Effects of Antenatal Depression Screening and Intervention among Chinese High-risk Pregnant Women with Medically Defined Complications: A Randomized Controlled Trial

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Abstract

Aim- High-risk pregnant women with antenatal depression are prone to postpartum depression. The purpose of this study was to evaluate the effectiveness of an antenatal depression screening and intervention among Chinese high-risk pregnant women with medically defined complications.

Methods- Using a randomized controlled trial design, we enrolled 352 pregnant women with obstetrical complications and an EPDS e 9 or PDSS e 60. These participants were randomly assigned into the intervention group (n=176) and control group (n=176). The intervention group underwent a 6-session group intervention with one session focused on the husbands; the control group received the usual care. Participants were assessed at baseline, late pregnancy (e28 weeks), three days and 42 days after delivery with PDSS and EPDS.

Results- Analysis of variance of repeated measures showed significant differences at each time point between groups. Analysis of the Kruskal-Wallis test showed that there was no statistically significant differences in the PDSS and EPDS scores at any time point among the high-risk pregnant women who attended different frequencies of the maternal intervention sessions (p＞.05). Analysis of the Mann-Whitney U test showed that the PDSS and EPDS were also not impacted based on whether or not the husbands participated in Session 6 of the intervention (p＞.05).

Conclusions- This study highlights the effectiveness of the screening and the targeted management of antenatal depression in Chinese high-risk pregnant women.

Introduction

Depression is a common health problem among women during the childbearing years.[1] According to the literature, approximately, 12.8% of women will suffer from depression

prenatally and 9.9% will experience depression postnatally.[2] High-risk pregnancy is also a highly distressing event, which includes a range of obstetric diagnoses.[3] Women categorized with a high-risk pregnancy due to medically defined complications have been described as more at risk for severe psychological problems. Robertson and colleagues undertook a systematic, evidence- based literature review of risk factors for postpartum depression and suggested that obstetric factors including pregnancy-related complications such as preeclampsia, hyperemesis, premature labor, as well as delivery-related complications, such as caesarean section, instrumental delivery, premature delivery, and excessive bleeding intrapartum have been examined as potential risk factors for postpartum depression.[4] Moreover, Blom and colleagues conducted a prospective longitudinal study, in which a cohort of 4941 pregnant women were enrolled, and showed that the risk of postpartum depression increased with the number of perinatal complications women experienced (p<.001).[5] Thus, screening for antenatal depression is recommended for all pregnant women, but high-risk pregnant women are particularly at risk.

The negative consequences of untreated maternal depression appear to include an increase in obstetrical complications and women with untreated maternal depression appear to be more likely to engage in high-risk health behaviors.[6] Sun compared 65 cases of high-risk pregnancy and 162 cases of normal pregnancy on psychological status and pregnancy outcomes, and found that high-risk pregnant women had a higher rate of cesarean section, stillbirth, fetal distress and instrument delivery due to a higher incidence of prenatal anxiety and depression (p<.05).[7] These results were consistent with Alder et al., who concluded that depression during pregnancy was associated with obstetric complications, as well as adverse fetal and neonatal outcomes, and depressed women reported more somatic symptoms, had more visits to the obstetrician, and received more pain relief during labor.[8]

In recent years, there have been a growing number of studies that demonstrate the relationship between antenatal depression and postnatal depression. A number of scholars in China and abroad have found that the following risks factors are the strongest predictors of postpartum depression: depression during pregnancy, anxiety during pregnancy, experience

of stressful life events during pregnancy, low levels of social support, and a previous history of depression.[9-12]Therefore, screening for depression and subsequent management should be initiated early in the pregnancy to prepare women for the stress of motherhood and to strengthen women's learned resourcefulness skills and support networks for better coping with the complexity of the maternal role, thus minimizing the risk of postnatal depression.[13]

Concomitant with the increase in high-risk pregnancy rates, the incidence of psychological problems such as anxiety and depression in Chinese pregnant women has increased.[14] In a previous study,[15] our team enrolled a total of 842 pregnant women with complications who then completed the Postpartum Depression Screen Scale (PDSS) to screen antenatal depression. We found the prevalence of antenatal major and minor depression was 8.3% and 28.9% respectively, which was consistent with previous studies among Chinese women.[16-17] These results suggest that Chinese high-risk pregnant women's psychological problems may be more severe and necessitate focused professional attention.[18]

There is consequently a significant need to improve access to effective and acceptable interventions for antenatal depression, especially for women who experience obstetrical complications. However, there is little research providing a comprehensive test of the feasibility and acceptability of an antenatal depression screening and intervention that is focused on postpartum depression and delivered to high-risk pregnant women. In light of this, we carried out a prospective randomized controlled trial (RCT) for a sample of potentially depressed women presenting with obstetrical complications for prenatal care in obstetrics clinics in China. We aim to evaluate the effectiveness of antenatal depression screening and management on postpartum depression among this sample of Chinese high-risk pregnant women.

