher total score indicates a higher level of perceived social support. Previous studies have reported that the PSSS presents satisfactory internal consistency and test–retest reliability in prenatal women. In this study, the PSSS demonstrated good reliability with a Cronbach's α of 0.963.

2.3.5 Coping styles

The Simplified Coping Style Questionnaire (SCSQ) developed by Xie was used to measure the coping style of women with twin pregnancies[38]. SCSQ comprises two dimensions and 20 items: positive coping (12 items) and negative coping (8 items). Each item is rated from 0 ("never") to 3 ("almost always"). Total or average scores for each dimension can be calculated to reflect an individual's typical coping styles and its frequency when facing stress. The Cronbach's α of SCSQ was 0.905 in this study, suggesting the relatively high internal consistency.

2.4 Statistical analysis

SPSS 26.0 and Mplus 8.3 were used in this study for data analysis, and the results were statistically significant difference at two-sided $P < 0.05$.

SPSS 26.0 was used for descriptive analysis, and the data were tested for normality. Continuous variables with a normal distribution were expressed as mean ± standard deviation (M ± SD), while those with a no-normal distribution were presented as median (M) and quartile (Q). Categorical variables were described using frequencies (n) and percentages (%).

In this study, Latent profile analysis (LPA) was performed using Mplus 8.3 based on the scores of depression and anxiety, so as to identify potential categories of depressive and anxiety symptoms among women with twin pregnancies. The analysis commenced with a one-class model, followed by the sequential addition of more classes to identify the most fitting model. Model fit was evaluated using criteria such as Akaike Information Criterion (AIC), Bayesian Information Criterion (BIC), and sample-size adjusted Bayesian Information Criterion (aBIC), entropy, the bootstrap likelihood ratio test (BLRT), and the Lo-Mendell-Rubin adjusted likelihood ratio test (LMRT). With lower values of AIC, BIC, and aBIC indices a better-fitting model. The entropy value ranges from 0 to 1, with higher values representing greater accuracy of classification. A statistically significant p-value ($p < 0.05$) for the LMR and BLRT indicates that the k-class model fits significantly better than the (k − 1)-class model.

Chi-square test, Kruskal-Wallis test, t-test, and analysis of variance (ANOVA) were conducted to compare differences in socio-demographic variables, social support, coping styles and subgroups based on the categorical results of LPA. Variables with statistical significance identified in univariate analyses were selected as independent variables, and multivariate logistic regression was performed to explore the influencing factors of distinct subgroups of anxiety and depressive symptom among women with twin pregnancies.

3 Results

3.1 Sample characteristics

The participants were mostly married (97.9%), had a satisfied relationship with spouse (95.2%) and employed status of their spouses (86.8). Over two-thirds participants were below 35 years old (74.9%), had a medical insurance payment (72.8%), and conceived naturally (66.8%). More than half of participants were in the first and second trimesters of pregnancy (66.5%), reported monthly household income over 6000 yuan(62.9%), were primipara (61.1%) and employed (59.0%). Nearly half of participants had university or above degree (49.7%), while more than half of their spouses presented high school or below degree (56.3%). Only a few participants had history of adverse pregnancy (25.4%), pregnancy-related complications (16.5%), and history of mental illness (1.2%). The characteristics of women with twin pregnancies were presented in Table 1.

Table 1
Demographic information of women with twin pregnancies (n = 334)

Variable	N	%
Age		
<35	250	74.9
≥ 35	84	25.1
Gestation age (week)		
<28	222	66.5
≥ 28	112	33.5
Marital status		
Married	327	97.9
Unmarried/Divorced/Widowed	7	2.1
Ways of conception		
Natural conception	223	66.8
Assisted reproductive technology	111	33.2
Educational level		
High school or below	168	50.3
University	133	39.8
Postgraduate	33	9.9
Spouse's education level		
High school or below	188	56.3
University	126	37.7
Postgraduate	20	6.0
Employment status		
Employed status	197	59.0
Unemployed status	137	41.0
Spouse's employment status		
Employed status	290	86.8
Unemployed status	44	13.2
Monthly household income (Yuan)		
4000 ~ 6000	131	39.2
6001 ~ 8000	79	23.7
>8000	124	37.1

