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Psychometric testing of Chinese version of screening tools (PASS) and GAD among perinatal population: hospital based evidence 2023

Xiaoying Zhong¹ , Mei He², Xiujing Guo^{1*}, Xixi Li^{2*}, Bangjun Wang², Changqing Pan², Rong Hu² and Hongjing Wu³

Abstract

Background Anxiety disorders are increasing worldwide, untreated anxiety is linked to maternal and child health outcomes. The purpose of this study is to test psychometric properties of the Perinatal Anxiety Screening Scale (PASS) among Chinese women.

Methods The PASS was translated into Chinese following Beaton's intercultural debugging guide. A total of 494 women in the antenatal and postnatal phase participated (268 antenatal and 186 postnatal) were recruited between March 2023 and July 2023 from two hospitals in Sichuan Province, China. The instruments included the demographic characteristics form, PASS, Edinburgh Postnatal Depression Scale (EPDS), and Generalized Anxiety Disorder-7 (GAD-7). The confirmatory factor analysis (CFA), internal consistency reliability and convergent validity were assessed.

Results The mean age of the participant was 31.67 years (SD = 3.78; range from 23 to 49). The CFA showed that four-factor model of the *Chinese*-PASS had an excellent fit to the data ($\chi^2 = 1481.2477$; $df = 425$; $\chi^2/df = 3.485$; RMSEA = 0.071; CFI = 0.871; NNFI = 0.828; TLI = 0.859; and IFI = 0.871). The Cronbach's alpha coefficient of total scale was 0.950, and the split-half reliability of total scale was 0.907. The PASS significantly correlated with EPDS ($r = 0.732$) and GAD-7 ($r = 0.763$). The area under the ROC curve for PASS scores was 0.91 (SE = 0.01; 95% CI = 0.89–0.94). At cut-off score of ≥ 19.5 , the sensitivity was 0.87. The area under the ROC curve for GAD-7 scores was 0.89 (SE = 0.02; 95% CI = 0.86–0.92). At cut-off score of ≥ 3.5 , the sensitivity was 0.82.

Conclusions The result of this study show that the *Chinese*-PASS had a reasonably adequate validity and reliability and can be used to screen for anxiety disorder among women during the perinatal period.

Keywords Anxiety, PASS, Perinatal, Antenatal, Postnatal, China

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Introduction

Life altering moments like pregnancy, birth, and early parenthood can be stressful for women and their partners [1]. As a result, women may undergo a period of poor mental health or witness a worsening of previous mental health conditions [2, 3]. Almost 1 in 5 women will experience a mental health condition during pregnancy or in the year after the birth [4]. The importance of screening, diagnosis and management of perinatal mental health conditions into mental and child health services (e.g. a feasible package of interventions that meet women's needs) had been highlighted in the Nurturing Care Framework and the World Health Organization (WHO) guideline on improving Early Childhood Development [5]. So maternal mental health has become a global priority [6].

During pregnancy and after childbirth, individuals may experience heightened levels of anxiety due to various factors, including hormonal changes, physical and emotional stress, sleep deprivation, and the challenges of adjusting to parenthood [7]. Perinatal anxiety often refers to concerns about miscarriage, fetal health, childbirth, postpartum care, and financial issues, manifested in different ways, such as generalized anxiety, panic attacks, obsessive-compulsive symptoms, social anxiety, or specific phobias related to pregnancy or parenting [8]. Anxiety disorders are increasing worldwide, the prevalence of anxiety disorders in the perinatal period ranges from 11–25% [7, 9]. In a systematic review and meta-analysis study showed that pooled prevalence of perinatal anxiety was 17.4%, with prenatal anxiety 17.4% and 17.5% postpartum anxiety in mainland China [2]. Increased evidence indicates that untreated anxiety is linked to maternal and child health outcomes, including abnormal fetal development, prolonged labour, caesarean deliveries, preterm birth [10, 11]. Hence, it is significant for perinatal women to use the valid and reliable tool to identify the anxiety level and influencing factors [12, 13], which are crucial steps for improving maternal and child health outcomes [14].

In recent years, several tools have been used to measure anxiety among antenatal and postnatal women, including the Postpartum Specific Anxiety Scale (PSAS) [15], the Postpartum Worry Scale (PWS), the Perinatal Anxiety Screening Scale (PASS) [8], the Hospital Anxiety and Depression Scale (HADS) [16], the Generalized Anxiety Disorder-7 (GAD-7) [17], the Self-rating Anxiety Scale (SAS) [18], the State-Trait Anxiety Inventory (STAI) [19] and the Depression Anxiety Stress Scale (DASS)-21 [10]. Among these measures, PSAS, PWS, PASS are specific assessment tool for perinatal women, HADS, GAD-7, DASS-21, SAS, and STAI are universal evaluation measures. PSAS and PWS only designed to test anxiety among postnatal women. The PASS is a

self-administered scale to screen for anxiety in antenatal and postnatal women that was developed from an extensive psychometric assessment [14], which resulted in production of a 31-item scale comprised of four-factor structure: (1) Excessive Worry and Specific Fears, (2) Perfectionism, Control and Trauma, (3) Social Anxiety, (4) Acute Anxiety and Adjustment [20]. The PASS has been translated and validated in several other languages and cultural contexts (Including Turkey [21], Arabic [22], Sri Lankan [23], Italy [24], Iran [9] and Russia [25]) that confirm its psychometric properties.

The American Congress of Obstetricians (ACOG) widely recommend routine screening for anxiety at least once during the perinatal period with a standardized validated instrument [26, 27]. However, at present, lack of the specific instrument to assess anxiety among antenatal and postnatal women in China. A validation study of PASS was conducted in Beijing, China, however, a cut-off score and confirmatory factor analysis of the PASS were not reported [28]. Therefore, for these reasons, we chose to use the PASS, and this study is aimed to report on the translation and psychometric testing of the *Chinese-PASS* with Chinese perinatal women.

Methods

Study design and participants

This is a descriptive, cross-sectional study. This investigation was divided into two phases (Fig. 1). In phase 1, the PASS was translated to Chinese using the Beaton intercultural debugging guideline [29]. In phase 2, the reliability and validity of the Chinese version of the PASS were assessed through a cross-sectional survey.