Methods

Study design and participants

This study was a two-armed randomized controlled trial in the Fudan University affiliated Obstetrics and Gynecology Hospital which is a major teaching hospital located in Shanghai,

China. The antenatal clinic serves a wide range of pregnant women including low- and high-risk pregnant patients with medically defined complications. Ethical approval was obtained from the Institutional Review Board (IRB) of Fudan University affiliated Obstetrics and Gynecology Hospital (registration number 24-C-2015-24, [2013]24). After providing their written informed consents, the participants were randomly assigned into the intervention and control group and asked to complete questionnaires on depressive symptomatology and psychosocial correlates.

Recruitment and screening by the Edinburgh Postnatal Depression Scale (EPDS) and Postpartum Depression Screening Scale (PDSS) were conducted by research assistants during routine visits to Fudan University affiliated Obstetrics and Gynecology Hospital antenatal clinic from November 2014 to August 2015. To be eligible, participants needed to be: 1) pregnant with medically defined complications (Table 1. lists the complications in these participants), 2) less than 28 gestational weeks, 3) have an EPDS e 9 or PDSS e 60, 4) agree to participate, 5) primigravida, and 6) attend periodic the antenatal medical appointments. Those diagnosed with intellectual disabilities and/or dementia were excluded. We also excluded participants who met criteria for major depression and provided referrals for more intensive treatments. The total of 352 pregnant women were considered eligible for inclusion and randomly assigned into the intervention group (n=176) and control group (n=176) (see Figure 1).

Sample Size

Sample size was powered to detect a clinically meaningful difference in reduction of symptoms of postpartum depression for women in the intervention group in comparison with women in the control group. Assuming that approximately 40% of high-risk pregnant women would report depressive symptoms in the control group (based on previous research),[19] our recruitment target of 306 patients (153 per group) met 80% power based on a two-sided *p*=.05-level Chi-Squared test to detect a clinically meaningful 15% reduction in depressive symptoms (from 40 to 25%, a relative risk reduction of about 15%). To allow for decreased power due to 15% sample loss at follow-up, we planned to enroll 352 participants.

Randomization

First we numbered the high-risk pregnant women according to their enrolled time. Then we used a random number table to randomize women to either the intervention or control group.

Intervention

The intervention content and manual were developed based on previous RCT study [20] which was focused on Chinese women with normal pregnancies by the research team that included three clinical psychologists and two senior obstetric head nurses. In this study, we modified the psychological intervention program to adapt it to high-risk groups. The intervention is a combination of 6-session group psychological intervention and continuous support between sessions. The group intervention schedule followed antenatal medical appointments wherever possible and the individual counseling were carried out via telephone or email to provide continuous support between sessions. Each therapist was in charge of his or her own session and was trained together by the research team leader, who is a psychological expert. The first round of the 6-session group psychological interventions was carried out under the supervision of the research team leader in order to make sure the intervention adhered to the manual and maintain the treatment fidelity. Each session lasted one and a half hours. Among 6 sessions, five were focused on maternal mental health and one was focused on the husbands. There were 10-12 participants per group. According to the different antenatal exam appointments, the participants were flexible and not fixed in each group. The group was guided by the researchers, and participants interactively discussed pre-determined topics for the first hour of each session (see Table 2 for additional details about each session). After the interactive discussion, participants were given a 10 minute rest and then they received tailored group specific education based on the problems that came up during the interactive discussion for the remaining 30 minutes of the session. Each session began after 10:00am and ended at 12:00pm, so participants were provided with free food and water. Each of them had its own focus and topics.

- Session 1: facilitated the awareness of antenatal anxiety and depression.
- Session 2: enhanced high-risk pregnancy related knowledge and reducing anxiety and

depression due to obstetrical complications.

- Session 3: developed a proper understanding of postpartum depression and making an initial self-assessment for the risk factors of postpartum depression.
- Session 4: encouraged appropriate psychological defense mechanism to cope with a disharmonious family relationship and stressful events.
- Session 5: discussed the delivery experience, encouraging participants to express negative emotions and address misconceptions about high-risk deliveries.
- Session 6: instructed husbands to identify symptoms of postpartum depression and respond to its early warning signs in order to improve prompt diagnosis and promote postnatal maternal mental health.

