Psychosocial Risk Factors for Postpartum Depression in Chinese Women: A Meta-Analysis

Qi Weijing  
Hbei Medical University

Zhao Fuqing  
Hbei Medical University

Liu Yutong  
Hebei Medical University

Li Qing  
Hebei Medical University

Hu Jie (✉ hujie3993@126.com)  
Hebei Medical University

Research article

Keywords: postpartum depression, risk factors, meta-analysis, psychosocial

DOI: https://doi.org/10.21203/rs.3.rs-65507/v1

License: This work is licensed under a Creative Commons Attribution 4.0 International License. Read Full License
Abstract

Background: Postpartum depression (PPD) has been identified as a recognized public health problem that may adversely affect mothers, infants, and family units. Recent research has identified risk factors for this disease in Westerners; however, a comprehensive study has yet to pool all evidence to provide estimates of psychological and social risk factors in China. Therefore, this study aimed to quantitatively assess all qualified studies and identify the psychological and social risk factors for postpartum depression in Chinese women.

Methods: The following databases were used in the literature search from their inception until June 2019: PubMed, Embase, FMRS, China Science and Technology Journal Database (VIP), China National Knowledge Infrastructure (CNKI), and China Biology Medicine disc (CBM). Meta-analysis was conducted by RevMan software. Study heterogeneity and publication bias were estimated.

Results: From a total of 887 identified studies, 48 were included in the analysis. Prenatal depression (OR 7.70; 95% CI 6.02-9.83) and prenatal anxiety (OR 7.07; 95% CI 4.12-12.13) were major risk factors for PPD. A poor economic foundation (OR 3.50; 95% CI 2.92-4.20) and a poor relationship between husband and wife (OR 3.42; 95% CI 2.82-4.13) were moderate risk factors. Minor risk factors included a poor relationship between mother-in-law and daughter-in-law (OR 2.89; 95% CI 2.12-3.95), a lack of social support (OR 2.57; 95% CI 2.32-2.85), unplanned pregnancy (OR 2.55; 95% CI 2.08-3.14), mother-in-law as the caregiver (OR 2.5; 95% CI 1.67-3.74) and poor living conditions (OR 2.44; 95% CI 1.92-3.10).

Conclusions: This study demonstrated a number of psychological and social risk factors for postpartum depression in Chinese women. The major and moderate risk factors are prenatal depression, prenatal anxiety, a poor economic foundation and a poor relationship between husband and wife. These findings suggest that prenatal prevention aimed at these risk factors is important due to the presence of many of these factors during the prenatal period.

Background

Postpartum depression (PPD) is the most common type of nonpsychotic psychiatric syndrome during the perinatal period\(^1\). The prevalence of PPD varies from 0.5–60.8% around the world and from 3.5–63.3% in Asian countries, as measured using the Edinburgh Postpartum Depression scale (EPDS)\(^2\). The prevalence of PPD in China is estimated to be between 1.1% and 52.1% and is increasing yearly\(^3\). PPD has been identified as a recognized public health problem that not only affects mothers’ health but also causes poor developmental outcomes in children and poor relationships in families\(^4\).

Postpartum depressive symptoms include the inability to sleep, anxiety, sadness, extreme concern and worry about the baby, and even recurrent thoughts of death\(^5\). Because maternal emotion plays an important role in the development of children, the pathogenesis of PPD merits greater attention. Although numerous studies have identified risk factors for postpartum depression, due to factors such as the small
sample sizes of individual studies, incomplete patient data, and different assessment methods, the results of these studies are still controversial.

In addition, review\textsuperscript{6} on the risk factors for postpartum depression have primarily included studies conducted in Western populations and have overlooked many studies undertaken in the Chinese cultural context. Western and Chinese women differ considerably in terms of genetics, philosophical traditions, cultural practices, ethnicity, religion and attitudes toward psychological problems\textsuperscript{7}. Western women express their thoughts overtly and have always maintained a more open attitude in facing the world. The two different cultural backgrounds lead to differences in the psychosocial risk factors for PPD\textsuperscript{8}. Given the deeply rooted influence of the Chinese cultural traditions of Confucianism, Buddhism and Taoism, the thought processes of Chinese females have historically been more traditional and conservative in nature\textsuperscript{9}. Currently, Chinese women still maintain a conservative self-concept and manifest their emotional problems through somatic complaints. This kind of psychology often limits communication and is more likely to lead to anxiety and depression.

At present, studies on Chinese women have reported that poor relationships with husbands or mothers-in-law, introverted maternal personality, anxiety or depression during pregnancy, an unsMOOTH delivery process, poor postpartum sleep quality, dissatisfaction with neonatal sex and poor health conditions of newborns were risk factors for postpartum depression\textsuperscript{10}. However, most of the reports are cross-sectional or case-control studies and often include recall bias, and the risk factors for postpartum depression have still not been completely identified. In addition, although some Chinese individuals have emigrated overseas, they have been influenced by traditional Chinese culture for a long time, and thus, their way of thinking and their living habits are still similar to those of individuals in their motherland. Thus, this study aimed to quantitatively assess all qualified studies and identify the psychosocial risk factors for postpartum depression in Chinese women, including those living overseas.

**Methods**

**Search strategy**

A systematic search of the electronic databases PubMed, Embase, FMRS, the China Science and Technology Journal Database (VIP), China National Knowledge Infrastructure (CNKI), and China Biology Medicine disc (CBM) was performed for relevant studies published before June 2019. Chinese search terms included postpartum depression, risk factors, influencing factors, social factors, and psychological factors. English search terms included the following: Postnatal Depression OR Depression, Postnatal OR Post-Partum Depression OR Depression, Post-Partum OR Post Partum Depression OR Postpartum Depression OR Post-Natal Depression OR Depression, Post-Natal OR Post Natal Depression AND Factor, Risk OR Factors, Risk OR Risk Factor OR Population at Risk OR Risk, Population at OR Populations at Risk OR Risk, Populations at AND Chinese OR in China. Additionally, we also performed a manual search of the reference lists of retrieved articles and recent reviews.
Selection criteria and exclusion criteria

The inclusion criteria were as follows: (1) the studies evaluated the psychosocial risk factors associated with postpartum depression in Chinese women; (2) the study was a case-control study or a cohort study; (3) the studies reported relative risks (RRs) or odds ratios (ORs) with corresponding 95% confidence intervals (CIs) or provided data to calculate them; and (4) participants were Chinese mothers, including those living overseas. Reviews, case reports or articles with repeated samples were excluded.

Data extraction and quality assessment

Data were obtained from each included study independently by two reviewers. Disputes were discussed between the reviewers until consensus was reached. Data extracted from the studies included the first author, publication year, study sites, sample size and type, and quality score. We used the Newcastle-Ottawa Scale (NOS) to assess the quality of the selected cohort and case-control studies\(^\text{11}\). The NOS was used to score the studies on three criteria: the selection of the study groups; the comparability of the groups; and the ascertainment of outcome or exposure. The total score ranged from 0 to 9, with higher scores representing higher methodological quality and lower risk of bias.

