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Health-Related Quality of Life Among Pregnant Women With and Without Depression in Hubei, China

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Abstract The role of prenatal depression on physical and mental health among women in mainland China has not been previously investigated. The aim of this research was to (a) calculate the prevalence of depression during pregnancy, (b) explore the relationship between depression sample characteristics and quality of life and (c) identify predictors of physical and mental health among pregnant women. This study was designed as a cross-sectional and exploratory survey. A total of 454 pregnant women participated in the study between December 2009 and June 2010 in central China. The data was collected using the Medical Outcomes Study short form 36 v2 and the Edinburgh Postnatal Depression Scale. Participants were recruited at outpatient departments of obstetrics and gynecology. Findings show that almost 40% of pregnant women experience prenatal depression. Depression was significantly associated with physical and mental health-related quality of life (HRQoL). Depression, increased age, higher gestational age, being employed and married were significant predictors of lower physical HRQoL. Depression, lower BMI and having an unintended pregnancy were significant predictors of lower mental HRQoL. Prenatal depression is very common in women from mainland China. Depressed women suffer from impaired physical and mental health; prenatal depression has a negative impact on women's HRQoL. We recommend that antenatal services integrate screening for depression into routine antenatal care.

Keywords Mainland China · Health-related quality of life · Prenatal depression · Pregnant women

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Introduction

Pregnancy is one of the most significant events that can occur in a women's life and is often considered to be a time of excitement, expectancy and change. During pregnancy, women have to deal with many physical and chemical changes in their body. Changes in the endocrine system and bodily organs [1] cause substantial changes in the woman's physical and mental health [2]. For many women, mental health issues may rise during pregnancy [3–5]. Physical symptoms of pregnancy such as nausea, vomiting, hemorrhoids, backache, oral pain and shortness of breath [6] can be upsetting and can also have potentially negative effects on the pregnant woman's mental health. Only in the past decade has attention been paid to prenatal depression, with studies revealing that depression is highly prevalent during pregnancy [7–9], and is even more common than postpartum depression [10]. Ante-natal depression may vary by trimester; in the USA, researchers found that of the women in their cohort with symptoms of depression, 15% were in their first trimester, 14% in their second trimester, and 30% in their third trimester [9]. A study in Lithuania reported quite different rates of depression: 6.1% at 12–16 weeks gestation, 3.5% at 22–26 weeks, and 4.4% at 32–36 [11]. There is evidence that suggests that differences in

rates of depression in pregnancy may be due to culture and ethnicity [12, 13].

Symptoms of prenatal depression include low mood, lack of concentration, continuous fatigue, sleep disorders, sudden changes in eating, constant anxiety and irritation. Prenatal depression has been shown to have adverse effects on maternal and fetal outcomes [14, 15]. Studies have shown an association between prenatal depression in mothers and decreased infant Apgar scores [16], increased preterm births, low birth weight infants [15], and higher risk of diarrhea in the infant [17]. In addition, it is suggested that depression during pregnancy can lead to depression in the offspring during adolescence, and that mothers who experience depression during pregnancy are more likely to have a higher risk of future depressive episodes [18].

Health-related quality of life (HRQoL) is a multidimensional concept used in public health to refer to a person or group's perceived physical and mental health status over time [19]. Generally, HRQoL assesses areas of physical functioning (the ability to perform physical activities), psychological well-being, subjective symptoms (such as bodily pain and fatigue), and social and cognitive functioning [20]. Public health professionals often use HRQoL to measure the impact of specific conditions such as allergies, anemia, cancer and diabetes [20]. Epidemiological studies from various cultures have suggested that pregnancy is associated with significant impairments in HRQoL (USA [2, 7–9], Canada [21], Switzerland [22], and Singapore [23]), particularly in relation to physical health [2, 21].

Both physical and mental problems caused by pregnancy can interfere with a woman's HRQoL. Research has shown that presence and severity of nausea and vomiting during pregnancy has a negative impact on HRQoL [6], as does oral pain [24] and back pain [25]. Women with prenatal depression are reported to have limited physical functioning compared to women without depression [7, 8, 21]. In a Canadian study, pregnant women with symptoms of depression scored significantly lower in six out of eight categories measuring health, including bodily pain, general health and vitality [21].