Phase I: translation process

The Beaton intercultural debugging guideline was divided into six steps: forward translation, synthesize, back-translation, expert evaluation, pre-testing, and submission of a written report to the original author [29].

Step 1: forward translation

The PASS was independently translated into Chinese by two bilingual experts (a midwife and a doctor), both of whom were proficient in both English and native Chinese.

Step 2: synthesize

A panel of three nursing professors, two nursing postgraduates three psychiatrists, and two obstetricians reviewed the forward-translated versions to determine the most accurate translation. Following the resolution of ambiguities and disagreements, a preliminary initial translation version titled "Version 1.0 forward translation *Chinese-PASS*" was created.

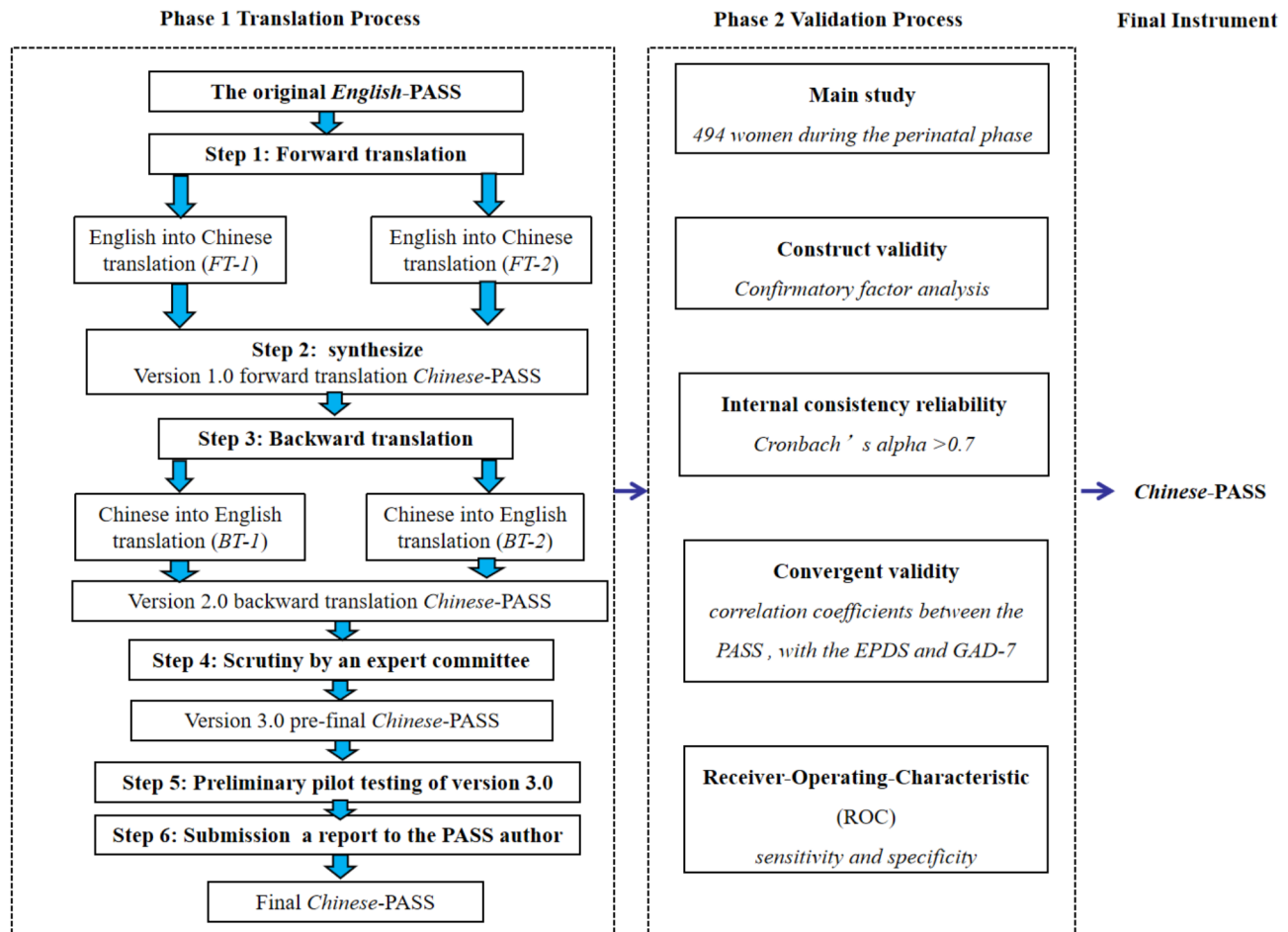


Fig. 1 Translation and validation process of the PASS. Note: FT-1=Forward translation version-1; FT-2=Forward translation version-2; BT-1=Backward translation version-1; BT-2=Backward translation version-2; ROC curve=Receiver-operating-characteristic curve; PASS=Perinatal Anxiety Screening Scale; EPDS=Edinburgh Postnatal Depression Scale; GAD-7=Generalized Anxiety Disorder-7

Step 3: backward translation

This team consisted of one English teacher and one doctor of nursing, neither of whom had been exposed to the original PASS. The two researchers translated Version 1.0 into English and named it “Version 2.0 backward translation *Chinese-PASS*,” which was then compared to the original PASS.

Step 4: scrutiny by an expert committee

Ten experts were invited to evaluate the cultural adaptation of the Version 2.0 *Chinese-PASS*, which served as the foundation for the Version 3.0 pre-final *Chinese-PASS*.

Step 5: preliminary pilot testing

Convenience sampling was used to select ($n = 30$) women to participate in a preliminary survey that resulted in the final *Chinese-PASS*. These pilot participants were asked if they had an unclear understanding of the content, and none declared that they did.

Step 6

Submission of a written report to the original author. The final *Chinese-PASS* was sent to the original authors, ensuring that the scale was equivalent in two different cultures.

Phase II: validation process

In the current study, the demographic characteristics and health-related factors were as independent variables, and the level of the perinatal anxiety was as dependent variables.

Instruments

Demographic characteristics form

Basic demographics included age, education level, marital status, number of pregnancies, pregnancy mode, history of caesarean section.