Statistical analysis

Different outcome data types were converted into the form of odds ratios (ORs) with 95% confidence intervals (CIs), which were used to pool the outcome data. The Cochrane Q test was performed to assess statistical heterogeneity, and the Higgins I\(^2\) statistic was used to determine the extent of variation between effect estimates (0−100%). For outcomes with low heterogeneity, I\(^2\) < 50% and \(p > 0.1\), the fixed-effects model (M-H method) was used for analysis. In addition to I\(^2\) ≥ 50% or \(p < 0.1\), the random-effects model (D-I method) was used\(^\text{12}\). The sensitivity analysis was carried out by changing the model method. Publication bias was evaluated via the visual analysis of funnel plots. Statistical analyses were performed using Review Manager 5.3 (Cochrane Collaboration, UK).

Results

Literature search

A total of 887 studies were obtained through six database searches, of which 196 were excluded because of duplicates. Most articles (\(n = 456\)) were excluded after the title and abstract information were reviewed. Then, 187 articles that did not meet the inclusion criteria were excluded after the full text was reviewed. Finally, the meta-analysis included 48 studies, and the study selection process is shown in Fig. 1.

Study characteristics
A total of 35,028 perinatal women were included across the 12 cohort studies and 36 case-control studies, with 6765 women identified as having postpartum depression. The studies investigated Chinese women in mainland China, Hong Kong and overseas. The EPDS and Self-Rating Depression Scale (SDS) were the most common instruments used to assess PPD. The quality score of the included studies ranged from 5 to 8, and 11 studies were scored 7 or more. The study characteristics and quality evaluation are summarized in Table 1.

**Quantitative synthesis**

**Case-control studies and cohort studies**

The study types of the five risk factors included case-control studies and cohort studies. Sixteen studies (12 case-control studies and 4 cohort studies) reported that a poor relationship between husband and wife was associated with an increased risk of PPD (OR = 3.42; 95% CI 2.82–4.13; $I^2 = 24\%; p < 0.00001$) (Fig. 2).

Ten studies (8 case-control studies, 2 cohort studies) investigated the association between poor economic foundation and the risk of PPD (OR = 3.50; 95% CI 2.92–4.20; $I^2 = 4\%; p < 0.00001$) (Fig. 3).

Nine studies (5 case-control studies, 4 cohort studies) investigated the association between prenatal depression and the risk of PPD (OR = 7.70; 95% CI 6.02–9.83; $I^2 = 69\%; p < 0.00001$) (Fig. 4).

Thus, poor economic foundation and prenatal depression were significantly related to PPD. Nine studies (7 case-control studies, 2 cohort studies) reported that a poor relationship between mother-in-law and daughter-in-law was associated with an increased risk of PPD (OR = 2.89; 95% CI 2.12–3.95; $I^2 = 72\%; p < 0.00001$) (Fig. 5).

Nine studies (4 case-control studies, 5 cohort studies) investigated the association between a lack of social support and the risk of PPD (OR = 2.66; 95% CI 1.57–4.53; $I^2 = 98\%; p = 0.0003$). After subgroup analysis according to the type of study design, the heterogeneity of the case-control group decreased ($I^2 = 46\%, p = 0.14$), but the heterogeneity of the cohort group was still very high ($I^2 = 99\%, p < 0.00001$). After adjustment, it was found that the heterogeneity of the cohort group decreased significantly after one document was excluded ($I^2 = 42\%, p = 0.16$) (Fig. 6–7). This may be due to major differences in social support between Chinese-Canadian women and Chinese women22.

**Case-control studies**

Four of the risk factors included case-control studies. Seven studies investigated the association between unplanned pregnancy and the risk of PPD. The pooled OR for unplanned pregnancy was 2.55 (95% CI 2.08–3.14; $I^2 = 26\%; p < 0.00001$) (Fig. 8). Six studies investigated the association between poor living
conditions and the risk of PPD. The pooled OR for poor living conditions was 2.44 (95% CI 1.92–3.10; I² = 21%; p < 0.00001) (Fig. 9). Four studies investigated the association between prenatal anxiety and the risk of PPD. The pooled OR for prenatal anxiety was 7.07 (95% CI 4.12–12.13; I² = 59%; p < 0.00001), and a random-effects model was adopted (Fig. 10). Three studies investigated the association between mothers-in-law as caregivers and the risk of PPD. The pooled OR for mothers-in-law as caregivers was 2.50 (95% CI 1.67–3.74; I² = 0%; p < 0.00001) (Fig. 11).

Therefore, unplanned pregnancy, poor living conditions, prenatal anxiety and mothers-in-law as caregivers were found to be significantly associated with postpartum depression.

**Heterogeneity test and sensitivity analysis**

The results of 48 studies were tested by the Cochrane Q test. There was no significant difference in the heterogeneity of 7 risk factors (prenatal depression, poor economic foundation, poor relationship with partner, lack of social support, unplanned pregnancy, mothers-in-law as caregivers and poor living conditions). However, for the poor mother-in-law relationship and prenatal anxiety, the random-effects model was used because of the high heterogeneity. In sensitivity analyses, the change model method was used to estimate the point and interval of the OR values of all risk factors to judge the stability of the meta-analysis (Table 2). The point estimates of the combined OR values of the fixed-effects model and the random-effects model were similar, and the interval estimation range of the random-effects model was slightly wider than that of the fixed-effects model. This result indicated that the comprehensive analysis results of the influencing factors in this study were reliable overall.

**Publication bias**

Publication bias was evaluated via the visual analysis of funnel plots. The funnel plot generally appeared to be symmetrical, indicating no publication bias (Fig. 12–13).

**Discussion**

PPD is a crucial part of the spectrum of mood disturbances affecting postpartum women. A variety of factors affect the physical and mental health of pregnant women. Thus, identifying alterable risk factors for PPD and controlling them at an early stage are essential for the treatment and prevention of this condition.

The psychosocial risk factors for postpartum depression in Chinese women identified in this meta-analysis mainly included three kinds: prenatal emotional factors (prenatal anxiety and prenatal depression), social demographic factors (poor marital relationship, poor living conditions, lack of social support and unplanned pregnancy) and social and interpersonal factors (poor relationship between husband and wife, poor relationship between mother-in-law and daughter-in-law and mother-in-law as the
caregiver). First, prenatal anxiety and depression were significantly associated with an increased risk of PPD, as confirmed by some Western studies. An Italian study\textsuperscript{61} showed that women with depression or anxiety during pregnancy and a lack of support from family and friends were at a higher risk of postpartum depression. This result has also been confirmed in China. According to the report of Lee\textsuperscript{13}, most postpartum depression was the continuation of prenatal psychological problems and emotional disorders, indicating that there was a significant correlation between prenatal psychological status and the occurrence of postpartum depression.