Variable	N	%
Age		
Medical insurance payment		
No	91	27.2
Yes	243	72.8
Parity		
Primipara	204	61.1
Multiparous	130	38.9
Relationship with spouse		
Unsatisfied	16	4.8
Satisfied	318	95.2
Pregnancy-related complications		
No	279	83.5
Yes	55	16.5
History of mental illness		
No	330	98.8
Yes	4	1.2
History of adverse pregnancy		
No	249	74.6
Yes	85	25.4

3.2 Prevalence of prenatal depression and anxiety

In this study, the average score of EPDS was 6.93 ± 4.21. In the sample, 33.23% women with twin pregnancies screened positive for depression, among which 26.34% women were mildly depressed, 6.89% women were moderately depressed. On the GAD-7 scale, women had an average score of 3.41 ± 3.59. The prevalence of prenatal anxiety was 34.13%, among which 33.53% women reported mild-to-moderate anxiety symptom, and 0.60% women reported severe anxiety symptom. Additionally, 24.85% women were identified as the co-morbid prenatal depressive and anxiety symptoms. (Seen in Table 2)

Table 2
Prevalence of prenatal depression and anxiety women with twin pregnancies (n = 334)

Variable		Frequency	Frequency
Depression symptom	Normal	223	66.77%
	Mild depression	88	26.34%
	Severe depression	23	6.89%
Anxiety symptom	Normal	220	65.87%
	Mild-to-moderate anxiety	112	33.53%
	Severe anxiety	2	0.60%

3.3 Results of latent profile analysis

Fit indices for the four candidate models are presented in Table 3, with the Akaike Information Criterion (AIC), Bayesian Information Criterion (BIC), and sample-size adjusted BIC (aBIC) showing a gradual downward trend across model specifications, while entropy reached the highest value in the 4-profile model. However, both the 3- and 4-profile model were excluded from further consideration because that certain profiles within these models had disproportionately small sample proportions, and coupled with non-significant p-values (> 0.05) for the LMR test. After integrating these statistical findings with considerations of practical relevance and interpretability, the 2-profile model was ultimately selected as the optimal fitted model. (Seen in Table 3)

Table 3
Latent profile model fitting indicators

Profile	AIC	BIC	aBIC	Entropy	LMR(P)	BLRT(P)	Probability (%)
1	11188.40	11247.98	11140.12	-	-	-	-
2	9470.78	9668.96	9504.01	0.935	0.0025	0.0000	0.65/0.35
3	8777.54	9044.32	8822.28	0.954	0.1867	0.0000	0.55/0.40/0.05
4	8075.56	8410.940	8131.80	0.967	0.7247	0.0000	0.49/0.28/0.19/0.04

Note: AIC=Akaike information criterion; BIC=Bayesian information criterion; aBIC=sample size adjusted BIC; LMR = Lo-Mendell-Rubin likelihood ratio test; BLRT: Bootstrapped likelihood ratio test.

3.4 Naming of latent profile

Based on the latent profile analysis results, the scores of the two identified profiles across the items of EPDS and GAD-7 were plotted in Fig. 1. Profile 1, accounting for 65.0% of the total sample, exhibited significantly lower scores than Profiles 2 on all items, and was labeled the “low-risk group” profile according to its score characteristics. Profile 2, which comprised 35.0% of the participants, yielded significantly higher scores than Profiles 1 across all items, and was thus designated the “high-risk group” profile.