The perinatal anxiety screening scale (PASS)

The PASS comprises 31 items and is divided into four subscales [8]: Excessive Worry and Specific Fears (1–10), Perfectionism, Control and Trauma (11–18), Social Anxiety (19–23), Acute Anxiety and Adjustment (24–31). Each item is scored on a four-point Likert scale, Not at all (with a score of '0'), Some times (with a score of '1'), Often (with a score of '2'), Almost Always (with a score of '3'). The total score (range 0–93) is calculated by adding the score of each item, a cut-off score of 26 is recommended to differentiate between high and low risk for presenting with an anxiety disorder [14], recommended severity ranges: asymptomatic (0–20), mild-moderate symptoms (21–41), and severe symptoms (42–93).

The edinburgh postnatal depression scale (EPDS)

The EPDS is a self-report questionnaire evaluating the symptoms of perinatal depression, it consists of 10 items, with each item rated from 0 to 3 and has three items that are reverse-coded [30]. Total scores range from 0 to 30, whereby high scores indicate a greater severity in depressive symptoms [31]. In the Chinese validation study, the EPDS was reported to have acceptable internal consistency ($\alpha=0.78$), with cut-off points that aid in the identification of postnatal depression among women [32]. In the current study, the Cronbach's alpha of the EPDS was 0.834, suggesting the internal consistency of the EPDS was adequate.

The generalized anxiety disorder-7 (GAD-7)

The GAD-7 is a seven-item self-report scale for measuring anxiety disorder. Item scores range from 0 (none) to 3 (almost every day) for each item, with total scores ranging from 0 to 21 [33]. Total scores can be categorized as, normal (0–4), mild (5–9), moderate (10–14), or severe (15–21) [34]. In the Chinese validation study, the GAD-7 was found to have a very good internal reliability ($\alpha=0.869$) [35]. In this study, the Cronbach's alpha of the GAD-7 was 0.895, suggesting the internal consistency of the GAD-7 was accepted.

Sample size

The sample size was calculated according to the criteria required for factorial analysis, with ten to twenty subjects per item [36]. Given the PASS includes 31 items, a sample size of 310 to 620 participants was considered adequate. Inclusion criteria included: (a) being aged 18–50 years, (b) being Han nationality, (c) pregnant women at 28–40 gestational weeks and within women at 9 weeks postpartum, and (d) could read and write in Chinese. Exclusion criteria included: (a) being less than 18 or more than 50 years of age, (b) poor obstetric outcome (e.g., stillbirth, abortion etc.), (c) induction of labour, and (d) provided insufficient data.

Participants were recruited from two tertiary hospitals in Sichuan province in China. Perinatal women were in the obstetric clinic and obstetric ward between March 2023 and July 2023. A total of 540 women (antenatal women=300, postnatal women=240) agreed to participate in the study, but 46 participants (antenatal women=32, postnatal women=14) were excluded because their data was insufficient or unreliable. A sample of 494 women were therefore included in the data analysis.

Data analysis

All data analysis were carried out using IBM SPSS Statistics for Windows, Version 21.0 and IBM AMOS Statistics for Windows, Version 24.0. All statistical tests were two-tailed and a p -value of less than 0.05 was considered statistically significant. The variables were summarized using frequency and percentages were for the categorical variables, and mean and standard deviations (SD) for the continuous variables.

The confirmatory factor analysis (CFA) was computed to examine the construct validity, and the maximum-likelihood estimation was used to evaluate the CFA model [37]. When the Kaiser-Meyer-Olkin (KMO) test value is greater than 0.6 and the Bartlett spherical test statistic is significant ($P<0.001$), it indicates the data is suitable for factor analysis [38]. The evaluation indexes of confirmatory factor analysis should include: the relative chi-square (χ^2/df), root mean square error of approximation (RMSEA), comparative fit index (CFI), non-normed fit index (NNFI), Tucker-Lewis index (TLI), and incremental fit index (IFI). A χ^2/df ratio less than 5 is deemed to be indicative of a good fit. For other goodness of fit indices, the values indicative of good fit are $RMSEA<0.10$, and CFI, NNFI, TLI, and IFI >0.80 [39].

The internal consistency reliability of the PASS was assessed using Cronbach's alpha coefficients for the entire scale and each subscale, and threshold values above 0.70 were considered as acceptable [40].

The convergent validity was assessed using correlation coefficients between the PASS total score and its subscales, with the EPDS and GAD-7. In general, we considered the values of correlation coefficients 0.00–0.19 and 0.20–0.39 as very weak and weak, and the values 0.40–0.59 and 0.60–0.79 as moderate and strong, respectively, and above 0.80 as very strong correlation [41].

To assess the diagnostic accuracy of the PASS and to determine the best cutoff score [42], using the psychiatrist's diagnosis as the gold stand (The Diagnostic and Statistical Manual of Mental Disorders, Fifth Edition, DSM-5) [43], the receiver-operating-characteristic (ROC) curve was graphed for the PASS total score. Performance of the PASS at this optimal cut-off score against

the psychiatrist's diagnosis was elevated by sensitivity, specificity and predictive values [9].

Ethical approval

All methods were performed in accordance with the relevant guidelines and regulations or in accordance with the Declaration of Helsinki. The Ethics Committee approval of the Mianyang Central Hospital, School of Medicine, University of Electronic Science and Technology of China before conducting the study (ID: S20220217-01). Participants received oral information about the study, and verbal informed consent was obtained from all

peripartum women before the state of the study, and all participants completed informed written consent after being informed of the aim of research.

Results

Translation results of the PASS

This study translated the *English*-PASS into Chinese following the guideline, which included the Chinese version of the PASS and administration, scoring and interpretation guidelines of this tool. After expert consultation, item 28 "Racing thoughts making it hard to concentrate" was adapted as "Racing thoughts (quick thinking mode) making it hard to concentrate" and item 29 "Fear of losing control" was adapted as "Fear of losing control (emotions, language and behavior)". The result of the preliminary pilot testing showed that *Chinese*-PASS was easy to understand and concise assessment tool.