Another explanation for the effect of prenatal emotional distress is physiological changes. For example, excessive anxiety and depression in pregnant women may lead to a series of physiological and pathological reactions, such as a decrease in norepinephrine secretion and changes in other endocrine hormones, which may lead to the weakening of uterine contractions, a prolonged stage of labor and increased bleeding. These challenges further aggravate the anxiety of pregnant women and lead to an increased risk of developing PPD\textsuperscript{62}.

Second, this study found that social demographic factors were also risk factors for postpartum depression, such as a poor economic foundation, poor living conditions, a lack of social support and unplanned pregnancy. Among them, the economic foundation of the family had an important effect on the psychological status of the mother. Previous reviews suggested that the status of the family's economic income was positively related to the level of stress in pregnant women. Yu\textsuperscript{42} suggested that after adjustments were made for other related factors, the incidence of postpartum depression among women who were worried about family economic status was 3.162 times higher than among those who did not worry about it. The probable explanation may be that after childbirth, the cost of raising the baby and the basic cost of living for the family significantly increased. If the family income is insufficient, it will lead to high levels of pressure for pregnant women and easily cause negative emotions. In recent years, with China's two-child policy, raising multiple children in a family increases the family's financial burden, which may be a factor of PPD. A study in Turkey shows that there was a significant relationship between monthly income and depression, which was similar to the results of the present study\textsuperscript{63}.

In addition, previous studies have shown that social support was a protective factor against postpartum depression, and as far as mothers were concerned, the greatest social support comes from their husbands. Xiong et al\textsuperscript{64} suggested that puerperae with spousal support were much less likely to develop postpartum depression. A Chinese study also confirmed that high levels of social support can reduce the risk of postpartum depression, with other factors were fixed\textsuperscript{23}. Our findings are generally consistent with those of previous reviews. Eastern and Western women differ considerably in terms of social and cultural systems, and these differences have an impact on many aspects after delivery. For example, in Taiwan, family relations play a dominant role in social communication. During puerperium in traditional Chinese culture, women are often taken care of by relatives for at least one month. Traditional postnatal practices and family support protect the health and well-being of women after childbirth in China. In contrast, the absence of support for these practices among Chinese migrants in Western societies may have negative
implications for their health. Therefore, giving adequate social support to parturients during the puerperal period can help them get through this critical period smoothly.

Third, in this study, the interpersonal risk factors for postpartum depression were a poor relationship between husband and wife, a poor relationship between mother-in-law and daughter-in-law and mother-in-law as the caregiver. The poor relationship between husbands and wives, as an important factor affecting human physical and mental health, has attracted the close attention of researchers worldwide. Zhang suggested that the quality of the husband-wife relationship was mainly reflected in the quality of the husband's care for his wife, and women who were less satisfied with their husband's care were more likely to have depression. Poor marriage and family relationships will not only reduce maternal social support but also become a maternal stressful life event, which brings about an increased risk of developing PPD. This study was confirmed in a Polish study. Malus et al confirmed the significance of the marital relationship in the development of postpartum depression. A sense of closeness and intimacy in the relationship were associated with better mood and a greater ability to cope with the difficulties of labor, puerperium, and caring for a newborn baby.

In addition, the results of this study found that the risk factors for postpartum depression related to Chinese cultural characteristics included the mother-in-law as the caregiver and a poor relationship between mother-in-law and daughter-in-law. Traditionally, mothers-in-law exercise significant power in the family and are a major influence on the postpartum care of new mothers. In China, due to the influence of doing-the-month culture, mothers and newborns are mostly cared for by their mothers-in-law. The strain between mothers-in-law and daughters-in-law is a sensitive problem and may be a cause of PPD in China. Steinberg indicated that the strain between mothers-in-law and daughters-in-law often offset the benefits of assistance and may even contribute to negative mood during the postpartum period. In traditional Confucian philosophy, the new mother should be considered a good daughter-in-law if they behave in a way that is respectful at home and are obedient to their in-laws and husband. The relationship between women and their parents-in-law is based on the environment rather than consanguinity. Sometimes they were reluctant to express their own feelings and opinions to their in-laws. New mothers feel very stressed when they have opinions different from their care providers. The situation may become even worse when conflicts occur with mothers-in-law. Because of the differences in backgrounds, values, identity, and logic of ideas, conflicts with respect to childcare between women and their mothers-in-law become prominent. Meanwhile, the birth of newborns makes both of them focus on their children, and both want to spend more time with their children and grow closer to them. Because of the possessive and exclusive nature of love, competition and conflicts inevitably arise between them. In addition, after the birth, the focus of the attention of the mothers-in-law shifted from the new mother to the newborn, causing the new mother to feel left out, which brings about an increased risk of developing PPD. Pregnant women think that they should be rewarded and valued for "carrying on the family line", but the gap between reality and ideals leads to maternal depression. Additionally, in China, because of the close relationship between the son and his original family, he will be on his mother's side when conflicts
occur between family members. Wives’ lack of support from husbands can lead to marital disharmony, which is also an important risk factor for PPD.

**Limitations**

This study had several inevitable limitations. First, some risk factors have received less attention; for example, nonuniform measurement standards and statistical difficulties have not been combined, such as the type of residence, postpartum wound recovery, postpartum work stress, and maternal occupation. Second, postpartum depression is the result of the interaction of multiple factors, but due to methodological limitations, it is difficult to investigate the interaction among risk factors. Third, in terms of language selection, this study only includes literature in Chinese and English, which may lead to bias in the comprehensiveness of the literature search, thus affecting the research results and the intensity of the argument.

In addition, this study covers a wide range of research sites, including pregnant Chinese women in mainland China, Hong Kong and overseas. Although some Chinese women have emigrated overseas, because they have been influenced by traditional Chinese culture for a long period of time, their way of thinking and living habits are still similar to those of individuals in their motherland.

**Conclusion**

In conclusion, psychosocial risk factors for postpartum depression mainly include prenatal depression, prenatal anxiety, a poor economic foundation, a poor relationship between husband and wife, a poor relationship between mother-in-law and daughter-in-law, a lack of social support, unplanned pregnancy, the mother-in-law as the caregiver and poor living conditions. These psychosocial risk factors are meaningful for identifying mothers “at-risk” during pregnancy even earlier. Meanwhile, some psychosocial interventions targeting these risk factors may be conducted during the pregnancy period to prevent PPD, such as interpersonal psychotherapy, mindfulness therapy and psychoeducational programs.

**Abbreviations**

PPD: Postpartum depression: EPDS, Edinburgh postnatal depression scale

HADS: Hospital Anxiety and Depression Scale, SDS: Self-rating depression scale

SCL-90: Symptom Checklist 90, BDI: Beck Depression Inventory

CES-D: Center for Epidemiological Studies Depression Scale

VIP: the China Science and Technology Journal Database
Declarations

Ethics approval and consent to participate
Not applicable

Consent for publication
Not Applicable

Availability of data and material
All data generated or analyzed during this study are included in this article (and its supplementary files).

