Journal of Affective Disorders 253 (2019) 292–302

Contents lists available at ScienceDirect

Journal of Affective Disorders

journal homepage: www.elsevier.com/locate/jad

Research paper

Influencing factors for prenatal Stress, anxiety and depression in early pregnancy among women in Chongqing, China

Tang Xian, Lu Zhuo, Hu Dihui, Zhong Xiaoni*

School of Public Health and Management, Chongqing Medical University, 1# yixue Rd., Chongqing 400016, China

ARTICLE INFO

Keywords:
Prenatal stress
Prenatal anxiety
Prenatal depression
Prevalence
Influencing factors
Mainland China

ABSTRACT

Background: Prenatal mental disorders are associated with maternal and fetal adverse outcomes, while few studies have been performed in mainland China. This study aimed to investigate the prevalence and influencing factors of maternal stress, anxiety and depression in early pregnancy and provide scientific basis for reducing prenatal mental disorders.

Methods: Data were obtained from 1220 women with < 15 weeks gestation in a cohort study conducted in Chongqing, China. Prenatal stress, anxiety and depression were assessed using the pregnancy pressure scale, the Hamilton anxiety scale, and the self-rating depression scale, respectively.

Results: The prevalence of prenatal stress, anxiety and depression in early pregnancy was 91.86%, 15.04% and 5.19%, respectively. Logistic regression analysis revealed that the risk factors for prenatal stress include housewife/unemployment, presence of anxiety and low- and moderate-level social support, besides, the protective factors were exercise, active smoking and no suggestion from parents. Housewife/unemployment, primiparity, presence of stress and depression and low-level social support were found to be associated with the development of anxiety symptoms, whereas exercise had a protective effect on it. Group-oriented personality, presence of anxiety, no suggestion from husband, low- and moderate-level family care, and low-level social support were risk factors for prenatal depression.

Limitations: All participants were recruited from one region of China, and none of them have a history of cesarean section.

Conclusion: Early screening and intervention may have great significance for reducing mental disorders of pregnant women, and the family and society support should be brought into the intervention as well.

1. Introduction

Pregnancy leads women into a new stage in their lives, which grants them a new name of “mother”, and makes them experience biological and psychological changes as well as status transitions in family and sociality. Almost all women suffer from mental disorders of different types and degrees for some reason during this period, among which stress, anxiety and depression are the most common and often comorbid (Furber et al., 2009;Pampaka et al., 2018a).

Previous studies have largely focused on postnatal mental disorders, particularly postnatal depression (Howard et al., 2014), and few studies have been conducted on prenatal mental problems. A growing number of literatures reported that the prevalence of mental disorders was higher in the prenatal period than in the postnatal period (Dennis et al., 2017; Sidebottom et al., 2014), and that prenatal mental disorders (stress, anxiety and depression, etc.) were not only associated with maternal and fetal adverse outcomes, including fetal abnormalities, low birth weight, preterm birth, stillbirth, and obstetric complications (Alder et al., 2007; Bansil et al., 2010; Grote et al., 2010; Staneva et al., 2015), but also had enduring effects directly or indirectly on children's growth and development. Offspring of pregnant women with one or more of these mental disorders during pregnancy had a higher risk of behavioral/emotional problems, attention deficit hyperactivity disorder (ADHD), and autism in childhood (O'Connor et al., 2002; Van den Bergh and Marcoen, 2004; Walder et al., 2014), depression, impulsivity and cognitive disorders in adolescence (Bergh et al., 2005; Pawlby et al., 2009), and schizophrenia in adulthood (Mäki et al., 2009). In addition, pregnant women may be more likely to have postnatal depression if they experienced mental disorders such as anxiety, depression, perceived stress, and post-traumatic stress disorder (PTSD) in the prenatal period (Milgrom et al., 2008; Pampaka et al., 2018b). Therefore, prenatal mental disorders have won increasing attention from

* Corresponding author.
E-mail address: zhongxiaoni@cqmu.edu.cn (X. Zhong).

https://doi.org/10.1016/j.jad.2019.05.003
Received 23 January 2019; Received in revised form 29 March 2019; Accepted 1 May 2019
Available online 02 May 2019

researchers, and have recently become the research priority of public health in various countries.

The prevalence of prenatal anxiety and depression in each trimester of pregnancy was estimated to be 18.2%－24.6% and 7.4%－12.8%, respectively, in international studies (Bennett et al., 2004; Dennis et al., 2017). Risk factors including lack of social support (Bayrampour et al., 2015), history of mental illness (Bayrampour et al., 2015; Giardinelli et al., 2012), history of domestic violence and abuse (Akçalı Aslan et al., 2014; Fisher et al., 2013), unplanned/unexpected pregnancy (Bunevicius et al., 2009; Waqas et al., 2015), and miscarriage (Fisher et al., 2013) were considered significantly correlated to prenatal anxiety and depression, while evidence for sociodemographic (age, income level) and obstetric (parity) factors have not been identified (Biaggi et al., 2016). The prevalence of prenatal stress was reported to be 12%－84% in several studies, and the associated factors include lack of social support, domestic violence, drug abuse and panic disorder (Kingston et al., 2012; Shishehgar et al., 2016; Woods et al., 2010).