Demographic characteristics of participants

The analytic sample is 494 women who completed the 31-item PASS questions. The mean age of the women was 31.67 years ($SD = 3.78$; range from 23 to 49). A summary of the demographic data is shown in Table 1.

Confirmatory factor analysis

The KMO value was 0.949, and the Bartlett spherical test statistic was 8439.201 ($P < 0.001$), revealing the data was suitable for factor analysis. The structure of the thematically derived four-factor model was observed to be an excellent fit to the data, $\chi^2 = 1481.2477$; $df = 425$; $\chi^2/df = 3.485$; $RMSEA = 0.071$; $CFI = 0.871$; $NNFI = 0.828$; $TLI = 0.859$; and $IFI = 0.871$ (see Figs. 2).

Reliability

The Cronbach's alpha coefficient of the full set of PASS was 0.950, with that of the subscale ranging from 0.858 to 0.882. The Spearman-Brown coefficient of the full PASS was 0.907, with that of the subscales ranging from 0.777 to 0.843 (Table 2).

Convergent validity

The PASS total and subscale scores were moderate to strong and positively correlated with the EPDS and GAD-7 (see Table 3).

ROC curve analysis

The psychiatrist diagnosed 22.70% of women ($n = 112$) as having anxiety disorder following DSM-V. The area under the ROC curve (AUC-ROC) for PASS scores was 0.91 ($SE = 0.01$; 95% $CI = 0.89-0.94$) (See Fig. 3). At cut-off score of ≥ 19.5 , the sensitivity was 0.87. The AUC-ROC for GAD-7 scores was 0.89 ($SE = 0.02$; 95% $CI = 0.86-0.92$). At cut-off score of ≥ 3.5 , the sensitivity was 0.82.

Table 1 Demographic characteristics of participants ($n = 494$)

Variables	<i>n</i> (%) or Mean(<i>SD</i>)
Age(Year)	31.67 \pm 3.78
Pregnancy stage	
Antenatal	268 (54.3)
Postnatal	226 (45.7)
Education level	
Junior high school and below	34 (6.9)
Senior high school	344 (69.6)
University and above	116 (23.5)
Marital status	
Marriage	488 (98.8)
Unmarried/Divorced	6 (1.2)
Number of pregnancies	
1	288 (58.3)
2	122 (24.7)
≥ 3	84 (17.0)
Pregnancy mode	
Wanted pregnancy	371 (75.1)
Unwanted pregnancy	52 (10.5)
IVF	71 (14.4)
History of caesarean section	
No	428 (86.6)
Yes	66 (13.4)
Anxiety (DSM-5)	
None	382 (77.3)
Yes	112 (22.7)
Level of Anxiety (PASS)	
Asymptomatic	371 (75.1)
Mild-moderate symptoms	105 (21.3)
Severe symptoms	18 (3.6)
Level of Anxiety (GAD-7)	
Normal	387 (78.3)
Mild	88 (17.9)
Moderate	17 (3.4)
Severe	2 (0.4)
Level of depression (the scores of EPDS ≥ 10)	
Negative	446 (90.3)
Positive	48 (9.7)

Note: PASS, Perinatal Anxiety Screening Scale; IVF, In Vitro Fertilization; DSM-5, Diagnostic and Statistical Manual of Mental Disorders, Fifth Edition; EPDS, Edinburgh Postnatal Depression Scale; GAD-7, Generalized Anxiety Disorder-7