Competing interests
The authors declare that they have no conflict of interest.

Funding
The work was conducted through a research grant # BJ2016082 to Hebei Education Department Humanities and Social Sciences Young Talent Project.

The funding organization was not involved in the design of the study and collection, analysis, and interpretation of data and in writing the manuscript.

Authors’ contributions
WQ, FZ, JH, YL, and QL were all involved in the processes of study design, data extraction, and statistical analysis. WQ wrote the manuscript. JH and FZ were responsible for the selection of articles. All authors read and approved the final version of the manuscript.

Acknowledgements
We appreciate the contribution of all people who participated in this study. We are also grateful for the valuable insight and feedback from the reviewers and the editorial team.

References

1. O'Hara MW, McCabe JE. Postpartum depression: current status and future directions. *Annu Rev Clin Psychol* 2013; 9: 379-407.

2. Norhayati MN, Hazlina NH, Asrenee AR, Emilin WM. Magnitude and risk factors for postpartum symptoms: a literature review. *J Affect Disord* 2015; 175: 34-52.

3. Mu T, Li Y, Pan H, et al. Postpartum depressive mood (PDM) among Chinese women: a meta-analysis. *Archives of Women's Mental Health* 2019; 22(2): 279-87.

4. Johannsen BM, Larsen JT, Laursen TM, et al. Self-harm in women with postpartum mental disorders. *Psychol Med* 2019: 1-7.

5. Chang H, Chen J, Huang Y, Chin-Hung Chen V. Prevalence and Factors Associated with Depressive Symptoms in Mothers with Infants or Toddlers. *Pediatr Neonatol* 2014; 55: 470-9.

6. Beck CT. A Meta-Analysis of Predictors of Postpartum Depression. *Nurs Res* 1996; 45(5): 297-303.

7. Klainin P, Arthur DG. Postpartum depression in Asian cultures: A literature review. *Int J Nurs Stud* 2009; 46(10): 1355-73.

8. Guitian Z. A comparison of Cultural characters between China and the West on "emotion and reason". *Yin du academic journal* 1993; 04: 63-6.

9. Zhao SQ. Analysis of the Causes of the Transformation of Female Concepts in Modern China. *Journal of Shandong Normal University (Humanities and Social Sciences)* 2015; 04(60): 34-43.

10. Liu SX, Xia W. A Meta-analysis of risk factors of postpartum depression. *Shanxi Medical Journal* 2014; 24(43): 2847-9.

11. Stang A. Critical evaluation of the Newcastle-Ottawa scale for the assessment of the quality of nonrandomized studies in meta-analyses. *EUR J Epidemiol* 2010; 25(9): 603-5.

12. DerSimonian R, Laird N. Meta-analysis in clinical trials. *Control Clin Trials* 1986; 7(3): 177-88.

13. Lee DT, Yip AS, Leung TY, Chung TK. Ethnoepidemiology of postnatal depression. Prospective multivariate study of sociocultural risk factors in a Chinese population in Hong Kong. *Br J Psychiatry* 2004; 184: 34-40.

14. Zhao Y, Munro-Kramer ML, Shi S, Wang J, Zhu X. A longitudinal study of perinatal depression among Chinese high-risk pregnant women. *Women Birth* 2018; 31(6): 395-402.

15. Pan XF, Lu ZM, Xiao J. Prospective study on occurrence of postnatal depression and its psychosocial risk factors. *Maternal and Child Health Care of China* 2004; 11: 28-30.

16. Zhao ZM, Zhao F, Yang X, et al. Antenatal and postnatal depression in Chengdu, China: a longitudinal study. *Chinese Journal of Disease Control & Prevention* 2018; 22(10): 1051-4.
17. Siu BW, Leung SS, Ip P, Hung SF, O'Hara MW. Antenatal risk factors for postnatal depression: a prospective study of Chinese women at maternal and child health centres. *BMC Psychiatry* 2012; **12**: 22.

18. Li HL, Li WL, Liu DH. Related factor of postpartum depression in 1994 cases in a hospital in Xi'an. *Chinese Journal of Woman and Child Health Research* 2017; **10**(27): 1374-6.

19. Gu W, Tang YF, Huang YM, Shi SS. Study on incidence and risk factors associated with postpartum depression. *Shanghai Medical Journal* 2004; **10**(27): 756-8.

20. Sun HL, Su H, Zhang J, Fan W. Analysis of Correlation Factors of Postpartum Depression. *Journal of Kunming Medical University* 2015; **12**(36): 60-4.

21. Kang AQ, Wu CM, Yang L. The incidence status and effect factors of postpartum Depression in Rudong county. *Chinese Journal of Family Planning* 2015; **10**(23): 652-5.

22. Dennis CL, Brown HK, Wanigaratne S, et al. Determinants of comorbid depression and anxiety postnatally: A longitudinal cohort study of Chinese-Canadian women. *J Affect Disord* 2018; **227**: 24-30.

23. Cai FY, Kuang L, Wang W, Li DQ, Cao J, Hui X. Prediction model for postpartum depression based on social psychological factors establishment and evaluation. *Academic Journal of Second Military Medical University* 2017; **04**(38): 476-81.

24. Hu J, Wang YQ. Study on related risk factors of patients with pre- and postnatal depression. *Nursing Research of China* 2010; **09**(24): 765-7.

25. Gu SS, Qian Y, Chen H, Fu R, Wang FQ, Cheng JY. Status and related factors of postpartum depression in patients with second child. *Chinese Journal of Woman and Child Health Research* 2017; **10**(28): 1177-80.

26. Zhang X, Li SF. Risk factors of postpartum depression of the parturients in Meilin and corresponding health care guidance. *Journal of Guangdong Medical University* 2017; **03**(35): 303-6.

27. Wu XQ, Ma J, Zhang Y, Zhu DL. Analysis of postpartum depression and its influencing factors in Futian District. *Applied Preventive Medicine* 2019; **02**(25): 95-8.

28. Shen R. Investigation and Analysis of postpartum depression status and its influencing factors and Psychological intervention research [Thesis]; 2011.

29. Yang LP, Xu Q, Qi L. Risk factors and preventive measures of postpartum depression. *Chinese Clinical Nursing* 2016; **06**(8): 501-4.

30. Zhang X, Tu Q, Xi W, Jiang YL, Gao Y. A study of incidence and the related factors of postpartum depression. *Chin J Psychiatry* 2001; **04**: 47-9.