In recent years, prenatal stress, anxiety, and depression are increasingly common among Chinese women, like their counterparts in other countries. However, there may be great differences among regions in China. Previous studies on prenatal anxiety or depression mainly focused on the associations with pregnancy outcomes, the effectiveness of interventions and the development in specific subgroups (such as pregnant women with gestational diabetes mellitus and threatened abortion, etc.), and less research has been conducted on the influencing factors. The prevalence of prenatal anxiety was about 1.8%－42.1% (Hou et al., 2018; Tao, 2016; Zhang, 2017; Zheng, 2011) and depression 3.6%－40.2% (Li et al., 2012; Tao, 2016; Zhang, 2017; Zheng, 2011) in Chinese women. Reported risk factors for prenatal anxiety and depression include young age, low levels of education, disharmony in the family relationship, low life satisfaction, and lack of social support (Kang et al., 2016; Lau et al., 2014; QIAO et al., 2009; Zhao et al., 2014). In terms of prenatal stress, studies in China mainly focused on the stress levels, stressors, and associations with adverse outcomes, and little research has been done on the prevalence. These studies have suggested that Chinese women have mild to moderate prenatal stress, which was found to be related to low monthly per capita household income, obstetric complications, miscarriage experience, frequent cooking, and bad sleep quality, and that the main stressors include worries about fetal abnormalities, safety of delivery, abnormal conditions during childbirth/cesarean section and labor pain (Hou et al., 2018; Song et al., 2013; Zhang, 2017).

Moreover, the past studies on Chinese women have paid much less attention to early pregnancy than to other periods. To our knowledge, few researches on the prevalence or influencing factors of mental disorders in early pregnancy have been carried out across the globe, apart from two studies providing the prevalence of anxiety and depression in the first trimester (Li et al., 2012; Yu et al., 2017). Although some studies reported the findings in Hong Kong, the data may not be applicable to the mainland due to the obvious economic and cultural gaps (Chan et al., 2013; Lee et al., 2007). Besides, statistical data on prenatal mental disorders in mainland China are scarce. At present, we have only found two studies reporting the prevalence or influencing factors of stress in early pregnancy (Lin et al., 2019; Zhang et al., 2017) and several studies reporting the results of anxiety or depression. However, there might be some limitations in these studies, such as the use of unrecognized psychological assessment methods, small sample size and biased sample sources (Ding et al., 2015; Meng and Liu 2011; Sun, 2012; Zhang et al., 2011). The prevalence of early pregnancy anxiety and depression that are reported in these studies is more representative, however, none of them investigated the associated factors (Tao, 2016; Zhang, 2017; Zheng, 2011). Li et al. (2019) discussed the influencing factors of anxiety in early pregnancy but did not report the prevalence rate. Only Wang, J. (2014) and Wang et al. (2015) conducted a relatively comprehensive study on the prevalence and influencing factors of early pregnancy depression.

As far as we know, studies on the prevalence and influencing factors of stress, anxiety and depression in early pregnancy have been conducted extensively only in several provinces in mainland China (Hunan province and Anhui province, etc.), and less or no research on some of these mental problems have been carried out in most regions, such as those five provinces in southwest China where Chongqing is located. At present, we found that there was no research on prenatal stress, anxiety and depression in early pregnancy among women in Chongqing. Furthermore, many researchers have found that stress, anxiety and depressive symptoms were co-existed, but only few studies in China have discussed them all together. Therefore, based on a prospective pregnancy cohort study in Chongqing, we explored the occurrence of prenatal stress, anxiety and depression in early pregnancy among mainland Chinese women, and reported the prevalence and influencing factors of early pregnancy stress, anxiety and depression in Chongqing for the first time. This study is an expansion and enrichment to the maternal mental disorder researches in early pregnancy in mainland China, which can help us better understand the negative emotions of women during pregnancy in Chongqing, the southwest regions and mainland in China. And it can also provide a basis for formulating maternal health care policies and guidelines to improve the welfare of pregnant women.

2. Methods

2.1. Study procedures

The data of our study were collected from “Study on the Public Opinion Propagation Model for Generative Mechanism and Regularity of Cesarean Delivery Behavior”, which was a prospective cohort study initiated by the National Natural Science Foundation of China. The study has been approved by Ethics Committee of Chongqing Medical University and conducted in Chongqing, a provincial city in southwestern China. Participants were recruited from the department of gynecology and obstetrics at four hospitals in four regions with different economic conditions (developed regions: Yubei district and Jiangjin district, less-developed regions: Dianjiang district and Yunyang district). All participants attending the initial examination of pregnancy (January 2018–September 2018) in these hospitals were screened, and a total of 1220 women who met the inclusion and exclusion criteria and signed the informed consent were included in this study.

Inclusion criteria: women with singleton pregnancy, gestational age <15 weeks, and willingness to participate in the cohort study. Exclusion Criteria: women with histories of cesarean section, or with health problems, such as mental illness.

Participants recruitment: (a) Investigators who were trained and experienced nurses in these hospitals selected qualified participants according to inclusion and exclusion criteria; (b) Investigators carried out face-to-face interviews with participants, and informed them of the relevant content of the study; (c) Participants who were willing to take part in the study signed the written informed consent.