3.5 Univariate analyses of depression and anxiety profiles

Univariate analysis results revealed that the two profiles of women with twin pregnancies exhibited statistically significant differences in terms of educational level, spouse’s educational level, monthly household income (Yuan),

medical insurance payment, pregnancy-related complications, history of mental illness, social support, positive coping, and negative coping. (Seen in Table 4)

Table 4
Univariate analyses of depression and anxiety profiles (n = 334)

Variable	Low-risk group n(%)/M(SD)/M(Q)	High-risk group n(%)/M(SD)/M(Q)	$\chi^2/t/Z$	*p*
Age			0.002	0.963
<35	163	87		
≥ 35	55	29		
Gestation age (week)			0.214	0.644
<28	143	79		
≥ 28	75	37		
Marital status			0.003	0.956
Married	214	113		
Unmarried/Divorced/Widowed	4	3		
Ways of conception				
Natural conception	142	81	0.751	0.386
Assisted reproductive technology	76	35		
Educational level			6.297	0.043
High school or below	99	69		
University	94	39		
Postgraduate	25	8		
Spouse's education level			11.178	0.004
High school or below	109	79		
University	92	34		
Postgraduate	17	3		
Employment status			1.066	0.302
Employed status	85	52		
Unemployed status	133	64		
Spouse's employment status			1.597	0.206
Employed status	25	19		
Unemployed status	193	97		
Monthly household income (Yuan)			7.534	0.023
4000 ~ 6000	76	55		
6001 ~ 8000	50	29		
>8000	92	32		

Variable	Low-risk group n(%)/M(SD)/M(Q)	High-risk group n(%)/M(SD)/M(Q)	$\chi^2/t/Z$	*p*
Medical insurance payment			5.882	0.015
No	50	41		
Yes	168	75		
Parity			0.824	0.364
Primipara	137	67		
Multiparous	81	49		
Relationship with spouse			3.433	0.064
Unsatisfied	7	9		
Satisfied	211	107		
Pregnancy-related complications			7.603	0.006
No	191	88		
Yes	27	28		
History of mental illness			7.608	0.006
No	218	112		
Yes	0	4		
History of adverse pregnancy			1.397	0.237
No	167	82		
Yes	51	34		
Family support	24(4)	20.5(8)	-6.470	<0.001
Friend support	24(5)	20(8)	-6.018	<0.001
Other support	23(4)	20(7)	-5.666	<0.001
Positive coping	27.49 ± 6.66	21.72 ± 6.75	7.501	<0.001
Negative coping	10.67 ± 4.59	11.53 ± 4.26	-1.671	<0.001

3.6 Multivariate logistic regression of depression and anxiety profiles

The result of multivariate logistic regression showed that medical insurance payment, pregnancy-related complications, family support, positive coping, and negative coping were identified as influencing factors for different profiles of prenatal depression and anxiety among women with twin pregnancies.(Seen in Table 5)

Table 5
Multivariate logistic regression of depression and anxiety profiles (n = 334)

Variables	Profile 1: Low risk group VS Profile 2: High risk group					
	B	*SE*	Waldχ^2	*P*	*OR*	*95%CI*
Medical insurance payment (Ref:no)	-0.651	0.287	5.143	0.023	0.522	0.297 ~ 0.915
Pregnancy-related complications (Ref:no)	0.886	0.341	6.734	0.009	2.425	1.242 ~ 4.734
Family support	-0.070	0.035	3.957	0.047	0.932	0.870 ~ 0.999
Positive coping	-0.134	0.026	25.793	<0.001	0.875	0.831 ~ 0.921
Negative coping	0.153	0.035	19.280	<0.001	1.165	1.088 ~ 1.248

Note: B=Unstandardized coefficient; SE=Standard Error; Waldχ^2 = Wald chi-square test; P = P-value; OR =Odds ratio; 95%CI = 95%Confidence Interval.

4 Discussion

This study employed LPA to explore the subgroups of prenatal depression and anxiety among 334 Chinese women with twin pregnancies, and identified the influencing factors of different profiles. Two profiles were rationally selected and named: low-risk group and high-risk group.