Specific pregnancy conditions and socio-demographic characteristics may also play a role in determining a pregnant woman's HRQoL. Couto et al. [26] suggest that women with a history of recurrent spontaneous abortion seem to have a poorer quality of life during pregnancy as do women at risk of a preterm delivery [27]. Quality of life during pregnancy was also found to vary by country [28] and by level of education, with pregnant women with less than high school education reportedly experiencing worse physical functioning than those with graduate degrees [29].

Depression has a negative impact on multiple HRQoL domains [7, 9] and yet prior studies conducted in China have only described the prevalence of, and risk factors for, postpartum depression. To our knowledge, there have not been any studies examining the HRQoL of pregnant women with prenatal depression in the People's Republic of China—the most populous country in the world. Further, little is known about the extent to which pregnancy and prenatal depression effect HRQoL or the physical and mental health of Chinese women. Perhaps for this reason, health care professionals have paid little attention to maternal mental health disorders. Currently, in China, the health care services that are available to pregnant women are only focused on pregnancy-related physical problems rather than mental problems. Screening for prenatal depression is not provided in the routine check-up for pregnant women, meaning that symptoms may go unnoticed and depression, un-treated.

The purpose of this study is to (a) calculate the prevalence of depression during pregnancy, (b) explore the relationship between depression and sample characteristics and quality of life and (c) identify predictors of physical and mental health among pregnant women. The results from which can be used to influence the health services available to pregnant women and for developing guidelines to improve maternal well-being.

Methods

Design

We performed an exploratory, cross-sectional study with 574 women in their 1–40th week of pregnancy, who were regularly attending antenatal visits in clinical settings in central China. Two general hospitals, which are also the university-affiliated hospitals, were chosen for the locations. In China, due to the availability of advanced equipment and obstetric experts, a great number of pregnant women from varying socioeconomic backgrounds receive prenatal care in hospital facilities.

Sample and Recruitment

This study used a convenience sampling technique with pregnant women recruited at outpatient departments of obstetrics and gynecology. Women were eligible if they were at least 18 years of age, able to read and understand Chinese, and willing to provide written consent. All eligible pregnant women were invited to participate in the study. No financial compensation was offered to the women for their participation. Recruitment was conducted between December 2009 and June 2010. This study was approved by the institutional review board of Huazhong University of Science and Technology.

Measurements

Demographic Data

A Chinese version of a self-report questionnaire was designed to collect demographic information. It included socio-demographic data such as age, height, weight, marital status, educational level, employment status, exercise routine, drinking and smoking history, and total monthly family income, and obstetric data which included number of pregnancies and births, history of abortion, gestational age (GA), whether the pregnancy was planned or not, and any complications during the current pregnancy. GA was calculated based on either the last menstrual period or from an obstetric ultrasound examination. If there was any inconsistency between the two measurements, the outcome of obstetric ultrasound examination was selected.

The Edinburgh Postnatal Depression Scale (EPDS)

The 10-item EPDS was initially developed to detect depression in postpartum women [30] but has subsequently been validated for use during pregnancy [31]. The EPDS has been translated and used in 35 different languages and in diverse populations of women, including women from mainland China [32]. Prior studies show satisfactory sensitivity ranging from 68 to 100%, and specificity from 76 to 96%. Different cutoff points for identifying depression in people from different countries using this scale have been identified. Recently, a Chinese version of the EPDS among pregnant women was developed which has good reliability and validity. A cutoff point of 9.5 has been shown to have a sensitivity of 80% and specificity of 83%, when screening for clinical depression during pregnancy [32]. Response scores for individual items range from 0 to 3, for a total maximum score of 30. A cutoff score of 9.5 is used to assess prenatal depression in the present study with scores higher than this signifying depression. EPDS is a self-administered scale, which can be completed in 5 minutes. The reliability coefficient in this study was 0.804.