Control Group

Women allocated to the control group received routine obstetrical care. They were screened with the PDSS and EPDS at each time point and then given feedback about their depression status from the research assistants. Risk was assessed at each interview point. If the participant was identified as being at risk for suicide or had suicidal ideations, then she was advised to be referred to the psychiatry department of the Fudan University affiliated Hushan Hospital for the further psychotherapy and case management.

Measures

EPDS-The EPDS is a 10-item instrument that was used to measure depressive symptoms at several time points during pregnancy and after childbirth.[21] The cut-off points of 9/10 are used as markers of possible minor depression[22]and scores >12 are associated with a diagnosis of major depressive disorder.[21] The Chinese vision of the EPDS has good validity. The area under the curve was 0.91, suggesting excellent psychometric properties in screening for depressive illness (major and minor depression).[23] In the Chinese population, scores e 9 suggest risk for major or minor depression while a cut-off score of 13 or more indicates a positive screen for major depression.[23] Since our study wanted to detect any level of depression we chose the cut-off point of 9. The reliability of the EPDS in this study was 0.807.

PDSS- The PDSS is a 35-item self-report instrument used to detect depression.[24] Although developed for postpartum depression, the PDSS has also been used to screen for antenatal depression.[25] Li et al. translated the PDSS from English into Chinese, reporting a Cronbach's ± of 0.96 and an intra-class correlation coefficient of 0.79.[26] In Chinese high-risk pregnant women, scores e 60 suggest risk for major or minor depression. A cut-off score of 80 or more indicates a positive screen for major postpartum depression.[27] We utilized a cut-off score of 60 for this study to be able to detect both minor and major depression. The reliability of the PDSS in this study was 0.954.

In our former study, [27] the EPDS and PDSS proved to be reliable assessments for major and minor depression among the Chinese pregnant women with obstetric complications. Combined use of these tools should consider lower cutoff scores to reduce the misdiagnosis and improve the screening validity.

Diagnostic interview-The Mini-International Neuropsychiatric Interview (MINI) is a short structured diagnostic interview, developed jointly by psychiatrists and clinicians in the United States and Europe, for DSM-IVand ICD-10 psychiatric disorders.[28] Si et al. evaluated the reliability and validity of the Chinese version of the Mini-International Neuropsychiatric Interview, and reported the mean sensitivity of the MINI was 91.2%-100% and it had a kappa value of 0.94.[29]

Follow-Up Assessments

Participants were re-administered the EPDS and PDSS in late pregnancy (e 28 weeks) and at three days and 42 days postnatal follow up. At recruitment and 42 days after delivery, participants whose score indicated major depression (EPDS e 13 or PDSS e 80) were interviewed using the Chinese version of the MINI.[29] The MINI was administered by the trained research assistant blinded to treatment status.

Statistical Analyses

The Statistical Package for the Social Science (SPSS) version 19 was used for data analysis. The intervention and control group conditions were compared on baseline values using Chi-Square, t-test, and Fisher's exact test analyses on categorical and continuous measures. The difference between the intervention and control group on the primary outcomes were calculated using repeated measures analysis of variance (RM-ANOVA). The Kruskal-Wallis test was used to evaluate the relationship between intervention frequency and effects. The Mann-Whitney U test was used to test the effects of Session 6 on the husbands. All significance levels were two-tailed and set at $p<.05$.

Results

Participants' Characteristics

The two groups were similar in all demographic and obstetrical characteristics and no between-group differences were noted at baseline. There were also no significant differences on baseline EPDS or PDSS scores between the intervention and control groups (Table 3). Nine participants were lost to follow-up in the intervention group and nine in the control group at follow-ups (Figure 1).There were no baseline differences between participants who were lost to follow-up and those who continued.

Changes on EPDS and PDSS Scores

Table 4 reports the mean baseline EPDS and PDSS scores and changes from baseline to 42 days postnatal for intervention and control groups. The analysis of longitudinal data showed there were significant group by time effects as well as time effects. Regarding the significant interaction between time and group, RM-ANOVA analyses showed significant differences at each time point between groups as a consequence of a major improvement of the EPDS and PDSS scores of the women assigned to the intervention group. After controlling for baseline depression scores, women in the intervention group had a greater decrease in their depressive symptoms than women in the control group in late pregnancy, three days and 42 days postnatally ($p<.05$) (see Figure 2 and 3).