31. Yin J. The Risk Factors of Postpartum Depression and Nursing Strategy. *Hebei Medicine* 2011; **12**(17): 1673-6.

32. Huang GH. Analysis of pathogenic factors of postpartum depression. *Today Nurse* 2012; **06**: 29-30.

33. Song LQ. Discussion on related factors and nursing countermeasures of postpartum depression. *Today Nurse* 2012; **01**: 77-9.
34. Wang XL, Dong Y, Zhou XM, et al. Risk Factors of Postnatal Depression among Women in Urban Nuclear Family. *China Journal of Health Psychology* 2013; **04**(21): 513-5.
35. Lin YP, Gu SQ, Shen HL. Analysis of the incidence and influencing factors of postpartum depression in 2023 parturients. *Chinese Rural Health Service Administration* 2014; **08**(34): 979-80.
36. Zhou Q, Zhang FZ. Analysis on Related Factors of Postpartum Depression and Its Preventive Measures. *Medical Recapitulate* 2014; **18**(20): 3417-8.
37. Wang YC, Zou T, Deng B. Cross-sectional survey of postpartum depression in the old town of Guiyang City and analysis of its influencing factors. *Practical Preventive Medicine* 2014; **10**(21): 1257-60.
38. Chen XD, Jiang WW. Influencing factors and intervention measures of postpartum depression in rural pregnant women. *Chinese Journal of Public Health Management* 2017; **06**(33): 877-9.
39. Yan J, Qin SH, Zhao YM, Li XY, Kun ML. Analysis of the incidence and influencing factors of postpartum depression in a grass-roots hospital. *Guide of China Medicine* 2018; **10**(16): 135-6.
40. Han YH. Analysis of influencing factors of postpartum depression of pregnant women and related nursing countermeasures. *Journal of Shanxi Medical College for Continuing Education* 2018; **01**(8): 111-3.
41. He KL, Tao M, Zhu XZ. Analysis of related factors of postpartum depression and preventive measure. *Chinese Journal of Woman and Child Health Research* 2019; **06**(30): 705-7.
42. Yu J. The study of postpartum depression in Shanghai [Thesis]; 2010.
43. Zhang Y, Zou S, Cao Y, Zhang Y. Relationship between domestic violence and postnatal depression among pregnant Chinese women. *INT J GYNECOL OBSTET* 2012; **116**(1): 26-30.
44. Zhang H, Zhou P, Liu L. Analysis of relevant factors of postpartum depression in rural primiparas. *Medical Journal of Chinese People's Health* 2014; **4**(26): 1-5.
45. Li J, Wang X. Analysis of influencing factors of postpartum depression in parturients in northern Anhui. *Journal of Fuyang Institute of Technology* 2104; **02**(25).
46. Liu S, Hu Y. Postpartum depression status and the influencing factors analysis. *Chinese Clinical Nursing* 2015; **04**(7): 281-3.
47. Liu Y, Li X, Zhang H, Liu Y. Current situation of postpartum depression and analysis of related social and psychological factors. *Maternal and Child Health Care of China* 2015; **22**(30): 3794-6.
48. Chen L, Ding L, Qi M, Jiang C, Mao X, Cai W. Incidence of and social-demographic and obstetric factors associated with postpartum depression: differences among ethnic Han and Kazak women of Northwestern China. *PEERJ* 2018; **6**: e4335.
49. Wang P. Analysis of related factors in 168 patients with postpartum depression. *Journal of Shandong Medical College* 2013; **04**(35): 278-80.
50. Li Y. Related risk factors for postpartum depression and its nursing intervention. *Journal of Clinical Medicine in Practice* 2019; **6**(23): 126-8, 132.
51. Guan A. Postpartum Depression Status and Influencing Factors of Hospitalized Parturients in Three General Hospitals of Baotou [Thesis]; 2012.

52. Zhang Y. Study of Psychosocial Factors for Postpartum Depression among 479 Wome [Thesis]; 2011.

53. Aiwen D, Ribo X, Jiang T, Luo Y, Wei D. Epidemiological study of postpartum depression among migrant women at Tianhe District of Guangzhou. *The Journal of Practical Medicine* 2014; 10(30): 1648-51.

54. Deng A, Xiong R, Jiang T, Luo Y, Chen W. Prevalence and risk factors of postpartum depression in a population-based sample of women in Tangxia Community, Guangzhou. *ASIAN PAC J TROP MED* 2014; 7(3): 244-9.

55. Han YH. Investigation on the incidence and influencing factors of postpartum depression in a certain area. *Guide of China Medicine* 2015; 12(13): 107-8.

56. Liu H. Analysis on the influencing factors of postpartum depression in rural women in Doumen District of Zhuhai city and the prevention countermeasures. *Maternal and Child Health Care of China* 2017; 14(32): 3100-2.

57. Zhou H, Qin Z, Yang X, Tang J, Mo J, Qian Q. Investigation and Analysis of related factors of Postpartum Depression among Women in Changzhou. *Maternal and Child Health Care of China* 2019; 6(34): 1347-51.

58. Liu P, Ya X. Analysis of influencing factors and nursing strategies of postpartum depression. *Maternal and Child Health Care of China* 2014; 33(29): 5402-3.

59. Xie R, He G, Koszycki D, Walker M, Wen SW. Fetal Sex, Social Support, and Postpartum Depression. *The Canadian Journal of Psychiatry* 2009; 54(11): 750-6.

60. Pan L. An analysis of the higher risk factors engendering postpartum depression. *Health Research* 2015; 05(35): 544-5.

61. Palumbo G, Mirabella F, Gigantesco A. Positive screening and risk factors for postpartum depression. *EUR PSYCHIAT* 2017; 42: 77-85.

62. Chen W, Li Y. Analysis of The Effect of Prenatal Anxiety and Depression on Obstetric Complications and Pregnancy Outcomes. *Modern Medical Imageology* 2018; 08(27): 2886-7.

63. Oztora S, Arslan A, Caylan A, Dagdeviren HN. Postpartum depression and affecting factors in primary care. *NIGER J CLIN PRACT* 2019; 22(1): 85-91.

64. Xiong R, Deng A, Wan B, Liu Y. Prevalence and factors associated with postpartum depression in women from single-child families. *INT J GYNECOL OBSTET* 2018; 141(2): 194-9.

65. Chu Y, Cordia M. Postnatal experience and health needs of Chinese migrant women in Brisbane, Australia. *Ethn Health* 2005; 10(1): 33-56.

66. Zhang YL, Zhang QG, Han JL. Related Study of Social Support and Coping Style of The Patients of Caesarean Birth of The Postpartum Depression. *Medicine and Philosophy (Clinical Decision Making Forum Edition)* 2008; 02: 57-8.
67. Malus A, Szyluk J, Galinska-Skok B, Konarzewska B. Incidence of postpartum depression and couple relationship quality. *PSYCHIATR POL* 2016; 50(6): 1135-46.

68. Steinberg S. Childbearing research: a transcultural review. *SOC SCI MED* 1996; 43(12): 1765-84.

69. Leung SK, Arthur D, Martinson IM. Perceived stress and support of the Chinese postpartum ritual “doing the month”. *Health Care Women Int* 2005; 26(3): 212-24.