The Medical Outcomes Study Short Form 36 (SF-36v2)

The Medical Outcomes Study short-form General Health Survey (SF-36) is a brief and generic measurement of health, considered to be an important tool for assessing functional health and well-being from the patient's perspective [20]. The SF-36 has been used to survey specific populations, such as women during pregnancy and after delivery [2], and for specific diseases, such as depression [33]. The SF-36v2 is comprised of 36 items and is used to measure health-related quality of life [20]. It is divided into eight different domains: physical functioning (PF), role limitations due to physical health (RP), bodily pain (BP), vitality (VT), social functioning (SF), role limitations due to emotional problems (RE), mental health (MH), and general health perceptions (GH). Each of the subscales consists of a number of items. The items are calculated differently and scoring involves summing the individual item responses for each of the eight domains. Higher scores represent a better state of health. Summary scores for a physical component (PCS) and mental component (MCS) can be obtained from these. PCS is calculated from a combination of PF, RP, BP, and GH scores, and MCS is calculated from a combination of VT, SF, RE, and MH scores [20]. The PCS measure reflects physical morbidity and etiology, whereas the MCS measure reflects psychological or mental morbidity and etiology. The use of SF-36v2 in pregnancy as a clinical research tool has been recommended by researchers [34], with the Chinese version of the SF-36v2 being used for this study. The form takes approximately 5–10 minutes to complete. For this study, the Cronbach's alpha coefficient of the eight domains ranged from 0.707 to 0.882, suggesting good internal consistency.

Data Collection Procedure

We collected data on demographic information, depressive symptomatology, and health-related quality of life. Trained researchers distributed the questionnaire to eligible participants. They were informed that (1) their involvement was completely voluntary and that they could withdraw from the study at any point in time, (2) all of the items must be completed and they should complete the questionnaire themselves, unless they have difficulty understanding it, and (3) that discussing the survey with companions was not allowed. All completed questionnaires were kept confidential and anonymous. Each respondent was assigned a unique ID number which was marked at the top of the questionnaire.

Statistical Analysis

All data were entered into an Excel spreadsheet. The SF-36v2 scores were calculated using the QualityMetric Health Outcomes™ Scoring Software 2.0 [20]. As the standardization of content and scoring enables a valid and reliable interpretation of SF-36v2, the norm-based scoring (NBS) method was used. NBS metrics were developed as an alternative to the 0–100 scoring metric. In NBS, each scale is scored using the same mean (50) and the same standard deviation (10 points) as found in the 1998 Health Survey representing the general US population. Thus, mean scores are compared to the 1998 normative sample; mean scores on any of the health domain scales or component

summary measures of less than 47 indicate impaired functioning [20]. Using NBS we compared our depressed, pregnant women with depressed people in the US, and our non-depressed, pregnant women to similar aged, non-depressed women in the US.

Data were then entered into SPSS statistical software for analysis. Descriptive statistics including mean and standard deviations were used for sample characteristics. SF-36v2 dimensions and summary scores were compared between women with and without prenatal depression using single sample *t* tests. One-way ANOVA was used to determine the EPDS scores across three stages. Chi-square was used to examine the difference between the prevalence of depressive disorders across three trimesters. Pearson correlations were conducted to examine the relationship between MCS/PCS and each potential predictor variable. Two multivariable stepwise linear regression models were used to identify independent predictors of MCS and PCS. Variables for the multivariate models included age, body mass index, history of abortion, gestational age, parity, pregnancy complications, educational level, marital status, employment status, total monthly family income, exercise time per week, and depression. The assumptions for each of the statistical measures were met and an alpha level of 0.05 was established.

Results

Response and Retention Rate

A total of 574 pregnant women were approached and asked to participate in the study. Of them, 36 women refused to participate in the study. The main reasons for refusal were being too busy, tiredness, difficulty in reading and understanding, and reluctance to disclose information. Of the 538 women who agreed to participate, 84 were removed for not completing the entire questionnaire. Of these, 15.4% were in their first trimester, 20.1% were in their second, and 22.5% were in their third trimester. The demographic characteristics of the women that were removed for non-completion of the form were not significantly different from those who completed the form. All remaining 454 pregnant women were included in the analysis.

Sample Characteristics

Maternal characteristics are presented in Table 1. The mean age of the 454 participants was 28.5 years (ranging from 19 to 40) and the mean BMI was 25 kg/m^2 (ranging from 17 to 36). The mean and median GA was 26 weeks. Most women were married (99%), 40% had graduated from university, 64% were not working during their pregnancy and 15% of women reported a monthly family income below USD$313, which is considered insufficient for raising a child in China [35]. The majority of women reported that they exercised regularly (both before and during their pregnancy), 93% had never smoked and 92% did not drink alcohol. Most women were in their first pregnancy and most had not experienced any pregnancy complications so far. Of the 6% of women who reported having experienced complications in their current pregnancy, their complications included high blood pressure, gestational diabetes and gestational anemia.