Depression Diagnosis by MINI

Using the MINI, the presence of depression was ascertained at 42 days postnatally in the following individuals: 1) participants in each group whose EPDS e 13 or PDSS e 80, 2) we extracted 30% of those whose EPDS = 9-12 or PDSS = 60-79, and 3) we extracted 10% from those whose EPDS ＜ 9and PDSS ＜ 60. Thus, 33 participants in the intervention group and 45 participants in the control group were interviewed with the MINI. After being interviewed, there were 6 positives in the intervention group, including generalized anxiety disorder (GAD; n=3), dysthymia (n=2) and depression comorbid with anxiety (n=1). There were 18 positives in the control group, including GAD (n=9), depression (n=3), dysthymia (n=4) and depression comorbid with anxiety (n=2). Analysis of Fisher's exact test for the MINI indicated significant differences between the two groups (p<.05) (Table 5). In response to the question, " Did you repeatedly consider hurting yourself, feel suicidal, or wish that you were dead?", one women in the intervention group and three women in the control group said yes. All of them were advised to referral for the further psychotherapy.

Adherence

There were five maternal sessions and one husband-specific session scheduled as part of the intervention. Figure 1 shows the number of sessions attended. Women received an average of 3.50 (SD = 1.51) sessions during pregnancy. Among them, 72.7% participated in at least half (e3) of the maternal sessions, 39.2% participated in all (5) sessions, and 52.3% of the husbands participated. Women's reasons for non adherence mainly included the following: antenatal exam time lasted too long, too many antenatal exam items, busy with work and not having time, uncomfortable due to complications, and did not have transportation (many women were unable to drive to the hospital due to complications). Husbands' reason for non adherence was mainly due to being busy with work and lack of time. Analysis of the Kruskal-Wallis test showed that there was no statistically significant differences in the PDSS and EPDS scores at any time point among the high-risk pregnant women who attended different frequencies of the maternal intervention sessions (p＞.05). Analysis of the Mann-Whitney U test showed that the PDSS and EPDS were also not impacted based on whether or not the husbands participated in Session 6 of the intervention (p＞.05).

Discussion

Expanding upon a previous intervention study on postpartum depression among Chinese pregnant women without any complications, [20] we developed a group interactive psychological intervention targeting high-risk pregnant women. We successfully reduced perinatal depressive symptoms in a RCT, which proved interventions selectively targeting women at elevated risk for postpartum depression may be more effective than universal interventions aimed at preventing postpartum depression.[30] This intervention was tailored to the needs of each individual group. Specifically, we focused the last 30 minutes of each intervention on the group's questions, problems, and identified educational needs. The results of this study support the need for tailored interventions that meet the demands of high-risk pregnant women. Han enrolled 120 high-risk pregnant women and conducted a prenatal demand questionnaire survey before the onset of intervention.[31] After the targeted intervention, the high-risk pregnant women's physiological and psychological conditions were effectively improved. Our study results were consistent with his findings on the psychological response and clearly testify that psychological interventions with tailored interventions meet the real demand of high-risk pregnant women. The perinatal outcomes were described elsewhere.[32]

By implementing an antenatal depression screening, we found awareness of antenatal depression was increased not only among the obstetric staff but also among the high-risk pregnant women. Many obstetric doctors and nurses actively attempted to ask about the questions associated with antenatal depression. For most high-risk pregnant women enrolled in the study, they began to express concern about their psychological health and learned to adjust unstable emotions. Thus, we also found a significant effect on depressive symptom in the control group ($p<.05$), which proved the importance of universal screening for perinatal depression. However, screening alone does not improve treatment rates or patient outcomes.[33] Our results confirmed that antenatal depression screening alone cannot achieve the same significant effects of preventing and reducing postpartum depression as our intervention did. Therefore, the importance of a tailored intervention after depression screening during

pregnancy cannot be overemphasized.[34]