The 65.0% women with twin pregnancies were sorted into low-risk group, showed low scores across all items of the EPDS and GAD-7. This indicated that this group had an overall favorable mental state, with no obvious depressive or anxiety symptoms, only had relatively higher scores on some individual items. Among the mean scores of the EPDS and GAD-7, the highest score was EPDS1(I was happy and could see the funny side of things), EPDS3(When something went wrong, I unnecessarily blamed myself) and GAD-1(Felt nervous, anxiety or urgent), GAD-3(Worrying too much about various things).The former may stem from transient feelings caused by pregnancy hormone fluctuations and physical fatigue; the latter may be due to the reasonable concerns about the specificity of twin pregnancies (e.g., worries about fetal development and delivery difficulty)[39]. Although the scores of the low-risk group remained well below the clinical symptom threshold and were not accompanied by a concurrent rise in other item scores, this group shouldn't be ignored because these individuals may transition to high-risk level with the emergence of risks associated with twin pregnancies. As the profile with the most significant proportion, it is essential to provide continuous monitoring through routine prenatal psychological screenings, health education, and targeted interventions to prevent them transitioning to high-risk group, and such measures should focus on items with higher scores.

The high-risk group, accounting for 35.0% of the total sample, exhibited significantly higher scores across all items of the EPDS and GAD-7, 24.85% of women were comorbid with both depressive and anxiety symptoms, and 7.78% of women expressed suicidal ideation, which should be of the core population in urgent need of prioritized intervention. Among the mean scores of the two scales items, the score discrepancy in GAD-7 between the low-risk group and the high-risk group was more pronounced, and the high-risk group obtained the highest scores on EPDS1(I was happy and could see the funny side of things), EPDS4(I felt anxious or worried without any reasons) and GAD-1(Felt nervous, anxiety or urgent), GAD-4(It was hard to relax). These indicated that this group not only suffered from severe emotional distress, but also the most pronounced feelings of uncontrollable anxiety and persistent worry, and anhedonia. This not only was related to the physiological and obstetric specificity of twin pregnancies but also could be explained by characteristics of high-risk group (e.g., presence of pregnancy-related complications, lack of medical insurance), which made it difficult for them to effectively alleviate the multiple pressures of pregnancy, thereby exacerbating anxiety and

depressive symptoms[23, 39]. This study underscores the critical need for early screening and intervention of suicidal ideation in high-risk group, which aligns with the guidelines and findings that recommend screening for both mental disorders and suicidal risk when pregnant women first contacted with primary care providers[40–42]. Moreover, health care providers should hold regular lectures for women to share the knowledge and skills to identify and manage negative emotions, and provide targeted interventions such as cognitive behavioral therapy and mindfulness-based stress to correct irrational cognitions.

This study found that those women without medical insurance were more likely to be categorized into the high-risk group, which was consistent with previous research[43]. Compared with singleton pregnancies, women with twin pregnancies usually face with higher medical expenses from prenatal examinations, treatment, and neonatal care[44]. As a result, women without medical insurance maybe unable to sustain heavy self-paid medical expenses, increasing their worry and stress and subsequently leading to heavier psychological burden. Additionally, women without medical insurance have limited healthcare accessibility and continuity, which may lead to delayed or reduced necessary prenatal examinations[45]. This insufficient screening and management of complications further amplifies the uncertainty and fear regarding pregnancy outcomes. Therefore, medical insurance status should be routinely incorporated into perinatal psychological risks assessment to identify high-risk group. Moreover, this result also highlights the important supporting role of social security policies in perinatal mental health, and also suggests that it is necessary to improve the medical insurance preferential policies targeting women with twin pregnancies, so as to alleviate their economic concerns and indirectly reduce the risk of mental illnesses.

In this study, we found that women with twin pregnancies who had pregnancy-related complications were more likely to be classified into the high-risk group. This finding was consistent with previous studies[23], which identified pregnancy-related complications as a core risk factor for prenatal anxiety and depression among women with twin pregnancies. The potential explanation is that as high-risk pregnancy, twin pregnancies have a significantly higher incidence of complications than singleton pregnancies[46, 47]. The presence of complications is regarded as a stressful life event and psychological burden, because women not only would suffer from persistent concerns about maternal health and fetal development but also impose additional mental burdens due to necessary therapeutic interventions, which is favourable to trigger or exacerbate depressive or anxiety symptoms. This finding indicates that obstetric healthcare professionals should strengthen the prediction, screening, and management of pregnancy-related complications in twin pregnancies, which is a key factor in reducing the risk of prenatal depression and anxiety among women with twin pregnancies.