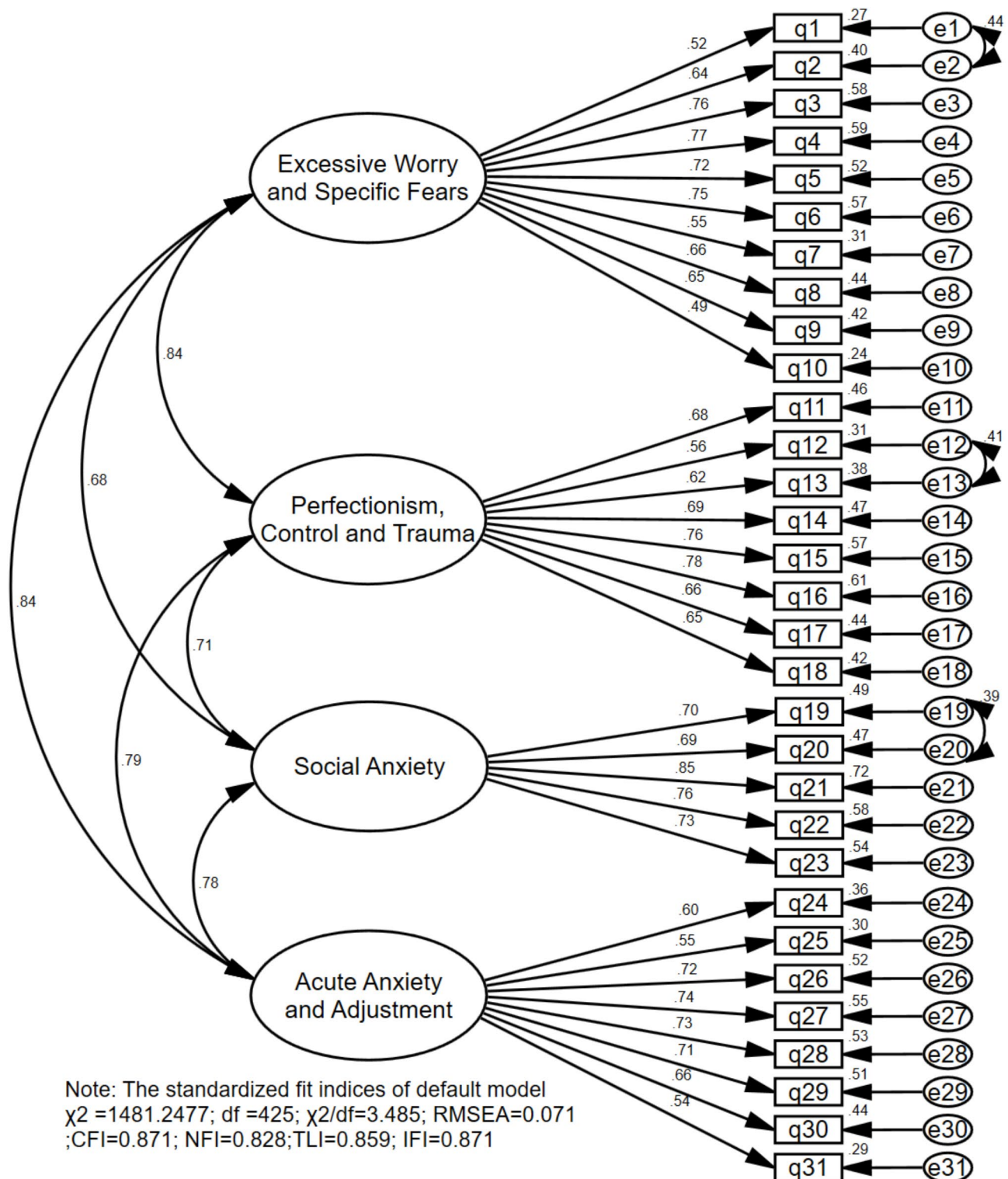


Fig. 2 Confirmatory factor analysis of the three factor model

Discussion

This study sought to translate the English version of the PASS into a Chinese version following standardized procedures, and to evaluate the reliability and validity

among Chinese women. In line with the *Russian-PASS*, *Persian-PASS*, *Italian-PASS*, *Arabic-PASS*, *Turkish-PASS* and *English-PASS* validation studies [8, 9, 21–25, 44], the *Chinese-PASS* showed a psycho-metrically robust tool

Table 2 Cronbach's alpha coefficient and Spearman-Brown coefficient of PASS ($n=494$)

Variables	Number of Items	Score (Mean \pm SD)	Cronbach's Alpha coefficient	Spearman-Brown coefficient
Excessive Worry and Specific Fears	10	6.14 \pm 4.68	0.882	0.777
Perfectionism, Control and Trauma	8	3.77 \pm 3.80	0.874	0.793
Social Anxiety	5	1.34 \pm 2.02	0.870	0.809
Acute Anxiety and Adjustment	8	2.98 \pm 3.14	0.858	0.843
Total of PASS	31	14.23 \pm 11.88	0.950	0.907

Note: PASS, Perinatal Anxiety Screening Scale; SD, Standard Deviation

to assess anxiety disorder during prenatal and postnatal periods.

Regarding factor structure, we obtained the four-factor model of the PASS using CFA, the *Chinese*-PASS was comprised of factor 1 (excessive worry and specific fears), factor 2 (perfectionism, control and trauma), factor 3 (social anxiety), and factor 4 (acute anxiety and adjustment). Consistently with researches conducted in Australia [8], Saudi Arabia [22] and Iran [9], our findings indicated the *Chinese*-PASS had a good fit to data, providing further support for the multidimensional structure of the PASS, as consisting of four factors. However, four-factor model of the *Chinese*-PASS slightly varied from *Russian*-PASS (six-factor structure) [25], this may be explained by differences culture aspect. In term of exploratory factor analysis, Cuixue Wang et al. study revealed the presence of four components with eigenvalues greater than 1, explaining a total variance of 59.403% [28], as such, the *Chinese*-PASS had excellent construct validity.

In terms of reliability, the threshold values of the Cronbach's α coefficient and Spearman-Brown coefficient above 0.70 were considered as acceptable. The Cronbach's α coefficient of the *Chinese*-PASS showed excellent reliability ($\alpha=0.950$), similarly to the *Russian*-PASS ($\alpha=0.930$) [25], *Persian*-PASS ($\alpha=0.950$; $\alpha=0.941$) [9, 44], *Sinhalese*-PASS ($\alpha=0.950$) [23], *Arabic*-PASS ($\alpha=0.940$) [22], *Turkish*-PASS ($\alpha=0.960$) [21], original

PASS ($\alpha=0.950$) [8] and validation research of the PASS was conducted in Beijing ($\alpha=0.954$) [28]. Together these findings demonstrated that the construct of PASS has high internal consistency.

Regarding convergent validity, the *Chinese*-PASS had a moderate to strong positive and significant relationship with previously validated the *Chinese*-EPDS and *Chinese*-GAD-7, aligning with others studies were conducted in Iran [9], Italy [24], Arabia [22] and Beijing, China [28].

The psychiatrist diagnosed 22.7% of perinatal women as having anxiety disorder using DSM-V criteria, was higher than the prevalence of 18.2% in China [45], slightly lower than with the screening of PASS (24.9%) and higher GAD (21.7%). This may be related to the coronavirus disease and frequent earthquakes in Sichuan [46, 47]. The cut-off score point of ≥ 19.5 for the *Chinese*-PASS was lower than the score of 26 for the English PASS, It indicates that Chinese women's risk for anxiety disorders occurs at a lower symptoms threshold compared with their Australian counterpart [8, 14].

The AUC-ROC ranges between 0 and 1, where a higher value indicates better discrimination power of the model [48]. In general, an AUC-ROC above 0.8 is considered good, while an AUC-ROC above 0.9 is considered excellent [48]. In the current study, the AUC-ROC of the *Chinese*-PASS was above 0.9, indicating the *Chinese*-PASS with a great discrimination. The *Chinese*-PASS with high specificity and sensitivity, suggests that the tool has a low false positive rate, which was consistent with previous validation studies [8, 14, 20, 21, 23, 24]. The result of this study suggested that the *Chinese*-PASS was suitable instrument both routine screening and clinical application among perinatal women with anxiety.