2.2. Study content and measurements

A structured questionnaire containing four aspects was used in this study. Part of the data were collected from the maternal health management manual in which all medical records from the initial examination of pregnancy to child's schooling were kept.

2.2.1. Assessment of maternal Stress, anxiety and depression in early pregnancy

2.2.1.1. Prenatal stress. Prenatal stress was measured using the pregnancy pressure scale (PPS) compiled by Chen Zhanghui et al. (Zhang, 2005). The scale has been widely applied to related studies in Chinese pregnant women and showed favorable reliability and validity (Pan et al., 2004). PPS consists of thirty items and reflects four aspects:

(a) identity of parents' roles, (b) health and safety of the mother and child, (c) changes in body shape and physical activities and (d) other stressors. Responses are rated on a 4-point Likert scale ranging from 0 (no stress) to 3 (severe stress). The average score of all items is calculated to assess the level of prenatal stress, and higher scores indicate the higher level, with 0 for no stress, 0.01–1.00 for mild stress, 1.01–2.00 for moderate stress and 2.01–3.00 for severe stress. This study only explored whether pregnant women have stress symptoms, so the average score of >0 was considered to be stressful.

2.2.1.2. Prenatal anxiety. Prenatal anxiety was assessed by the Hamilton anxiety scale (HAMA), which has been widely used in Chinese pregnant women (Hou and Wang, 2006; Liu and Yang, 2012; Zhang, 2005). HAMA reflects two aspects through fourteen items. One is somatic anxiety and the other is psychological anxiety. The presence of anxiety symptoms is assessed by a 5-point Likert scale ranging from 0 (no symptom) to 4 (severe anxiety), and higher total scores indicate greater anxiety. In this study, we only explored whether pregnant women have anxiety symptoms, so a total score of >14 was considered to be anxious.

2.2.1.3. Prenatal depression. Considering the applicability, reliability and validity of prenatal studies in China and educational level of participants, the self-rating depression scale (SDS) (Zung, 1965), commonly used in the psychological assessment of pregnant women in China, was used to measure prenatal depression. SDS consists of twenty items. Considering the large number of research items and the feasibility in pregnant population in the cohort study, only ten items were used after the items overlapping with HAMA were eliminated. SDS is a 4-point Likert scale ranging from 1 (no/a little of the time) to 4 (most of the time/all the time) to capture symptoms of prenatal depression. The depression level is assessed by the depression index (=actual total score / the highest possible score for all items). Higher scores indicate more severe depression. In this study, we only explored whether pregnant women have depressive symptoms, so the index of ≥ 0.5 was considered to be depressive (Duan and Sheng, 2012).

2.2.2. Personal influencing factors

Personal influencing factors include sociodemographic characteristics, personality traits, knowledge-attitude-practice, obstetric characteristics and exposure to suspected adverse factors.

The sociodemographic characteristics include age, place of residence, education level, working status during pregnancy and monthly per capita household income.

Knowledge-attitude-practice includes exercise during pregnancy, source of pregnancy-related knowledge (television, internet, books and magazines, hospital promotional materials, hospital training, medical personnel, maternity schools, others' maternal experiences, other pregnant women in the same hospital), expected delivery mode, and pregnancy-related knowledge judgement.

Obstetric characteristics contain BMI (at the initial examination of pregnancy), gestational age, parity, number of abortions, fever in the first trimester, vaginal bleeding, previous medical history, and family history (data were obtained from the maternal health management manual).

Suspected adverse factors contain the use of at-risk drugs, domestic pets, drinking, and smoking (data were obtained from the maternal health management manual).

The mental health of a pregnant woman is associated with her personality traits. The self-sufficient personality was measured by the ten items corresponding to factor Q2 (self-sufficiency) in the 16 Personality Factor Questionnaire (16PF) revised by Zhu and Dai (1988). In accordance with the scoring standard, two points are recorded for the same answer, zero for the opposite answer, and one for the moderate answer. The total raw score was calculated and then converted to a standard score (0–10) according to the norm for Chinese adult women. Higher scores indicate greater independence, with 3 points and below for group-oriented personality, 4–7 for the intermediate state and 8 points and above for self-sufficient personality. 16PF has been widely used in the study of personality traits in various groups in China, and shows good reliability and validity.

2.2.3. Family influencing factors

Family influencing factors include family care and family members' suggestion on delivery mode (husband, parents and parents-in-law).

The family adaptation partnership growth affection and resolve index (APGAR) has been widely used in Chinese pregnant women and proven to be valid and reliable (Smilkstein et al., 1982; Sun et al., 2018). APGAR consists of five items and reflects five aspects: adaptation, partnership, growth, affection and resolve. Responses are rated on a 3-point Likert scale ranging from 0 (rare) to 2 (often). The level of family care obtained by pregnant women is assessed with the total score of all items. Higher scores indicate better family care with 0–3 for a low level, 4–6 for a moderate level, and 7–10 for a high level.

2.2.4. Social influencing factors

Social influencing factors contain social support, medical staff service and friends' suggestion on delivery mode.