Prenatal Depression by Trimester

The mean EPDS score was 8.49 (standard deviation (SD) = 4.44), with 39% of women obtaining a score of 9.5 or greater (signifying depression). Of the women with prenatal depression, 36.4% were in their first trimester, 40.2% were in their second trimester and 39.8% were in their third trimester. The mean EPDS scores in the first, second and third trimester were 8.45 (SD = 5.15), 8.71 (SD = 4.55) and 8.19 (SD = 4.20), respectively. No significant differences were found in EPDS scores and the percentage of depressive disorder across the three trimesters.

Health-Related Quality of Life

The mean scores from each domain of HRQoL, PCS and MCS were compared between women with and without prenatal depression in our cohort. The results are presented in Table 2. Mean scores of HRQoL were significantly lower for women with prenatal depression compared with women without prenatal depression on all eight health domain scales and on two component summary measures (at $P < 0.001$ and $P = 0.002$ significance levels).

Correlations Between Predictor Variables and Health-Related Quality of Life

The results of associations between potential predictor variables and health-related quality of life are shown in Table 3. Lower age, GA, BMI, level of education, and total monthly family income showed significant positive correlation with MCS (at either $P < 0.05$ level or $P < 0.001$), while increased age and GA showed significant negative correlation with PCS ($P < 0.001$ and $P < 0.05$, respectively). Depression was significantly associated with both PCS and MCS ($P < 0.001$).

Predictors of Physical and Mental Health

Multivariate regression was carried out to identify which combination of independent variables (socio-demographic,

Table 1 Descriptive analysis of sample characteristics

Characteristics	Mean (SD)	n (%)
Age, years	28.5 (3.6)	
BMI	24.7 (3.5)	
Marital status		
Single		4 (0.9)
Married		450 (99.1)
Employment status		
Employed		163 (35.9)
Not employed		291 (64.1)
Total monthly family income		
≤2,000		66 (14.5)
2,000–4,000		187 (41.2)
4,000–6,000		96 (21.2)
≥6,000		105 (23.1)
Educational level		
<Bachelor's degree		271 (59.7)
≥Bachelor's degree		183 (40.3)
Exercise participation		
Never exercise		129 (28.4)
Exercise regularly		325 (71.6)
Smoking history		
Never smoking		424 (93.4)
Smoking/passive smoking during pregnancy		30 (6.6)
Drinking history		
Never drinking		419 (92.3)
Drinking at least once per week during pregnancy		4 (0.9)
Drinking before pregnancy, But stop drinking after pregnancy		31 (6.8)
Gestational age		
0–12 weeks		22 (4.8)
13–28 weeks		246 (54.2)
29−40 weeks		186 (41.0)
Parity		
Primiparous		356 (78.4)
Multiparous		98 (21.6)
Intention of pregnancy		
Unplanned		132 (29.1)
Planned		322 (70.9)
Pregnancy complications		
No		426 (93.8)
Yes		28 (6.2)
History of abortion		
No		262 (57.7)
Yes		192 (42.3)

obstetric characteristics and depression) best predicted better physical and mental health. As shown in Table 4, the identified predictors explained 11.7 and 43.9% of the

Table 2 Compare mean (SD) of SF-36 score between women with and without prenatal depression

	Women with prenatal depression	Women without prenatal depression	*P* value
Physical function	47.54 (7.21)	49.62 (6.80)	0.002
Role limitation due to physical problems	36.42 (9.94)	41.81 (9.65)	<0.001
Bodily pain	46.68 (8.20)	50.18 (8.10)	<0.001
General health	46.47 (8.37)	50.66 (7.47)	<0.001
Vitality	48.49 (7.00)	53.52 (7.93)	<0.001
Social function	40.79 (8.85)	45.56 (9.36)	<0.001
Role limitation due to emotional problems	35.69 (10.17)	44.25 (9.75)	<0.001
Mental health	41.86 (7.63)	50.95 (7.36)	<0.001
PCS	46.43 (7.42)	49.13 (6.95)	<0.001
MCS	39.62 (7.94)	48.67 (7.33)	<0.001