70. Lau Y, Keung Wong DF. The Role of Social Support in Helping Chinese Women with Perinatal Depressive Symptoms Cope With Family Conflict. *Journal of Obstetric, Gynecologic & Neonatal Nursing* 2008; 37(5): 556-71.

**Tables**
Table 1
Characteristics of included studies

| Author  | Year | Place       | Sample size | PPD Group | Non-PPD Group | Assessment method | Quality scores |
|---------|------|-------------|-------------|-----------|----------------|-------------------|----------------|
| Lee12   | 2004 | Hong Kong  | 781         | 122       | 659            | EPDS              | 8              |
| Zhao14  | 2018 | Shanghai    | 215         | 67        | 148            | EPDS              | 7              |
| Pan15   | 2004 | Sichuan     | 427         | 33        | 394            | EPDS              | 6              |
| Zhao16  | 2018 | Sichuan     | 1440        | 25        | 1415           | EPDS              | 6              |
| Siu17   | 2012 | Hong Kong  | 805         | 126       | 679            | EPDS              | 7              |
| Li18    | 2017 | Shanxi      | 1759        | 593       | 1166           | EPDS              | 6              |
| Gu19    | 2004 | Shanghai    | 999         | 307       | 692            | HADS              | 6              |
| Sun20   | 2015 | Yunnan      | 528         | 96        | 432            | EPDS              | 6              |
| Kang21  | 2015 | Jiangsu     | 3972        | 468       | 3504           | EPDS > 10         | 6              |
| Dennis22| 2017 | Canadian immigrants | 549 | 120 | 429 | EPDS > 9 | 8 |
| Cai22   | 2017 | Chongqing   | 371         | 60        | 311            | EPDS ≥ 13         | 7              |
| Hu24    | 2010 | Sichuan     | 264         | 146       | 118            | EPDS > 9          | 6              |
| Gu25    | 2017 | Xinjiang    | 824         | 286       | 538            | EPDS > 13         | 6              |
| Zhang26  | 2017 | Guangdong   | 538         | 49        | 489            | EPDS > 10         | 7              |
| Wu27    | 2019 | Guangdong   | 1437        | 100       | 1337           | EPDS > 10         | 6              |
| Shen28  | 2011 | Shanxi      | 104         | 52        | 52             | EPDS > 13         | 6              |
| Yang29  | 2016 | Hubei       | 400         | 37        | 363            | EPDS > 13         | 6              |
| Zhang29  | 2001 | Tianjin     | 463         | 47        | 416            | EPDS ≥ 13         | 7              |
| Yin31   | 2011 | Guangdong   | 202         | 37        | 165            | SDS > 40          | 5              |

PPD: Postpartum depression; EPDS, Edinburgh postnatal depression scale; HADS: Hospital Anxiety and Depression Scale, SDS: Self-rating depression scale, SCL-90: Symptom Checklist 90, BDI: Beck Depression Inventory, CES-D: Center for Epidemiological Studies Depression Scale.
| Author | Year | Place          | Sample size | PPD Group | Non-PPD Group | Assessment method | Quality scores |
|--------|------|----------------|-------------|-----------|---------------|-------------------|----------------|
| Huang32 | 2012 | Hunan          | 302         | 56        | 246           | EPDS             | 6              |
| Song33  | 2012 | Hunan          | 285         | 69        | 216           | SDS              | 5              |
| Wang34  | 2013 | Beijing        | 435         | 27        | 408           | SCL-90 > 2       | 6              |
| Lin35   | 2014 | Zhejiang       | 2023        | 204       | 1819          | EPDS             | 5              |
| Zhou36  | 2014 | Hubei          | 378         | 294       | 84            | EPDS/SDS         | 5              |
| Wang37  | 2014 | Guizhou        | 875         | 112       | 763           | EPDS             | 7              |
| Chen37  | 2017 | Zhejiang       | 380         | 260       | 120           | EPDS > 13        | 7              |
| Jiang39 | 2018 | Shandong       | 185         | 25        | 160           | EPDS             | 5              |
| Han40   | 2018 | Henan          | 248         | 124       | 124           | EPDS > 10        | 5              |
| He40    | 2019 | Zhejiang       | 398         | 217       | 181           | SDS EPDS         | 5              |
| Yu42    | 2010 | Shanghai       | 673         | 73        | 600           | EPDS             | 7              |
| Zhang43 | 2012 | Hunan          | 215         | 67        | 148           | EPDS > 13        | 6              |
| Zhang44 | 2014 | Guangdong      | 586         | 87        | 499           | EPDS > 13        | 6              |
| Li45    | 2014 | Anhui          | 687         | 103       | 584           | EPDS             | 7              |
| Liu46   | 2015 | Hunan          | 232         | 43        | 189           | EPDS/HAD         | 5              |
| Liu47   | 2015 | Heilongjiang   | 576         | 162       | 414           | EPDS             | 6              |
| Chen48  | 2018 | Northwest China| 640         | 84        | 556           | EPDS > 13        | 6              |
| Wang49  | 2013 | Shandong       | 917         | 168       | 749           | EPDS/SDS         | 5              |
| Li50    | 2019 | Shanxi         | 170         | 85        | 85            | SDS              | 5              |
| Guan51  | 2012 | Inner Mongolia | 246         | 92        | 154           | EPDS > 9         | 6              |

PPD: Postpartum depression; EPDS, Edinburgh postnatal depression scale, HADS: Hospital Anxiety and Depression Scale, SDS: Self-rating depression scale, SCL-90: Symptom Checklist 90, BDI: Beck Depression Inventory, CES-D: Center for Epidemiological Studies Depression Scale.
| Author | Year | Place    | Sample size | PPD Group | Non-PPD Group | Assessment method          | Quality scores |
|--------|------|----------|-------------|-----------|---------------|----------------------------|----------------|
| Zhang  | 2011 | Hubei    | 479         | 167       | 312           | BDI ≥ 5                    | 6              |
| Deng   | 2014 | Guangdong| 2021        | 158       | 1863          | CES-D > 20                 | 6              |
| Deng   | 2014 | Guangdong| 1823        | 499       | 1324          | EPDS > 13                  | 7              |
| Han    | 2015 | Beijing  | 203         | 189       | 14            | EPDS > 13, HAD > 9         | 6              |
| Liu    | 2017 | Guangdong| 418         | 93        | 325           | EPDS > 9.5                 | 5              |
| Zhou   | 2019 | Jiangsu  | 849         | 142       | 707           | EPDS > 10                  | 6              |
| Liu    | 2015 | Hubei    | 1427        | 198       | 1229          | EPDS ≥ 9                   | 5              |
| Xie    | 2018 | Hubei    | 534         | 103       | 431           | EPDS                       | 6              |
| Pan    | 2015 | Zhejiang | 745         | 93        | 652           | EPDS                       | 5              |