In this study, there were five maternal sessions, and women received an average of 3.5 sessions during pregnancy, slightly lower than what Freeman and Davis reported,[35] but no significant differences on perinatal depression were found between the number of sessions attended, which was consistent with the results of Milgrom et al.[36] Tang and colleagues evaluated the same intervention on Chinese pregnant women who were not considered high-risk. They had higher retention rates but did not capture significant differences due to the intervention.[20] Just like the findings in the study of Milgrom et al.,[36] although not all participants were able to attend every intervention session, they expressed a desire to discuss their unstable mood and distressing events through other methods. These participants contacted the study researchers via telephone, email, or made appointments for individual counseling. It is possible that continuous psychological supports are even more helpful since there were no significant difference of the outcome measure no matter how many sessions taken. We explored the reasons for not attending each intervention session by contacting each participant after an absence. O'Mahen and colleagues found that the reasons participants in the United States did not attend each intervention session in their study included: not liking the session-by-session questionnaires, wanting more practical advice from the therapist, not having time, and so on.[2] Many of these reasons were also noted by our participants. Additionally, pregnant women in China often wait a long time for antenatal exams in the obstetric clinic. Due to this, the timing of antenatal exams was uncertain and many of our participants cited this as the primary reason for missing an intervention session. Therefore, we suggest that it is necessary to reduce the waiting time for antenatal exams to improve the compliance of interventions in the future. Moreover, participants preferred to choose the interested sessions whose topics they were very concerned about and attend them. So we suggest that the intervention curriculum offered by hospitals should be flexible. Then high-risk pregnant women may have more choices and better compliance to attend the group sessions which maybe improve the cost-effectiveness.

Similarly, in our study, only 52.3% of the husbands participated in the Session 6 intervention,

which was lower than we anticipated. But the results showed that the outcomes of the intervention were not impacted based on whether or not the husbands participated. These results were consistent with the results of Tang et al.[20] when using the same intervention sessions. From these results, we can surmise that a one-time session for husbands may not raise their awareness of postpartum depression screening and treatment in such a short period. Thus, with a one-time session in China it is possible that the husbands could not play a positive and effective role in the prevention of postpartum depression as expected. The study by Brandon et al. demonstrated the effectiveness of partner-assisted therapies on prenatal depression,[37] however, the lack of a control group limited the results. Therefore, future studies should focus on the attendance of partners in rigorous RCT studies to determine if they truly impact mental health outcomes.

Psychosocial interventions to reduce or prevent postpartum depression are becoming increasingly popular, and the evidence base supporting their efficacy is growing.[38] Our findings suggests a preventive intervention effect, in which intervention participants were buffered against feelings of anxiety about their complications, delivery, and the maternal role during the perinatal period. This is the first RCT that explored an antenatal depression screening and management model for high-risk pregnant women in a Chinese maternity clinic. Feedback collected during this study suggests that high-risk pregnant women and providers accept and are satisfied with this model of care and universal depression screening was well accepted in our study.

However, there are limitations to be noted. First, this trial was implemented at only one institution which limits the generalizability of our results. Second, we only measure depressive symptom at 42 days after delivery and could not confirm the long-term effect of the intervention. Finally, many participants did not attend all of the six intervention sessions which limited the effects. However, analyses indicate that the number of sessions attended did not impact overall results on the EPDS or PDSS.

Conclusion

In conclusion, research has shown that high–risk pregnant women develop depressive symptoms during the early stages of pregnancy and these have the potential to last the whole perinatal period.[39] Furthermore, antenatal depression has been identified as a risk factor for postpartum depression.[40] Thus, active screening, earlier identification, and effective management of antenatal depression are of critical importance for the health of high-risk pregnant women.[41] Our study not only proved that a preventive antepartum group intervention consisting of six psycho-education sessions, focused on anxiety and depression adjustment, complication management, coping mechanisms, and family support can be effective in reducing the risk of postpartum depression among Chinese high-risk pregnant women, but also added to the evidence base that early detection is the best approach to prevent the postpartum depression.[42]Moreover, our findings highlight the effectiveness of the screening and the targeted management of antenatal depression in Chinese high-risk pregnant women. Screening for depression by combined using the EPDS and PDSS helped to identify the potentially depressed women presenting with obstetrical complications effectively during antenatal period, and subsequent targeted management effectively supported women for better coping with the complexity of the maternal role, thus minimizing the risk of postnatal depression. Further studies should examine the long-term effect of the antenatal depression screening and management.