Family support, as a core dimension of perceived social support, had been confirmed as a critical protective factor against prenatal depression and anxiety among women with twin pregnancies in other studies[48, 49]. Previous studies have confirmed that adequate family support could provide women with emotional comport and social resources, enhance women's psychological resilience and personal coping capacity, help them cope with stressful events more easily and more successfully adjust to motherhood, thereby reducing the risk of developing perinatal mental health problems[50, 51]. Twin pregnancy is associated with significant physiological, economic, and caregiving burdens, family support plays a more important role in this special group. Notably, the low-risk group also exhibited relatively higher scores on specific depression and anxiety items, indicating that even women with favorable mental states, family support is also needed to maintain psychological resilience. This finding underscores the need for healthcare providers to identify women with inadequate family support as high risk of mental health problems, and conduct targeted follow-up. Moreover, family members especially spouses should be encouraged to attend prenatal health education programs to enhance the coping resources and resilience of the family system.

The negative coping styles and the absence of positive coping styles significantly increased the likelihood of being classified into the high-risk group, which was consistent with previous research findings among women with

singleton[52, 53]. Coping style is defined as the totality of cognitive, emotional, and behavioral responses displayed by an individual when confronting stressful events, including positive coping and negative coping[54]. According to the stress and coping theoretical model[54], individuals were prone to experiencing negative emotions when confronted with unmanageable stressors. Twin pregnancy is widely recognized as a highly stressful event, although women adopt negative coping strategies could relive distress temporarily, it fails to mitigate the persistent stressors due to the complexity of twin pregnancies, ultimately leading to cumulative emotional exhaustion and exacerbating depressive and anxious symptoms. In contrast, women who adopt positive coping styles could enable them to assess stressors more rationally, and mobilize internal resources and external support to resolve difficulties, thereby buffering the impact of pregnancy-related stress on mental well-being[55]. Therefore, healthcare providers should encourage women with twin pregnancies to adopt positive coping strategies to cope with negative emotions, and further explore the interaction mechanisms between coping styles and other influencing factors to provide basis for developing precise interventions.

5 Strengths sand Limitations

A key strength of the current study is its adoption of LPA, an individual-centered approach, to explore the subgroups of prenatal depression and anxiety among women with twin pregnancies, which overcomes the limitations of traditional variable-centered research and enhances the specificity and targeting of subsequent interventions for this high-risk obstetric population.

This study also has several limitations that need to be acknowledged. Firstly, the cross-sectional design prevents the exploration of causal relationships between the identified influencing factors and the latent profiles of prenatal depression and anxiety, as well as the dynamic changes in emotional symptoms throughout the perinatal period. Future studies could adopt intensive longitudinal designs to track the trajectory of latent profiles and clarify the causal mechanisms underlying these relationships. Secondly, the participants were recruited solely from a tertiary hospital in Henan Province using a convenience sampling method, which may limit the generalizability of the findings. Future multi-center research with diverse socioeconomic backgrounds and healthcare settings would improve the external validity of the results. Finally, due to study restrictions, some influential psycho-social factors (e.g., personality traits, resilience, self-efficacy) were not included. These variables may play important roles in shaping the latent profiles of prenatal depression and anxiety, and should be taken into account in future studies.

6 Conclusion

Our study classified prenatal depression and anxiety in women with twin pregnancies into two distinct subgroups (low-risk and high-risk group), and identified key factors affecting different profiles, which provides a solid empirical basis for implementing personalized mental health management strategies based on these latent profiles. More importantly, we need to pay greater attention to the mental health needs of women with twin pregnancies, and develop more comprehensive clinical guidelines and social support policies to safeguard maternal and infant health.