PPD: Postpartum depression; EPDS, Edinburgh postnatal depression scale, HADS: Hospital Anxiety and Depression Scale, SDS: Self-rating depression scale, SCL-90: Symptom Checklist 90, BDI: Beck Depression Inventory, CES-D: Center for Epidemiological Studies Depression Scale.
Table 2  
Sensitivity analysis of risk factors of postpartum depression

| Risk factors                     | Type of research | OR   | 95% CI        | OR   | 95% CI        |
|---------------------------------|------------------|------|---------------|------|---------------|
| Prenatal depression             | Cohort study     | 4.21 | [2.82, 6.27]  | 4.40 | [2.64, 7.34]  |
|                                 | Case control study | 11.09 | [8.13, 15.12] | 12.72 | [7.85, 20.62] |
| marriage relationship           | Cohort study     | 5.76 | [3.86, 8.59]  | 5.76 | [3.27, 10.13] |
|                                 | Case control study | 2.93  | [2.36, 3.64]  | 2.93 | [2.36, 3.64]  |
| Mother-in-law relationship      | Cohort study     | 3.84 | [2.61, 5.65]  | 3.57 | [1.87, 6.82]  |
|                                 | Case control study | 2.37  | [2.17, 2.58]  | 2.70 | [1.90, 3.85]  |
| Social support                  | Cohort study     | 6.30 | [5.07, 7.83]  | 6.18 | [4.10, 9.31]  |
|                                 | Case control study | 1.97  | [1.75, 2.22]  | 1.85 | [1.52, 2.25]  |
| Economic foundation             | Cohort study     | 3.50 | [1.65, 7.43]  | 4.46 | [1.09, 18.20] |
|                                 | Case control study | 3.50  | [2.90, 4.22]  | 3.50 | [2.90, 4.22]  |
| Unplanned pregnancy             | Case control study | 2.55  | [2.08, 3.14]  | 2.64 | [2.04, 3.40]  |
| Prenatal anxiety                | Case control study | 7.93  | [5.76, 10.90] | 7.07 | [4.12, 12.13] |
| Mother-in-law as the caregiver   | Case control study | 2.50  | [1.67, 3.74]  | 2.50 | [1.67, 3.74]  |
| Living conditions               | Case control study | 2.44  | [1.92, 3.10]  | 2.65 | [1.96, 3.57]  |

ORs: odds ratios; CIs: corresponding 95% confidence intervals

Figures
Figure 1

Flowchart steps of the meta analysis

- Records identified through electronic database search (n=887)
- Duplicates removed (n=196)
- Record screened after duplicates removed (n=691)
- Studies excluded based on abstracts (n=456)
- Full-text articles evaluated for eligibility (n=235)
- Total paper excluded after full-text screening (n=187)
  - Does not conform to the study type (n=65)
  - Does not conform to the research object (n=33)
  - Studies not reporting on clinical outcomes (n=89)
- Studies include in meta analysis (n=48)
### Figure 2

**Poor relationship between husband and wife**

| Study or Subgroup | log(Odds Ratio) | SE  | SEL | Weight | Odds Ratio IV, Fixed, 95% CI | Odds Ratio IV, Fixed, 95% CI |
|-------------------|-----------------|-----|-----|--------|-------------------------------|-------------------------------|
| 1.2.1 Case control |                 |     |     |        |                               |                               |
| He Kai-Li 2019    | 1.1796          | 0.3869 | 6.4% | 3.25 [1.53, 6.93]          |                               |
| Zhou Qiong 2014   | 1.1401          | 0.361 | 7.9% | 3.13 [1.84, 5.24]          |                               |
| Jiang Yan 2018    | 1.4598          | 0.75  | 1.7% | 4.48 [1.03, 19.48]         |                               |
| Song Le-Qun 2012  | 1.4839          | 0.4986 | 3.8% | 4.41 [1.66, 11.72]         |                               |
| Yin Jing 2011     | 1.4207          | 0.6361 | 2.3% | 4.14 [1.18, 14.40]         |                               |
| Zhang Xin 2001    | 0.8629          | 0.3025 | 10.4% | 2.37 [1.31, 4.29]         |                               |
| Lin Yu-Ping 2014   | 0.9127          | 0.2447 | 15.8% | 2.49 [1.54, 4.02]         |                               |
| Wang Ya-Chao 2014  | 0.8586          | 0.3067 | 9.9%  | 1.93 [1.06, 3.54]         |                               |
| Wang Xiao-Li 2013  | 1.0483          | 0.598 | 2.7%  | 2.83 [0.86, 9.10]         |                               |
| Chen Xiao-Di 2017  | 1.5577          | 0.5029 | 3.7%  | 4.75 [1.77, 12.72]        |                               |
| Han Yan-Hong 2018  | 1.1467          | 0.3333 | 8.5%  | 3.15 [1.64, 6.05]         |                               |
| Huang Gu-Hua 2012  | 1.6262          | 0.4466 | 4.7%  | 4.77 [1.96, 11.49]        |                               |
| **Subtotal (95% CI)** |               |     |     | 77.2%  | 2.93 [2.36, 3.64]          |                               |
| **Heterogeneity:** Chi² = 6.29, df = 11 (P = 0.85); P = 0% |       |     |     |                               |                               |
| Test for overall effect: Z = 9.73 (P < 0.000001) |       |     |     |                               |                               |

#### 1.2.2 Cohort study

| Study or Subgroup | log(Odds Ratio) | SE  | SEL | Weight | Odds Ratio IV, Fixed, 95% CI | Odds Ratio IV, Fixed, 95% CI |
|-------------------|-----------------|-----|-----|--------|-------------------------------|-------------------------------|
| Bonnie WM 2012    | 1.8625          | 0.3229 | 9.1%  | 6.44 [3.42, 12.13]         |                               |
| Li Hua-Li 2017    | 2.0398          | 0.3498 | 7.8%  | 7.46 [3.76, 14.83]         |                               |
| Hu Juan 2010      | 1.0716          | 0.4129 | 5.6%  | 2.92 [1.30, 6.56]          |                               |
| Gu Wei 2004       | 3.8491          | 1.6279 | 0.4%  | 46.96 [1.93, 1141.07]      |                               |
| **Subtotal (95% CI)** |               |     |     | 22.6%  | 5.70 [3.86, 8.59]          |                               |
| **Heterogeneity:** Chi² = 5.03, df = 3 (P = 0.17); P = 40% |       |     |     |                               |                               |
| Test for overall effect: Z = 8.53 (P < 0.000001) |       |     |     |                               |                               |