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Figure 1. Consort diagram of all participants at recruitment and follow-ups

Figure 2. Between-group change in EPDS score

Figure 3. Between-group change in PDDS score

Table 1

Summary of Pregnancy Complications (n=352)

Types of complications	Number	%
Abnormal body mass index	111	31.5
Agee 35years old	27	7.7
Pregnancy -induced hypertension	5	1.4
Gestational diabetes	42	11.9
Heart disease	5	1.4
Thyroid disease	87	24.7
Hepatic disease	30	8.5
Blood disease	7	2.0
Kidney disease	1	0.3
Placenta previa	10	2.8
Twin pregnancy	19	5.4
Syphilis	1	0.3
Abnormal gestation history	31	8.8
Previous Infertility History	13	3.7
Genital tumors(eg. uterus myoma, ovarian cyst)	51	14.5
In-vitro-fertilization	30	8.5
Physical discomfort	29	8.2
High myopia	6	1.7
Breech position	5	1.4
Fetal dysplasia	4	1.1

Table 2

Details about Intervention Sessions

Session	Topics
Session 1: Identification of anxiety and depression during pregnancy.	1) Do you feel flustered or heart palpitations often during pregnancy? 2) Do you feel chest tightness or breathlessness often during pregnancy? 3) Do you feel fidgety, thirsty, or sweaty during pregnancy? 4) Do you often feel anxious and nervous without any reason during pregnancy? 5) Do you know what depression is? 6) What kind of things can make you feel depressed?
Session 2: Enhancing the high-risk pregnancy related knowledge.	1) Do you know what high-risk pregnancy is? 2) Why do some pregnant women experience obstetrical complications? 3) Does high-risk pregnancy have any influence on fetal and neonatal outcomes? 4) How do you cooperate with the doctor for check-ups and treatment of complications?
Session 3: Discussing postpartum depression and its related risk factors.	1) What factors influenced you to become pregnant? 2) What problems have you experienced during pregnancy? 3) What problems might you experience after delivery? 4) What do you hope your husband will do for you during pregnancy or after delivery? 5) Have you heard about postpartum depression? 6) Do you know which risk factors can lead to postpartum depression?
Session 4: Introducing psychological defense mechanism and coping methods.	1) Have you heard about psychological defense mechanism? 2) Have you experienced a stressful event? 3) How serious was it? 4) Do you know how to deal with it? 5) Which psychological defense mechanism did you use? 6) Which one is the most efficient to you?
Session 5: Encouraging psychological adjustment during delivery.	1) Are you afraid of or anxious about delivery? 2) Which delivery methods do you prefer? 3) Do you worry about the baby? 4) Do you hope your husband will accompany you during the labor?
Session 6: Instructing husbands to	1) Have you noticed any emotional changes in your wife since she became pregnant?

recognize postpartum depression.	2) Have you ever heard of postpartum depression? 3) Do you know what the symptoms of postpartum depression are? 4) What will you do if you believe your wife is depressed after delivery?

Table 3

Participant Characteristics

Variables	Intervention group (n=176)	Control group (n=176)	Value	P value
Age(years) (Mean±SD)	30.43±3.61	30.60±3.86	-0.428[a]	0.669
Education			0.086[△]	1.000
Elementary school and lower	4（2.3%）	4（2.3%）		
Middle school	14（8.0%）	14（8.0%）		
Vocational college	55（31.2%）	55（31.2%）		
College and higher	103（58.5%）	103（58.5%）		
Working status			0.166[b]	0.684
Full-time employed	144（81.8%）	141（80.1%）		
Unemployed	32（18.2%）	35（19.9%）		
Monthly household income (RMB)			3.144[△]	0.541
＜4000	4（2.3%）	1（0.6%）		
4000-5999	11（6.3%）	13（7.4%）		
6000-7999	13（7.4%）	13（7.4%）		
8000-9999	36（20.4%）	45（25.5%）		
≥10000	112（63.6%）	104（59.1%）		
Gestational weeks at baseline	20.93±4.39	21.80±4.20	-1.887[a]	0.060
High-risk scores (Mean±SD)	8.52±5.02	9.03±5.42	-0.918[a]	0.359
Numbers of complications			0.570[b]	0.752
One	116（65.9%）	112（63.7%）		
Two	46（26.1%）	46（26.1%）		
Three or more	14（8.0%）	18（10.2%）		
Depression history				0.624
Yes	2（1.1%）	1（0.6%）		
No	174（98.9%）	175（99.4%）		
Depression family history				0.543
Yes	6（3.4%）	4（2.3%）		
No	170（96.6%）	172（97.7%）		
EPDS score	8.02±3.80	7.88±3.93	0.331[a]	0.741
PDSS score	72.73±11.66	71.78±12.81	0.727[a]	0.468

EPDS: Edinburgh Postnatal Depression Scale; PDSS: Postpartum Depression Screen Scale