The social support level was measured using the social support rating scale (SSRS) compiled by Xiao, (1994), which has been widely used in Chinese populations including pregnant women and shows good reliability and validity (Sun et al., 2018; Xiao, 1994; Zheng et al., 2018). SSRS consists of ten items including three aspects: (a) objective support, (b) subjective support and (c) utilization of social support. The level of social support obtained by pregnant women is assessed with the total score. Higher scores indicate more social support with less than 35 for a low level, 35–45 for a moderate level, and higher than 45 for a high level (Sun et al., 2018).

2.3. Statistical analysis

Statistical analyses were performed with SAS version 9.4. According to the research purpose, some of the continuous variables (age, pregnancy-related knowledge judgment score, personality traits score, family care score, social support score, prenatal stress score, prenatal anxiety score and prenatal depression score) in this study were converted into categorical variables. The χ^2 test and Fisher's exact test were used to examine associations between prenatal stress, anxiety and depression and categorical variables. The variables with $p \leq 0.1$ in the univariate analysis were brought into the logistic regression analysis with the stepwise procedure (sle = 0.05, sls = 0.05). In addition, considering stress, anxiety and depression were co-existed, when one of the three variables were set as the dependent variable, the other two were brought into the multivariate analysis as control variables regardless of whether the results of univariate analysis are significant. The actual number of participants who were included in the statistical analysis of prenatal stress, anxiety, and depression were 1204, 1210, and 1215, respectively, since a small number of women failed to complete the study. Missing rates of variables were all below 1.5%, and observations with missing values were excluded from the analyses (Table 1).

3. Results

3.1. Participants' characteristics

All participants aged 16–44 years (mean = 25.8) with an average gestational age of 10.7 weeks. Sixty point nine percent of women lived in urban areas and 39.1% in rural areas. Almost half of women (53.8%) still work after pregnancy, 42.2% had a college degree or above, 30.6% had a high school/secondary school degree, and 27.1% had a junior high school degree or below. Forty one point six percent of the

Table 1
Sample characteristics of pregnant women and univariate analysis.