Table 3 Correlations between potential predictors and two component of HRQoL (Pearson's r)

	PCS	MCS
Age	−0.170***	0.108*
BMI	−0.070	0.114*
Level of education	0.048	0.203***
Exercise participation	0.036	0.078
Smoking history	−0.024	0.009
Drinking history	−0.010	−0.074
Total monthly family income	0.064	0.183***
EPDS	−0.221***	−0.650***
Intention of pregnancy	−0.049	−0.051
Gestational age	−0.145**	0.118*
Parity	−0.062	0.018
Abortion history	−0.063	−0.051
Pregnancy complication	0.035	0.067

* $P < 0.05$; ** $P < 0.01$; *** $P < 0.001$

variance in the PCS and MCS, respectively. Prenatal depression was a significant predictor of PCS and MCS ($P < 0.001$). Higher age, GA, employment status and martial status were significant predictors of PCS ($P < 0.05$). Lower BMI and having an intended pregnancy were significant predictors of MCS ($P < 0.05$).

Discussion

Prenatal depression is common during pregnancy and can have a substantial impact on health-related quality of life. The purpose of this study was to assess the pattern of

Table 4 Final multivariate regression models for PCS and MCS

SF-36 two components	Predictors	B	*P* value
PCS ($R^2 = 0.117$)	EPDS	−0.232	<0.0001
	Age	−0.179	<0.0001
	Gestational age	−0.129	0.004
	Employment status	−0.111	0.012
	Martial status	−0.107	0.017
MCS ($R^2 = 0.439$)	EPDS	−0.662	<0.0001
	BMI	0.129	<0.0001
	Intention of pregnancy	0.086	0.018

prenatal depression over three trimesters, explore the relationship between prenatal depression and HRQoL, and determine the predictors of HRQoL. To our knowledge, this is the first study to examine these outcomes among pregnant women in mainland China.

Prevalence and Effects of Prenatal Depression

The prevalence of prenatal depression from various populations has been shown to range from 10 to 30% [2, 36, 37]. While our findings of 40% seem much higher than these, they are not greatly higher than found in other Chinese studies. Studies conducted in Hong Kong [38] and Chengdu in mainland China [39], identified that respectively, 37% and 32% pregnant women had depressive symptoms. A possible explanation for the slightly higher rates in our study may be due to previous under-reporting of depression or from using a less valid instrument of measurement. Our result showed that the prevalence of depression reaches its highest in the second trimester, which is consistent with findings from other studies [40–42]. Possible explanations might be that pregnant women experience lots of physical discomfort, such as fatigue and sleep disorders, which do not improve in the second trimester and may in fact worsen during this period [40]. Our findings emphasize the importance of assessing women for symptoms of distress during their regular pregnancy checks by health care providers, while being especially vigilant in the second trimester when symptoms may be at their worst.

Our results revealed that pregnant women with depression also had impaired physical and mental functioning. Our results are consistent with a prior study by Mckee et al. [8] who reported significantly lower functional status was found for depressed subjects in all domains of the SF-36 compared with non-depressed subjects. When we compared our data to depressive normative data taken from the US general population (1998) [20], the mean scores of PCS and MCS for pregnant women in our sample with depression were higher (demonstrating better health) than for depressed women in the US. This implies that the general level of PCS and MCS in our cohort is better than the US cohort. Although this requires cautious interpretation, it may be the case that pregnant Chinese women have high levels of physical and mental health, even though they may be experiencing some emotional distress during their pregnancy. In Chinese culture, pregnancy is a happy and significant event with pregnant women being protected and cared for prudently by family numbers and coworkers; household duties are seldom allocated to them, therefore, work related fatigue, pain and stress may be reduced for pregnant Chinese women. As a result, their general well-being may be higher than experienced by other people.

When we then compared our pregnant, non-depressed women with normative data on non-depressed American women aged 25–34, the mean score on PCS for our women was lower, but the mean score for our women on MCS was higher. This again is demonstrating how pregnancy may result in better mental health despite pregnant women having lower physical health [43]. Our results are consistent with the study of Haas et al. [2] who also found that pregnant women reported similar or better health than normative samples of non-pregnant women of reproductive age.