[a] Obtained by t-test ; [b] obtained by χ^2; [△]obtained by Fisher's exact test

Table 4

EPDS and PDSS Scores at Each Time Point

	Group	Baseline	Late pregnancy	3 days postnatal	42 days postnatal	ANOVA (df=3)	
		Mean±SD	Mean±SD	Mean±SD	Mean±SD	Time	Group Time
EPDS score	Intervention (n=167)	8.04±3.78	5.26±3.41	4.14±3.10	4.14±3.70	58.798***	6.518***
	Control (n=167)	7.81±3.98	6.60±3.64	5.57±3.52	6.11±4.37		
PDSS score	Intervention (n=167)	72.68±11.81	56.38±14.38	50.00±13.20	49.21±15.38	167.577***	13.502***
	Control (n=167)	71.89±12.86	63.60±15.44	59.08±14.60	58.20±15.80		

ANOVA Analysis of variance; ***$P<.001$

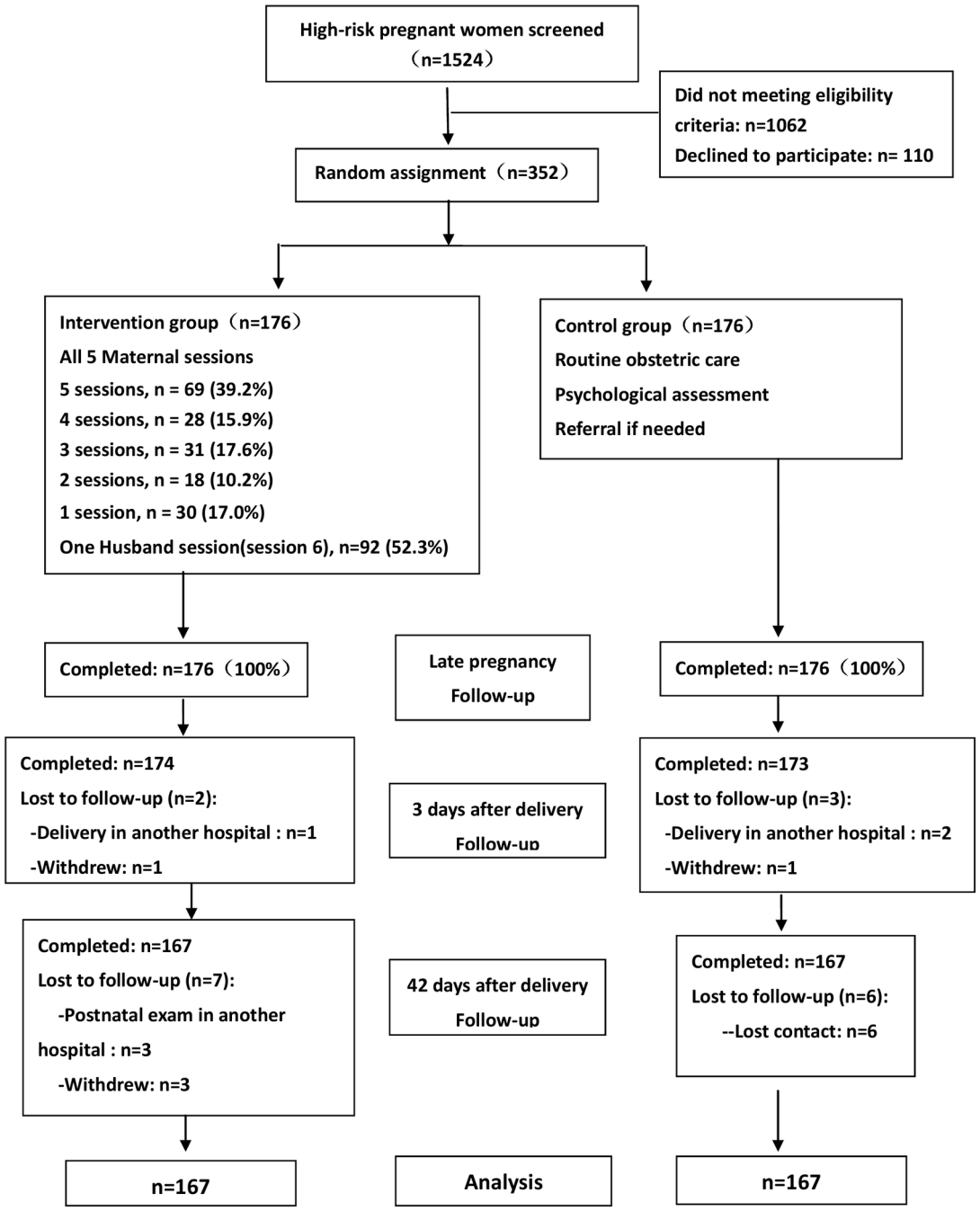
Table 5

EPDS and PDSS Scores of Participants' Evaluated with the MINI