Characteristics	Total n (%)	No Stress n (%)	Stress n (%)	*p* Value	No Anxiety n (%)	Anxiety n (%)	*p* Value	No Depression n (%)	Depression n (%)	*p* Value
N	1220(100.00)	98(8.14)	1106(91.86)		1028(84.96)	182(15.04)		1152(94.81)	63(5.19)	
Personal factors										
Age(years)				0.4730			**0.0231**			0.3766
≤ 19	36(2.95)	1(2.78)	35(97.22)		29(80.56)	7(19.44)		34(94.44)	2(5.56)	
20–24	474(38.85)	33(7.04)	436(92.96)		380(81.02)	89(18.98)		444(93.67)	30(6.33)	
25–29	495(40.57)	43(8.79)	446(91.21)		429(87.20)	63(12.80)		470(95.33)	23(4.67)	
30–34	161(13.20)	16(10.13)	142(89.87)		141(88.13)	19(11.88)		152(95.00)	8(5.00)	
≥ 35	51(4.18)	5(10.20)	44(89.80)		46(92.00)	4(8.00)		49(100.00)	0(0.00)	
Missing Data	3(0.25)	0(0.00)	3(100.00)		3(100.00)	0(0.00)		3(100.00)	0(0.00)	
Working Status				**0.0051**			**0.0010**			0.3101
Employment	656(53.77)	66(10.19)	582(89.81)		571(88.12)	77(11.88)		624(95.41)	30(4.59)	
Housewife/Unemployment	564(46.23)	32(5.76)	524(94.24)		457(81.32)	105(18.68)		528(94.12)	33(5.88)	
Exercise during Pregnancy				0.0515			**<0.0001**			**0.0083**
Yes	564(46.23)	55(9.79)	507(90.21)		504(90.00)	56(10.00)		543(96.62)	19(3.38)	
No	655(53.69)	43(6.71)	598(93.29)		524(80.74)	125(19.26)		608(93.25)	44(6.75)	
Missing Data	1(0.08)	0(0.00)	1(100.00)		0(0.00)	1(100.00)		1(100.00)	0(0.00)	
Source of Pregnancy-Related Knowledge: Hospital Promotional Materials				0.6307			**0.0103**			0.2832
Yes	322(26.39)	28(8.78)	291(91.22)		287(89.41)	34(10.59)		308(95.95)	13(4.05)	
No	897(73.52)	70(7.92)	814(92.08)		741(83.45)	147(16.55)		843(94.40)	50(5.60)	
Missing Data	1(0.08)	0(0.00)	1(100.00)		0(0.00)	1(100.00)		1(100.00)	0(0.00)	
Source of Pregnancy-Related Knowledge: Medical Personnel				0.6209			0.8337			**0.0321**
Yes	196(16.07)	14(7.25)	179(92.75)		164(84.54)	30(15.46)		190(97.94)	4(2.06)	
No	1023(83.85)	84(8.32)	926(91.68)		864(85.12)	151(14.88)		961(94.22)	59(5.78)	
Missing Data	1(0.08)	0(0.00)	1(100.00)		0(0.00)	1(100.00)		1(100.00)	0(0.00)	
Source of Pregnancy-Related Knowledge: Others' Maternal Experiences				0.8305			0.1920			**0.0429**
Yes	497(40.74)	39(7.94)	452(92.06)		428(86.64)	66(13.36)		477(96.36)	18(3.64)	
No	722(59.18)	59(8.29)	653(91.71)		600(83.92)	115(16.08)		674(93.74)	45(6.26)	
Missing Data	1(0.08)	0(0.00)	1(100.00)		0(0.00)	1(100.00)		1(100.00)	0(0.00)	
Source of Pregnancy-Related Knowledge: Other Pregnant Women in the Same Hospital				0.6953			0.2613			**0.0157**
Yes	99(8.11)	9(9.18)	89(90.82)		88(88.89)	11(11.11)		98(100.00)	0(0.00)	
No	1120(91.80)	89(8.05)	1016(91.95)		940(84.68)	170(15.32)		1053(94.35)	63(5.65)	
Missing Data	1(0.08)	0(0.00)	1(100.00)		0(0.00)	1(100.00)		1(100.00)	0(0.00)	
Pregnancy-Related Knowledge Judgment				0.6866			**0.0437**			**0.0090**
Low	252(20.66)	23(9.43)	221(90.57)		202(80.80)	48(19.20)		230(91.27)	22(8.73)	
Moderate	749(61.39)	57(7.68)	685(92.32)		631(85.16)	110(14.84)		710(95.30)	35(4.70)	
High	219(17.95)	18(8.26)	200(91.74)		195(89.04)	24(10.96)		212(97.25)	6(2.75)	
Expected Delivery Mode				0.5155			0.0994			**0.0118**
Not Considered Yet	533(43.69)	39(7.43)	486(92.57)		451(85.26)	78(14.74)		498(93.79)	33(6.21)	
Natural Delivery	626(51.31)	52(8.41)	566(91.59)		531(85.65)	89(14.35)		600(96.31)	23(3.69)	
Cesarean Section	61(5.00)	7(11.48)	54(88.52)		46(75.41)	15(24.59)		54(88.52)	7(11.48)	
Parity				0.5473			**0.0028**			0.0846
0 (primiparity)	827(67.79)	64(7.81)	755(92.19)		681(82.85)	141(17.15)		776(94.06)	49(5.94)	
≥ 1	393(32.21)	34(8.83)	351(91.17)		347(89.43)	41(10.57)		376(96.41)	14(3.59)	
Number of Abortions				0.4622			0.0867			0.3544
0	724(59.34)	54(7.53)	663(92.47)		613(85.38)	105(14.62)		685(94.74)	38(5.26)	
1	286(23.44)	28(9.89)	255(90.11)		248(87.32)	36(12.68)		274(96.14)	11(3.86)	
≥ 2	210(17.21)	16(7.84)	188(92.16)		167(80.29)	41(19.71)		193(93.24)	14(6.76)	
At-Risk Drug Use				0.8922			**0.0373**			**0.0190***
Yes	67(5.49)	5(7.69)	60(92.31)		51(76.12)	16(23.88)		59(88.06)	8(11.94)	
No	1153(94.51)	93(8.17)	1046(91.83)		977(85.48)	166(14.52)		1093(95.21)	55(4.79)	
Smoking				0.0575*			**0.0030**			0.1248*
Active	18(1.48)	4(22.22)	14(77.78)		11(61.11)	7(38.89)		16(88.89)	2(11.11)	
Passive	43(3.52)	5(11.63)	38(88.37)		41(95.35)	2(4.65)		43(100.00)	0(0.00)	
No	1159(95.00)	89(7.79)	1054(92.21)		976(84.94)	173(15.06)		1093(94.71)	61(5.29)	
Previous Medical History				0.6556			**0.0156**			0.7850
Yes	109(8.93)	10(9.26)	98(90.74)		84(77.06)	25(22.94)		103(95.37)	5(4.63)	
No	1111(91.07)	88(8.03)	1008(91.97)		944(85.74)	157(14.26)		1049(94.76)	58(5.24)	
Personality				0.2284*			0.0737			**0.0004***
Group-Oriented	37(3.03)	1(2.78)	35(97.22)		28(77.78)	8(22.22)		29(78.38)	8(21.62)	
Intermediate State	1148(94.10)	92(8.12)	1041(91.88)		975(85.53)	165(14.47)		1091(95.45)	52(4.55)	
Self-Sufficient	35(2.87)	5(14.29)	30(85.71)		25(73.53)	9(26.47)		32(91.43)	3(8.57)	
Stress							**0.0016**			0.4727*
Yes	1106(90.66)				925(84.09)	175(15.91)		1046(94.75)	58(5.25)	
No	98(8.03)				94(95.92)	4(4.08)		95(96.94)	3(3.06)	
Missing Data	16(1.31)				9(75.00)	3(25.00)		11(84.62)	2(15.38)	

(*continued on next page*)

Table 1 (*continued*)