Abbreviations

EPDS: Edinburgh Postnatal Depression Scale
GAD-7:Generalized Anxiety Disorder-7

LPA : Latent profile analysis

PSSS: Perceived Social Support Scale

SCSQ: Simplified Coping Style Questionnaire

M±SD: Mean±Standard deviation

Q: Quartile

AIC: Akaike Information Criterion

BIC: Bayesian Information Criterion

aBIC: adjusted Bayesian Information Criterion

BLRT: Bootstrap Likelihood Ratio Test

LMRT: Lo-Mendell-Rubin adjusted likelihood ratio test

ANOVA: Analysis of variance

Declarations

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Author contributions

All authors contributed to this manuscript. Sasa Huang conceived, planned, and designed the study. Hongxia Cui, Mingchen Fu, Liu Yang, Shuanghui Zhu, Hui Guo, and Min Guo collected the data. Ge Du and Peili Zhang checked the quality of the data. Sasa Huang and Dongqi Yang analyzed the data. Sasa Huang wrote the first draft manuscript. Dongsun Chen and Bing Lun revised the manuscript. All authors approved the submitted manuscript.

Ethics approval and consent to participate

The study has been reviewed and approved by the Ethics Committee of the Third Affiliated Hospital of Zhengzhou University (2024-Y106). Informed consent was obtained by all participants.

Data availability

The datasets are available from the corresponding author upon reasonable request.

Declaration of Competing Interests

The authors declare no competing interests.

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Figures

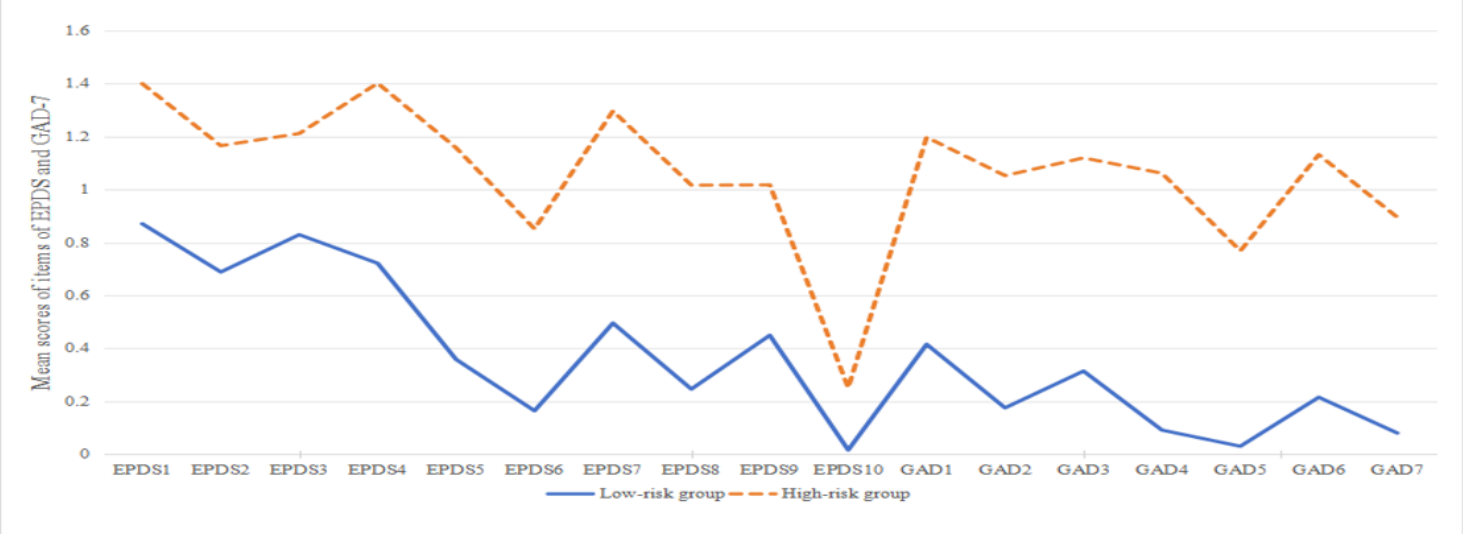


Figure 1

Average scores of the two groups on depression and anxiety items.