Group	EPDS＜9 and PDSS＜60 n (%)	EPDS 9-12 or PDSS 60-79 n (%)	EPDS≥13 or PDSS≥80 n (%)	Value	*P* value
Intervention (n=33)				7.420△	0.027
MINI(-)	12（44.4%）	6（22.2%）	9（33.3%）		
MINI(+)	1（16.7%）	1（16.7%）	4（66.7%）		
Control (n=45)					
MINI(-)	8（29.6%）	9（33.3%）	10（37.0%）		
MINI(+)	1（5.6%）	10（55.6%）	7（38.9%）		

△Obtained by Fisher's exact test

Figure 1. Consort diagram of all participants at recruitment and follow-ups



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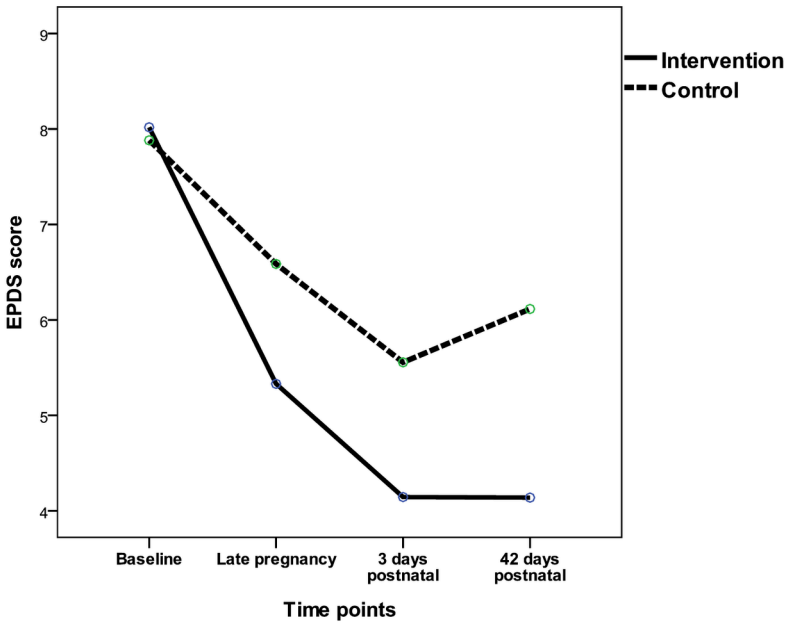

Figure 2. Between-group change in EPDS score

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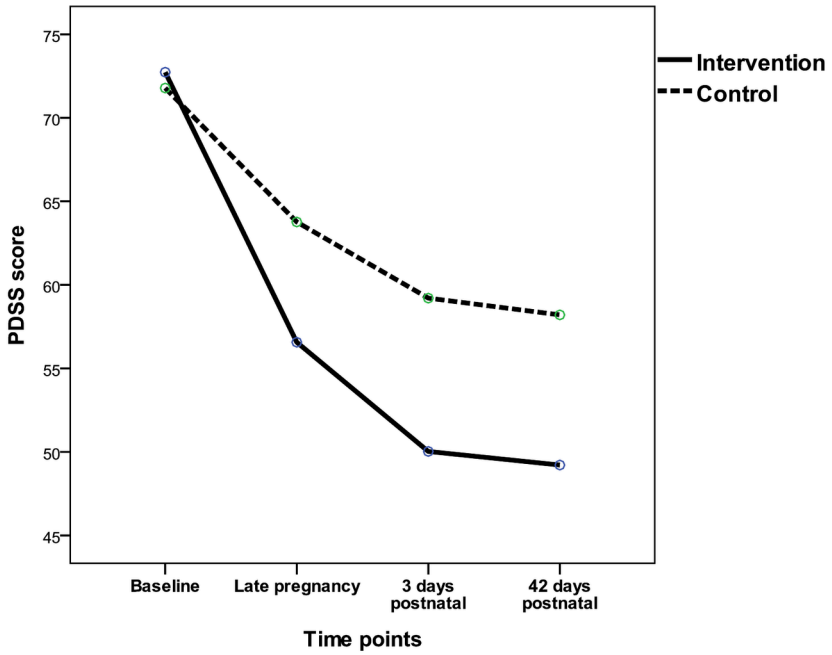

Figure 3. Between-group change in PDSS score

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