Strengths and limitations

This study is the first to explore the cut-off point of the PASS in Chinese women, and the finding have significant implications for clinical practise and research. The result of the current research indicated that the *Chinese*-PASS was valid and reliable tool in detecting anxiety in the perinatal period. Whilst this study has taken a strong scientific approach and used robust methods to translate and investigate the performance of the *Chinese*-PASS in

Table 3 The correlations coefficients between PASS, EPDS and GAD-7 ($n=494$)

Variables	Mean	SD	1	2	3	4	5	6	7
1. EPDS	5.68	3.78	1						
2. GAD-7	2.65	3.05	0.722**	1					
3. Excessive Worry and Specific Fears	6.14	4.68	0.682**	0.729**	1				
4. Perfectionism, Control and Trauma	3.77	3.8	0.582**	0.649**	0.721**	1			
5. Social Anxiety	1.34	2.02	0.550**	0.495**	0.576**	0.596**	1		
6. Acute Anxiety and Adjustment	2.98	3.14	0.695**	0.695**	0.715**	0.651**	0.665**	1	
7. Total of PASS	14.23	11.88	0.732**	0.763**	0.912**	0.878**	0.764**	0.868**	1

Note: PASS, Perinatal Anxiety Screening Scale; EPDS, Edinburgh Postnatal Depression Scale; GAD-7, Generalized Anxiety Disorder-7; SD, Standard Deviation; ** $P < 0.01$

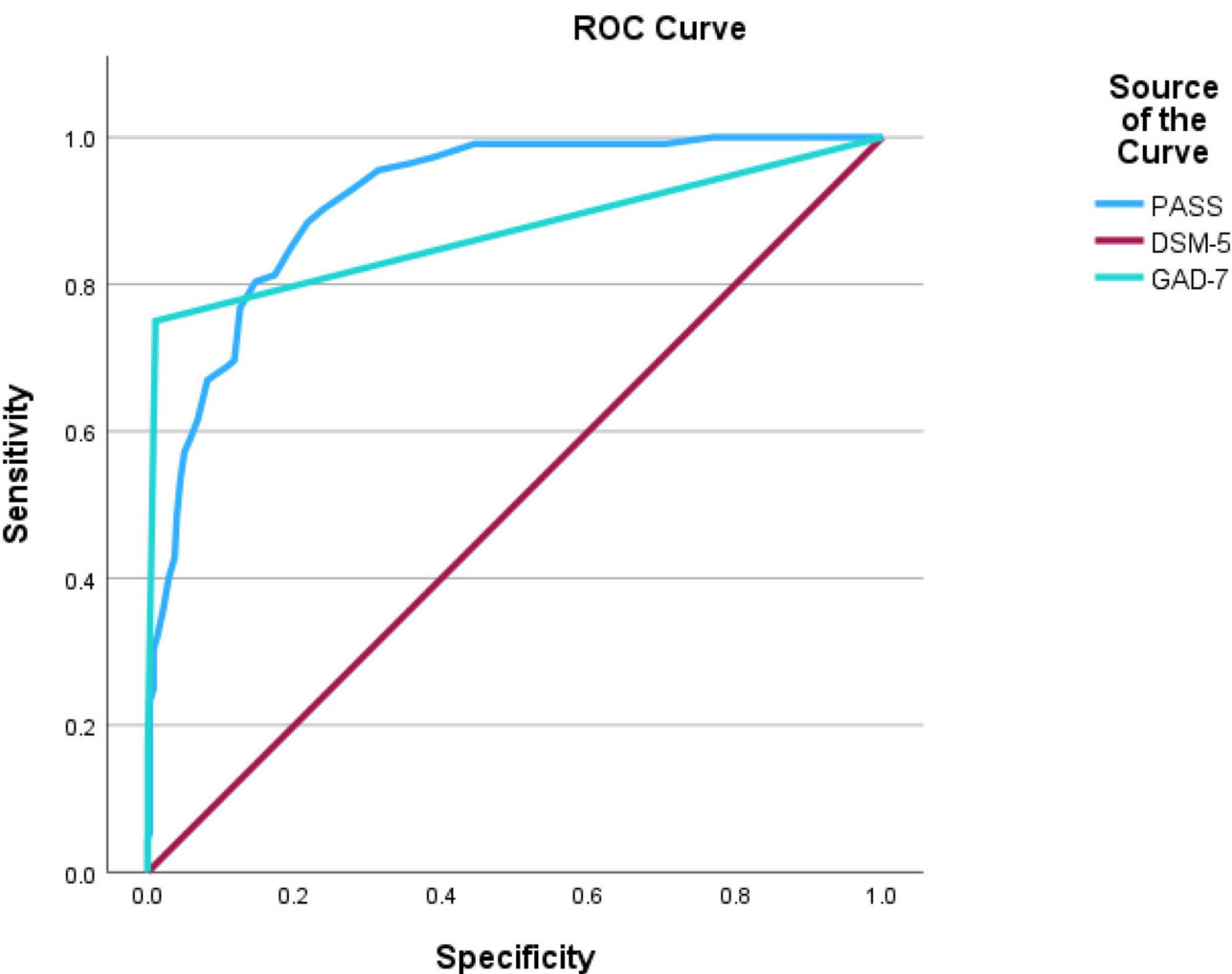


Fig. 3 ROC Curve-The receiver operating characteristic curve of the participants-Area under the curve of the PASS=0.91, area under the curve of the GAD-7=0.89

a Chinese context. There may still be several minor limitations. Participants were recruited from only two hospitals in Sichuan province. Hence, findings only reflect views of women confined to this region and cannot be generalized to other provinces in China. Henceforward, future research endeavors may pick up on these points and focus on larger sample sizes.

Conclusion

The *Chinese*-PASS had a reasonably adequate validity and reliability and can be used to screen for anxiety disorder among perinatal women. Regarding the AUC-ROC, the PASS perform better compared to GAD-7, the cut-off scores points were 19.5 and 3.5 for PASS and GAD-7, respectively.

Abbreviations

PASS	Perinatal Anxiety Screening Scale
WHO	World Health Organization
PWS	Postpartum Worry Scale

HADS	Hospital Anxiety and Depression Scale
GAD-7	Generalized Anxiety Disorder-7
SAS	Self-rating Anxiety Scale
STAI	State-Trait Anxiety Inventory
DASS-21	Depression Anxiety Stress Scale-21
ACOG	American Congress of Obstetricians
CFA	Confirmatory Factor Analysis
ROC	Receiver-Operating-Characteristic
AUC-ROC	Area Under the ROC Curve

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Author contributions

All authors approved the study. XZ, MH, XL and BW conceived the study. RH, XG and HW collected the data. XZ analyzed the data All authors interpreted the findings and contributed to the validation study. XZ wrote the first draft of the manuscript. All authors read and critically revised the first draft and confirmed the final version of the manuscript.

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Data availability

The datasets used and/or analyzed during the current study available from the corresponding author on reasonable request.