Relationships Between Prenatal Depression and Demographics and HRQoL

The current study had a number of important findings concerning the relationships between prenatal depression, socio-demographic characteristics, obstetric variables and health-related quality of life. We found many socio-demographic variables to be significantly associated with the mental and physical health of pregnant women. The negative correlation found between women's increased age and physical health was not surprising given that older pregnant women are more likely to have impaired physical health than younger women (age has previously been found to be negatively associated with physical functioning, which is one component of PCS [21]). Increased age was found to be *positively* correlated with MCS. This suggests that as women's age increases, they might have better mental health due to having had more life experiences and may have developed better coping methods that they can use to deal with emotional problems.

Higher levels of education and total monthly family income were also significantly correlated with higher scores on MCS. These suggested that as a woman's educational level and total monthly family income increases, so does her mental health status. While a higher level of education may enable women to have more knowledge about how to cope with distress, it may also be a proxy for income. As one would expect, financial instability can cause psychological distress, thus higher family income

may correlate with improved mental health. In another study, education positively correlated to general health, and higher income also had a positive impact on mental health [21]. However, few studies have examined education and family income as a class variable, thus more research should explore how various levels of education and family income are associated with HRQoL.

Similar to Hueston and Kasik-Miller [44], we found that level of physical health changed significantly with gestational age. As expected, with the increase of GA, pregnant women may suffer from severe bodily pain and frequent tiredness. A previous study has suggested that as GA increases, women may suffer more from emotional problems due to being limited socially, but this was not found in our study [21]. Further studies are needed to replicate and verify this discrepancy.

This study found that prenatal depression had a negatively impact on Chinese women's HRQoL, which supports data from other studies [2, 7, 9, 21]. However, one must keep in mind that the questions related to mental health and questions measuring EPDS are somewhat similar, thus the direction of the relationship between mental health status and prenatal depression should be reported cautiously. No studies have been carried out that attempt to reveal the mechanisms underlying the relationship between depression and functional status although it has been suggested that depression is linked to sharp changes in estradiol and progesterone levels [1]. Whether it is hormonal changes that cause depression and in turn influence a woman's HRQoL during pregnancy requires further investigation.

An unexpected finding in this study was that being employed and being married were found to be negative predictors of PCS. One possible explanation may be that married women were more likely to be responsible for taking care of their families, which may entail a higher work load than single women might have. Similarly, employed women would have a higher workload than non-employed women, both which may lead to impaired physical health.

Intention of pregnancy, as a positive predictor of MCS, is as expected. Prior research conducted on pregnant women suggested that women who had an unplanned pregnancy had higher levels of perceived stress [45]. Clearly, it provides evidence that a planned pregnancy is better for a woman's mental health.

Limitations

There are several limitations to our study. Firstly, questionnaires were used and data collected using a self-report method which may not be reliable. Secondly, mainland China is a large area; socio-demographic characteristics vary widely from district to district. Additionally, the study subjects were recruited from two hospitals in urban areas in central China with a large proportion being well educated, thus the results may not be generalizable to other geographical settings and socioeconomic class. Future research in rural populations and in different regions of China is advised. Thirdly, this study was cross-sectional whereas a longitudinal study is needed to explore the changes in health status during three trimesters and after pregnancy in the same population of women.

This study was the first to use SF-36 to assess the health status of women during pregnancy in mainland China. It was found to be a very useful instrument for measuring health statuses. We recommend that midwives use this assessment tool to help identify psychosocial problems in pregnant women. Because we used the NBS method, we were able to compare our results in pregnant women with results from non-pregnant women, and to compare our results in depressed women during pregnancy with results from depressed adults in the US. Very few studies have examined the relationships between health-related quality of life and depression during pregnancy in mainland China, making it difficult to compare our results with results from a culturally similar sample. Replications of these findings in mainland China are needed to determine whether our results can be generalized to a broader population in China.

In conclusion, this study found that the prevalence of prenatal depression in mainland China is very high. The presence of symptoms of depression within this population is a major public health problem. HRQoL is influenced by several factors, but especially by depression. We hope that these findings will help raise awareness of the mental health of pregnant women and that health care professions will pay more attention to this in the future. Emphasis should be put on assessing the mental health of pregnant women and to encourage the promotion of effective interventions for both the prevention and treatment of prenatal depression.

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