Characteristics	Total n (%)	No Stress n (%)	Stress n (%)	*p* Value	No Anxiety n (%)	Anxiety n (%)	*p* Value	No Depression n (%)	Depression n (%)	*p* Value
Anxiety				**0.0016**						**<0.0001**
Yes	182(14.92)	4(2.23)	175(97.77)					143(79.44)	37(20.56)	
No	1028(84.26)	94(9.22)	925(90.78)					1001(97.47)	26(2.53)	
Missing Data	10(0.82)	0(0.00)	6(100.00)					8(100.00)	0(100.00)	
Depression										
Yes	63(5.16)	3(4.92)	58(95.08)	0.4727*	26(41.27)	37(58.73)	**<0.0001**			
No	1152(94.43)	95(8.33)	1046(91.67)		1001(87.50)	143(12.50)				
Missing Data	5(0.41)	0(0.00)	2(100.00)		1(33.33)	2(66.67)				
Family Factors										
Family Care				0.0525			**<0.0001**			**<0.0001**
Low	75(6.15)	2(2.70)	72(97.30)		52(69.33)	23(30.67)		60(80.00)	15(20.00)	
Moderate	306(25.08)	19(6.31)	282(93.69)		237(78.48)	65(21.52)		275(90.46)	29(9.54)	
High	830(68.03)	77(9.37)	745(90.63)		734(88.75)	93(11.25)		809(97.71)	19(2.29)	
Missing Data	9(0.74)	0(0.00)	7(100.00)		5(83.33)	1(16.67)		8(100.00)	0(0.00)	
Husband's Suggestion on Delivery Mode				**0.0293**			0.6621			**0.0215**
Natural Delivery/Cesarean Section/ No Specific Suggestion	906(74.26)	64(7.13)	833(92.87)		767(85.22)	133(14.78)		863(95.68)	39(4.32)	
No Suggestion	314(25.74)	34(11.07)	273(88.93)		261(84.19)	49(15.81)		289(92.33)	24(7.67)	
Parents' Suggestion on Delivery Mode				**0.0004**			0.9080			0.8414
Natural Delivery/Cesarean Section/ No Specific Suggestion	956(78.36)	63(6.67)	882(93.33)		806(85.02)	142(14.98)		902(94.75)	50(5.25)	
No Suggestion	264(21.64)	35(13.51)	224(86.49)		222(84.73)	40(15.27)		250(95.06)	13(4.94)	
Parents-in-law's Suggestion on Delivery Mode				**0.0025**			0.1774			0.2243
Natural Delivery/Cesarean Section/ No Specific Suggestion	912(74.75)	61(6.76)	841(93.24)		777(85.76)	129(14.24)		865(95.26)	43(4.74)	
No Suggestion	308(25.25)	37(12.25)	265(97.75)		251(82.57)	53(17.43)		287(93.49)	20(6.51)	
Social Factors										
Medical Staff Service				0.0659			**0.0181**			0.0793
Great	890(72.95)	81(9.24)	796(90.76)		764(86.62)	118(13.38)		843(95.15)	43(4.85)	
Good	255(20.90)	12(4.76)	240(95.24)		206(81.42)	47(18.58)		242(95.28)	12(4.72)	
General and Below	74(6.07)	5(6.76)	69(93.24)		57(77.03)	17(22.97)		66(89.19)	8(10.81)	
Missing Data	1(0.08)	0(0.00)	1(100.00)		1(100.00)	0(0.00)		1(100.00)	0(0.00)	
Friends' Suggestion on Delivery Mode				**0.0005**			0.9441			0.4168
Natural Delivery/Cesarean Section/ No Specific Suggestion	961(78.77)	64(6.72)	888(93.28)		811(84.92)	144(15.08)		909(95.08)	47(4.92)	
No Suggestion	259(21.23)	34(13.49)	218(86.51)		217(85.10)	38(14.90)		243(93.82)	16(6.18)	
Social Support				**<0.0001**			**<0.0001**			**<0.0001**
Low	261(21.39)	10(3.88)	248(96.12)		178(68.73)	81(31.27)		228(88.03)	31(11.97)	
Moderate	763(62.54)	57(7.55)	698(92.45)		669(88.14)	90(11.86)		732(96.06)	30(3.94)	
High	179(14.67)	29(16.38)	148(83.62)		167(93.82)	11(6.18)		177(98.88)	2(1.12)	
Missing Data	17(1.39)	2(14.29)	12(85.71)		14(100.00)	0(0.00)		15(100.00)	0(0.00)	

* Fisher's exact probability test

Bold values indicate statistical significance at $P < 0.05$.

Univariate analysis was performed on all variables, and for readability only those variables which had been put into the multivariate regression analysis are shown ($P \leq 0.01$).

participants' monthly per capita household income was between 3001–5000 yuan, 34.9% was greater than 5000 yuan ($728), and 23.1% was equal or less than 3000 yuan ($437) (Table 1). (The data of gestational age, education level, place of residence, and monthly per capita household income were shown in Appendix (Table 5).)

3.2. The prevalence and influencing factors of maternal stress in early pregnancy

Ninety one point eight six percent (1106 of 1204) of pregnant women experienced pregnancy stress in early pregnancy (Table 1).

In the univariate analysis, significant differences in the prevalence of prenatal stress were observed among the groups in the working status, prenatal anxiety, family members' (husband, parents and parents-in-law) and friends' suggestion on delivery mode and social support ($P < 0.05$) (Table 1).