Declarations

Ethical approval and consent to participate

All methods were performed in accordance with the relevant guidelines and regulations or in accordance with the Declaration of Helsinki. The Ethics Committee approval of the Mianyang Central Hospital, School of Medicine, University of Electronic Science and Technology of China before conducting the study (ID: S202303115-02). Participants received oral information about the study, and verbal informed consent was obtained from all postpartum women before the state of the study, and all participants completed informed written consent after being informed of the aim of research.

Consent for publication

Not applicable.

Competing interests

The authors declare no competing interests.

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References

1. Akgn M, Turgut Y, z HG, Yangin H, Boz I. Examining the relationship between perinatal anxiety, COVID-19 phobia and birth type preferences: A cross-sectional study. *J Clin Nurs*. 2023;32(13–14):3820–30.
2. Yang L, Sun JW, Nan YP, Waqas A, Nisar A, Wang DL, Rahman A, Li XM. Prevalence of perinatal anxiety and its determinants in Mainland China: A systematic review and meta-analysis. *J Affect Disord*. 2023;323:193–203.
3. Fisher M, Sutcliffe P, Southern C, Grove A, Tan B. The effectiveness of interventions for the prevention or treatment of paternal perinatal anxiety: A systematic review. *J Clin Med* 2022, 11(22).
4. Viswasam K, Berle D, Starcevic V. Trajectories and predictors of anxiety symptoms during pregnancy in an Australian sample. *Aust N Z J Psych*. 2020;54(12):1173–81.
5. WHO guide for integration. of perinatal mental health in maternal and child health services [<https://www.who.int/publications/i/item/9789240057142>]
6. Tol WA, Ebrecht B, Aiyo R, Murray SM, Nguyen AJ, Kohrt BA, Ndyabangi S, Alderman S, Musisi S, Nakku J. Maternal mental health priorities, help-seeking behaviors, and resources in post-conflict settings: a qualitative study in Eastern Uganda. *BMC Psychiatry*. 2018;18:1–15.
7. Fairbrother N, Janssen P, Antony MM, Tucker E, Young AH. Perinatal anxiety disorder prevalence and incidence. *J Affect Disord*. 2016;200:148–55.
8. Somerville S, Dedman K, Hagan R, Oxnam E, Wettinger M, Byrne S, Coe S, Doherty D, Page AC. The perinatal anxiety screening scale: development and preliminary validation. *Arch Womens Ment Health*. 2014;17(5):443–54.
9. Amiri P, Bahaadinbeigy K, Asadi F, Rahmati S, Mazhari S. Validation of the Persian version of the perinatal anxiety screening scale (PASS) among antenatal and postnatal women. *BMC Pregnancy Childbirth* 2022, 22(1).
10. Rogers AM, Youssef GJ, Teague S, Sunderland M, Le Bas G, Macdonald JA, Mattick RP, Allsop S, Elliott EJ, Olsson CA, et al. Association of maternal and paternal perinatal depression and anxiety with infant development: A longitudinal study. *J Affect Disord*. 2023;338:278–88.
11. de Waal N, Boekhorst M, Nyklicek I, Pop VJM. Maternal mindfulness during pregnancy and early child Social-Emotional development and behavior problems: the potential mediating role of maternal mental health. *Mindfulness*. 2023;14(7):1767–79.
12. Lee MS, Lee JJ, Park S, Kim S, Lee H. Is social support associated with postpartum depression, anxiety and perceived stress among Korean women within the first year postpartum? *J Psychosomat Obstet Gynecol* 2023, 44(1).
13. Carroll JO, Ando K, Yun RMY, Panelli D, Nicklin A, Kennedy N, Carvalho B, Blake L, Coker J, Kaysen D et al. A systematic review of patient-reported outcome measures used in maternal postpartum anxiety. *Amer J Obstet Gynecol MFM* 2023, 5(9).
14. Somerville S, Byrne SL, Dedman K, Hagan R, Coe S, Oxnam E, Doherty D, Cunningham N, Page AC. Detecting the severity of perinatal anxiety with the perinatal anxiety screening scale (PASS). *J Affect Disord*. 2015;186:18–25.
15. Silverio SA, Davies SM, Christiansen P, Aparicio-Garcia ME, Bramante A, Chen P, Costas-Ramon N, de Weerth C, Della Vedova AM, Gil LI et al. A validation of the postpartum specific anxiety scale 12-item research short-form for use during global crises with five translations. *BMC Pregnancy Childbirth* 2021, 21(1).
16. Sioma-Markowska U, Krawczyk P, Brzek A. Assessing the risk of depression tendency in pregnancy and puerperium during COVID-19 pandemic in Poland. *Healthcare* 2023, 11(14).
17. Tauqeer F, Ceulemans M, Gerbier E, Passier A, Oliver A, Foulon V, Panchaud A, Lupattelli A, Nordeng H. Mental health of pregnant and postpartum women during the third wave of the COVID-19 pandemic: a European cross-sectional study. *BMJ Open* 2023, 13(1).
18. Ye LL, Yu CH, Chen XQ, Han YY. Application Effect of Cluster-Based Care in Patients with Hypertensive Disorders of Pregnancy and Osteoarthritis. *Comput Math Method Med* 2022, 2022.
19. Prokopowicz A, Stanczykiewicz B, Uchmanowicz I. Anxiety and psychological flexibility in women after childbirth in the Rooming-in unit during the COVID-19 pandemic. *J Midwifery Women Health*. 2023;68(1):107–16.
20. Fairbrother N, Corbyn B, Thordarson DS, Ma A, Surm D. Screening for perinatal anxiety disorders: room to grow. *J Affect Disord*. 2019;250:363–70.
21. Yazici E, Pek TM, Yuvaci HU, Kose E, Cevrioglu S, Yazici AB, Cilli AS, Erol A, Aydin N. Perinatal anxiety screening scale Validity and reliability study in Turkish (PASS-TR validity and reliability). *Psychiatry Clin Psychopharmacol*. 2019;29(4):609–17.
22. Jradi H, Alfharhan T, Alsuraimi A. Validation of the Arabic version of the perinatal anxiety screening scale (PASS) among antenatal and postnatal women. *BMC Pregnancy Childbirth* 2020, 20(1).
23. Priyadarshanie MN, Waas M, Goonewardena CSE, Balasuriya A, Senaratna BCV, Fernando DMS. Sinhala translation of the perinatal anxiety screening scale: a valid and reliable tool to detect anxiety disorders among antenatal women. *BMC Psychiatry* 2020, 20(1).
24. Koukopoulos A, Mazza C, De Chiara L, Sani G, Simonetti A, Kotzalidis GD, Armani G, Callovi G, Bonito M, Parmigiani G et al. Psychometric properties of the perinatal anxiety screening scale administered to Italian women in the perinatal period. *Front Psychiatry* 2021, 12.
25. Korgozha M, Evmenenko A. Validation and reliability of the Russian version of the perinatal anxiety screening scale. *Minerva Psychiat*. 2023;64(2):175–84.
26. Committee on Obstetric P. The American college of obstetricians and gynecologists committee opinion 630. Screening for perinatal depression. *Obstet Gynecol*. 2015;125(5):1268–71.
27. Siu AL, Bibbins-Domingo K, Grossman DC, Baumann LC, Davidson KW, Ebell M, Garcia FAR, Gillman M, Herzstein J, Kemper AR, et al. Screening for depression in adults US preventive services task force recommendation statement. *JAMA-J Am Med Assoc*. 2016;315(4):380–7.
28. Cuixue Wang YL, Wei Cao F, Lou. Chinese translation and reliability evaluation of the perinatal anxiety screening scale. *Chin J Mod Nurs (Chinese Journal)*. 2021;27(28):3816–22.
29. Beaton DE, Bombardier C, Guillemin F, Ferraz MB. Guidelines for the process of cross-cultural adaptation of self-report measures. *Spine*. 2000;25(24):3186–91.
30. Sominsky L, O'Hely M, Drummond K, Cao SF, Collier F, Dhar P, Loughman A, Dawson S, Tang MLK, Mansell T, et al. Pre-pregnancy obesity is associated with greater systemic inflammation and increased risk of antenatal depression. *Brain Behav Immun*. 2023;113:189–202.
31. Liu QR, Zong QK, Ding LL, Dai HY, Sun Y, Dong YY, Ren ZY, Hashimoto K, Yang JJ. Effects of perioperative use of Esketamine on postpartum depression risk in patients undergoing Cesarean section: A randomized controlled trial. *J Affect Disord*. 2023;339:815–22.
32. Wang YQ, Guo XJ, Lau Y, Chan KS, Yin L, Chen J. Psychometric evaluation of the Mainland Chinese version of the Edinburgh postnatal depression scale. *Int J Nurs Stud*. 2009;46(6):813–23.
33. Marlow M, Skeen S, Grieve CM, Carvajal-Velez L, Ahs JW, Kohrt BA, Requejo J, Stewart J, Henry J, Goldstone D, et al. Detecting depression and anxiety among adolescents in South Africa: validity of the IsiXhosa patient health Questionnaire-9 and generalized anxiety Disorder-7. *J Adolesc Health*. 2023;72(1):552–60.