**Total (95% CI)** 100.0% 3.42 [2.82, 4.13]

**Heterogeneity:** Chi² = 19.81, df = 15 (P = 0.18); P = 24%

**Test for overall effect:** Z = 12.52 (P < 0.000001)

**Test for subgroup differences:** Chi² = 8.49, df = 1 (P = 0.004), P = 88.2%
### Figure 3

**Poor economic foundation**

| Study or Subgroup | log[Odds Ratio] | SE | Weight | Odds Ratio IV, Fixed, 95% CI | Odds Ratio IV, Fixed, 95% CI |
|-------------------|-----------------|----|--------|-----------------------------|-----------------------------|
| **Case control**  |                 |    |        |                             |                             |
| Shen Rong 2011    | 3.1826          | 0.4592 | 7.4%   | 24.11 [9.80, 59.30]         | 2011                        |
| Yang Li-Ping 2016 | 2.6659          | 0.3663 | 10.5%  | 15.30 [8.17, 30.04]         | 2016                        |
| Gu Shen-Sen 2017  | 2.6879          | 0.2162 | 33.4%  | 8.15 [5.33, 12.45]          | 2017                        |
| Zhang Xian 2017   | 2.9806          | 0.6511 | 3.7%   | 19.90 [5.56, 71.20]         | 2017                        |
| Wu Xiang-Qi 2019  | 2.0821          | 0.4649 | 7.2%   | 8.02 [5.22, 19.95]          | 2019                        |
| **Subtotal (8%) CI** |                |    |        | 82.3% [8.13, 15.12]         |                             |
| **Heterogeneity:** |                |    |        | $\chi^2 = 7.55$, df = 4 (P = 0.11); I² = 47% |                             |
| Test for overall effect: |                |    |        | Z = 15.19 (P < 0.00001)     |                             |

| **Cohort study** |                 |    |        |                             |                             |
| Pan Xiao-Fang 2004 | 2.3618          | 0.5375 | 5.4%   | 10.61 [3.70, 30.43]         | 2004                        |
| Loo, DT 2004      | 0.9933          | 0.3929 | 10.1%  | 2.70 [1.25, 5.83]           | 2004                        |
| Ying Zhao 2018    | 1.6527          | 0.599 | 4.4%   | 5.22 [1.81, 15.88]          | 2018                        |
| Zhao Zhi-Mei 2018 | 1.3958          | 0.2965 | 17.8%  | 3.89 [2.17, 6.94]           | 2018                        |
| **Subtotal (8%) CI** |                |    |        | 37.7% [2.82, 6.27]          |                             |
| **Heterogeneity:** |                |    |        | $\chi^2 = 4.44$, df = 3 (P = 0.22); I² = 32% |                             |
| Test for overall effect: |                |    |        | Z = 7.06 (P < 0.00001)      |                             |
| **Total (95%) CI** |                |    |        | 10.5% [6.52, 9.83]          |                             |
| **Heterogeneity:** |                |    |        | $\chi^2 = 26.08$, df = 8 (P = 0.001); I² = 69% |                             |
| Test for overall effect: |                |    |        | Z = 16.32 (P < 0.00001)     |                             |
| Test for subgroup differences: |                |    |        | $\chi^2 = 14.09$, df = 1 (P = 0.0002); I² = 92.9% | Reduced PPD Risk Increased PPD Risk |

### Figure 4

**Prenatal depression**

Figure 5

Poor relationship between mother-in-law and daughter-in-law

Figure 6

Lack of social support (before adjustment)
Figure 7

Lack of social support (after adjustment)

| Study or Subgroup    | log(Odds Ratio) | SE  | Weight | Odds Ratio IV, Fixed, 95% CI | Year |
|----------------------|-----------------|-----|--------|-----------------------------|------|
| Yu Jin 2010          | 1.1227          | 0.4663 | 5.2%   | 3.07 [1.23, 7.66]           | 2010 |
| Yong Zhang 2012      | 1.4693          | 0.8103 | 3.0%   | 4.35 [1.31, 14.37]          | 2012 |
| Zhang 2014           | 1.1119          | 0.2452 | 16.6%  | 3.04 [1.68, 4.32]           | 2014 |
| Li Jun 2014          | 1.1537          | 0.2199 | 23.2%  | 3.17 [2.06, 4.88]           | 2014 |
| Liu Shen-Mei 2015    | 1.5282          | 0.4971 | 4.5%   | 4.61 [1.74, 12.21]          | 2015 |
| Liu Yi-Di 2015       | 0.5365          | 0.198  | 28.6%  | 1.71 [1.16, 2.52]           | 2015 |
| Ling Chenn 2018      | 0.8185          | 0.2577 | 16.9%  | 2.27 [1.37, 3.76]           | 2018 |

Total (95% CI) 100.0% 2.55 [2.08, 3.14]

Heterogeneity: $\chi^2 = 8.12$, df = 6 ($P = 0.23$); $I^2 = 26$

Test for overall effect: $Z = 8.86$ ($P < 0.00001$)

Figure 8

Unplanned pregnancy
### Figure 9

**Poor living conditions**

| Study or Subgroup | log(Odds Ratio) | SE  | Weight | IV, Random, 95% CI Year |
|-------------------|-----------------|-----|--------|-------------------------|
| Gu Shen-Sen       | 2.2908          | 0.2417 | 32.8%  | 9.88 [8.15, 15.87] 2017 |
| Zhang Xian        | 1.4796          | 0.5799 | 19.9%  | 4.39 [1.41, 13.68] 2017 |
| Chen Li-Shan      | 2.3933          | 0.3044 | 28.5%  | 10.95 [6.03, 19.88] 2018 |
| Wu Xiang-Qi       | 1.27            | 0.3812 | 23.8%  | 3.55 [1.69, 7.52] 2019 |

Total (95% CI) 100.0% 7.07 [4.12, 12.13]

Heterogeneity: Tau² = 0.17; Chi² = 7.40, df = 3 (P = 0.06); I² = 59%

Test for overall effect: Z = 7.10 (P < 0.00001)

### Figure 10

**Prenatal anxiety**

| Study or Subgroup | log(Odds Ratio) | SE  | Weight | IV, Fixed, 95% CI |
|-------------------|-----------------|-----|--------|-------------------|
| Ling Chen         | 0.9555          | 0.281 | 53.2%  | 2.90 [1.50, 4.51] |
| Guan An-Na        | 0.8713          | 0.3056 | 44.9%  | 2.39 [1.31, 4.35] |
| Zhang Ying        | 0.9159          | 1.4815 | 1.9%   | 2.50 [0.14, 45.59] |

Total (95% CI) 100.0% 2.50 [1.67, 3.74]

Heterogeneity: Chi² = 0.04, df = 2 (P = 0.93); I² = 0%

Test for overall effect: Z = 4.48 (P < 0.00001)

### Figure 11

**Mother-in-law as the caregiver**
Figure 12

Poor relationship between husband and wife funnel plot
Figure 13

Poor economic foundation funnel plot

Supplementary Files

This is a list of supplementary files associated with this preprint. Click to download.

- PRISMAforMetaAnalyseschecklist.doc