In the multivariate model (Table 2), housewives and women who were not working were 1.82 times more likely to experience prenatal stress than women who continued to work after pregnancy (OR 1.816, 95%CI 1.136–2.905). The presence of anxiety symptoms during pregnancy also increased the risk of prenatal stress (OR 3.463, 95%CI 1.204–9.961). Although the number of women smoking during pregnancy was extremely low, smoking actively reduced the odds of prenatal stress (OR 0.145, 95%CI 0.041–0.509), as did keeping on exercise during pregnancy (OR 0.631, 95%CI 0.405–0.983). In terms of family influencing factors, maternal prenatal stress was related to parents' suggestion on delivery mode and it would be significantly decreased if their parents did not provide any suggestion (OR 0.446, 95%CI 0.282–0.704). In regard to social influencing factors, women with low or moderate levels of social support were more likely to experience prenatal stress than those with high-level social support (OR 3.188, 95%CI 1.460–6.962; OR 1.962, 95%CI 1.191–3.229, respectively).

3.3. The prevalence and influencing factors of maternal anxiety in early pregnancy

Fifteen point zero four percent (182 of 1210) of pregnant women experienced anxiety in early pregnancy (Table 1).

In the univariate analysis, significant differences in the prevalence of prenatal anxiety were observed between groups with different characteristics, including age, working status, exercise during pregnancy, source of pregnancy-related knowledge (hospital promotional

Table 2
Model 1: multivariate logistic regression of prenatal stress (N = 1204).

Variables	β	Wald	p Value	OR (95%CI)
Working Status				
Employment				reference
Housewife/ Unemployment	**0.1641**	**6.2033**	**0.0128**	**1.816(1.136–2.905)**
Exercise during Pregnancy				
Yes	**−0.1266**	**4.1362**	**0.0420**	**0.631(0.405–0.983)**
No				reference
Smoking				
Active	**−0.1310**	**9.0694**	**0.0026**	**0.145(0.041–0.509)**
Passive	−0.0271	0.2758	0.5995	0.768(0.286–2.060)
No				reference
Anxiety				
Yes	**0.2446**	**5.3115**	**0.0212**	**3.463(1.204–9.961)**
No				reference
Parents' Suggestion on Delivery Mode				
Natural Delivery/ Cesarean Section/No Specific Suggestion				reference
No Suggestion	**−0.1822**	**12.0060**	**0.0005**	**0.446(0.282–0.704)**
Social Support				
Low	**0.2633**	**8.4655**	**0.0036**	**3.188(1.460–6.962)**
Moderate	**0.1790**	**7.0151**	**0.0081**	**1.962(1.191–3.229)**
High				reference

β, standardized regression coefficients. OR, adjusted odds ratio. 95% CI, 95% confidence interval.
Bold values indicate statistical significance at $P < 0.05$.

materials), pregnancy-related knowledge judgement, parity, at-risk drug use, smoking, previous medical history, prenatal stress, prenatal depression, family care, medical staff service, and social support ($P < 0.05$) (Table 1).

In the multivariate model (Table 3), primiparas had a higher risk of anxiety than multiparas (OR 1.516, 95%CI 1.010–2.276). Housewives and women who were not working after pregnancy were more likely to experience anxiety than women who continued to work (OR 1.544, 95%CI 1.080–2.206). Similar to prenatal stress, keeping on exercise reduced the odds of prenatal anxiety as well (OR 0.548, 95%CI 0.379–0.794). However, the presence of stress or depression increased the risk of prenatal anxiety (OR 3.121, 95%CI 1.063–9.162; OR 7.812, 95%CI 4.382–13.925 respectively). Lack of social support also triggered

Table 3
Model 2: multivariate logistic regression of prenatal anxiety (N = 1210).

Variables	β	Wald	p Value	OR (95%CI)
Working Status				
Employment				reference
Housewife/ Unemployment	**0.1194**	**5.6865**	**0.0171**	**1.544(1.080–2.206)**
Exercise during Pregnancy				
Yes	**−0.1653**	**10.1174**	**0.0015**	**0.548(0.379–0.794)**
No				reference
Parity				
0 (primiparity)	**0.1069**	**4.0342**	**0.0446**	**1.516(1.010–2.276)**
≥ 1				reference
Stress				
Yes	**0.1723**	**4.2925**	**0.0383**	**3.121(1.063–9.162)**
No				reference
Depression				
Yes	**0.2520**	**48.5790**	**<0.0001**	**7.812(4.382–13.925)**
No				reference
Social Support				
Low	**0.3693**	**18.1671**	**<0.0001**	**5.097(2.410–10.779)**
Moderate	0.1702	3.0028	0.0831	1.897(0.919–3.915)
High				reference

β, standardized regression coefficients. OR, adjusted odds ratio. 95% CI, 95% confidence interval.
Bold values indicate statistical significance at $P < 0.05$.

Table 4
Model 3: multivariate logistic regression of prenatal depression (N = 1215).