34. Tordoff DM, Wanta JW, Collin A, Stepney C, Inwards-Breland DJ, Ahrens K. Mental health outcomes in transgender and nonbinary youths receiving Gender-Affirming care. *JAMA Netw Open* 2022, 5(2).
35. Liu MS, Wang D, Fang JX, Chang YH, Hu YD, Huang KW. Validation of the generalized anxiety Disorder-7 in patients with COPD: a cross-sectional study. *BMC Psychiatry* 2023, 23(1).
36. Kline P. *An easy guide to factor analysis*. Routledge; 2014.
37. Stefana A, Langfus JA, Palumbo G, Cena L, Trainini A, Gigantesco A, Mirabella F. Comparing the factor structures and reliabilities of the EPDS and the PHQ-9 for screening antepartum and postpartum depression: a multigroup confirmatory factor analysis. *Arch Womens Ment Health* 2023.
38. McNeish D, Wolf MG. Dynamic fit index cutoffs for confirmatory factor analysis models. *Psychol Methods*. 2023;28(1):61.
39. Abraham S, Mir BA, Suhara H, Mohamed FA, Sato M. Structural equation modeling and confirmatory factor analysis of social media use and education. *Int J Educ Technol High Educ*. 2019;16(1):1–25.
40. Osburn HG. Coefficient alpha and related internal consistency reliability coefficients. *Psychol Methods*. 2000;5(3):343.
41. Carlson KD, Herdman AO. Understanding the impact of convergent validity on research results. *Organ Res Methods*. 2012;15(1):17–32.
42. Bewick V, Cheek L, Ball J. Statistics review 13: receiver operating characteristic curves. *Crit Care*. 2004;8(6):1–5.
43. Brown TA, Barlow DH. Dimensional versus categorical classification of mental disorders in the fifth edition of the diagnostic and statistical manual of mental disorders and beyond: comment on the special section. *J Abnorm Psychol*. 2005;114(4):551.
44. Barzgar-Molan S, Farshbaf-Khalili A, Jafarabadi MA, Babapour J, Yavarikia P. Psychometric properties of the Iranian version of a perinatal anxiety screening scale in Iranian perinatal population: A methodological study. *Crescent J Med Biol Sci*. 2020;7(4):551–9.
45. Yang J-p, Qu J, Sun K, Gao L-L. Anxiety symptoms and health-related quality of life in Mainland Chinese pregnant women: a cross-sectional study. *J Reproductive Infant Psychol*. 2023;41(1):3–14.
46. Wu Y, Zhang C, Liu H, Duan C, Li C, Fan J, Li H, Chen L, Xu H, Li X. Perinatal depressive and anxiety symptoms of pregnant women during the coronavirus disease 2019 outbreak in China. *Am J Obstet Gynecol*. 2020;223(2):240–e241.
47. Menclova AK, Stillman S. Maternal stress and birth outcomes: evidence from an unexpected earthquake swarm. *Health Econ*. 2020;29(12):1705–20.
48. Pepe MS. Receiver operating characteristic methodology. *J Am Stat Assoc*. 2000;95(449):308–11.

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