Variables	β	Wald	p Value	OR (95%CI)
Personality				
Group-Oriented	**0.1749**	**12.6369**	**0.0004**	**6.447(2.307–18.015)**
Intermediate State				reference
Self-Sufficient	0.0721	1.3077	0.2528	2.181(0.573–8.298)
Anxiety				
Yes	**0.4299**	**55.4339**	**<0.0001**	**8.912(5.011–15.852)**
No				reference
Family Care				
Low	**0.2636**	**23.8534**	**<0.0001**	**7.231(3.269–15.997)**
Moderate	**0.2948**	**14.2163**	**0.0002**	**3.442(1.810–6.544)**
High				reference
Husband's Suggestion on Delivery Mode				
Natural Delivery/ Cesarean Section/ No Specific Suggestion				reference
No Suggestion	**0.1991**	**7.3660**	**0.0066**	**2.298(1.260–4.190)**

β, standardized regression coefficients. OR, adjusted odds ratio. 95% CI, 95% confidence interval.
Bold values indicate statistical significance at $P < 0.05$.

anxiety. Women with low-level social support were 5.1 times more likely to develop anxiety than did those with high-level social support (OR 5.097, 95%CI 2.410–10.779). No significant differences were found in the prevalence of anxiety symptoms between women with moderate-level social support and those with high-level social support.

3.4. The prevalence and influencing factors of maternal depression in early pregnancy

Five point one nine percent (63 of 1215) of pregnant women experienced depression in early pregnancy (Table 1).

In the univariate analysis, significant differences in the prevalence of prenatal depression were found among the groups in personality traits, exercise during pregnancy, source of pregnancy-related knowledge (medical personnel, others' maternal experiences, other pregnant women in the same hospital), pregnancy-related knowledge judgment, expected delivery mode, at-risk drug use, prenatal anxiety, family care, husband's suggestion on delivery mode and social support ($P < 0.05$) (Table 1).

In the multivariate model (Table 4), the group-oriented personality and the presence of anxiety symptoms increased women's odds of prenatal depression (OR 6.447, 95%CI 2.307–18.015; OR 8.912 95%CI 5.011–15.852 respectively). In terms of family factors, women with low- and moderate-level family care were 7.2 times and 3.4 times respectively more likely to have depressive symptoms than did those with high-level family care (OR 7.231, 95%CI 3.269–15.997; OR 3.442, 95%CI 1.810–6.544 respectively). Moreover, maternal prenatal depression was related to husbands' suggestion on delivery mode and it would be significantly increased if their husbands did not provide any suggestion (OR 2.298 95%CI 1.260–4.190).

4. Discussion

4.1. The prevalence of prenatal Stress, anxiety and depression

Mental disorders are common in the prenatal period but are often overlooked by Chinese medical institutions. The prevalence of early pregnancy stress was 91.86% in our study, which was higher than that (78.9%) of women in Liuyang City, Hunan Province (Lin et al., 2019). And it was similar to the result (94.48%) of a study conducted by the Chinese Center for Disease Control and Prevention (China CDC) in several provinces and cities (Zhang et al., 2017). It suggests that the prevalence of early pregnancy stress among women in Chongqing may

be in the average level in China. The prevalence of prenatal stress is rarely reported in international studies, but there were some researchers who explored the trend of stress during pregnancy and found that the prevalence of stress in early pregnancy is the highest (Rallis et al., 2014). Compared with the results in the second and third trimesters of pregnancy in some studies, we did report a higher prevalence rate of stress (Woods et al., 2010).

In terms of prenatal anxiety, we reported a prevalence of 15.04% in early pregnancy. Some studies have also reported the prevalence of anxiety among women in other provinces and cities in China: 2.7% in Ma'anshan City, Anhui Province; 29.4% in Changsha City, Hunan Province; 22.57% in Zhoushan City, Zhejiang Province (Yu et al., 2017; Tao, 2016; Zheng, 2011), but the results vary considerably in regions because of the diversity of regional economy, culture and policy. The study conducted by the China CDC also reported the prevalence of early pregnancy anxiety and depression, which included the data of five mainland provinces and cities, making it a better representative of the occurrence of early pregnancy mental disorders than other studies that conducted in only one province or city (Zhang, 2017). The result of our study is similar to that of the China CDC (16.02%), suggesting that the prevalence of early pregnancy anxiety in Chongqing may be in the average level in China. In addition, the result of our study is slightly lower than that of early pregnancy anxiety (18.2%) in a global review article that included studies from 34 countries (Dennis et al., 2017).

The prevalence of early pregnancy depression in our study was 5.19%, which was similar to that in study conducted in Anhui Province, China (4.7%) (Tao, 2016), but far below the results of studies conducted in other provinces and the result of the study conducted by the China CDC (12.07%－36.4%) (Li et al., 2012; Yu et al., 2017; Wang, 2014; Y.Q. et Al.; Zhang, 2017; Zheng, 2011), suggesting that the prevalence of early pregnancy depression in Chongqing may be lower than the average level in China. Similar to the prevalence of anxiety, the prevalence of depression in our study was slightly lower than the result of a review article (7.4%) as well (Bennett et al., 2004). It is well known that due to differences in cultures, customs and norms, Asians usually adopt a more conservative attitude than Westerners toward some sensitive issues (Roomruangwong and Epperson, 2011). For example, when dealing with their own mental disorders, Asians would have a tendency of somatization, which is usually manifested by proposing physical disease to conceal psychological discomfort (AM, 1977; Wen-Shing, 1975). Moreover, Chinese researchers often apply “Western” measurement methods and criteria when conducting studies on mental disorders, cultural differences may lead to the neglect of specific symptoms in Asian populations (Halbreich and Karkun, 2006). These and some other factors may contribute to a lower reporting rate of mental disorders in Chinese women.

4.2. Influencing factors

4.2.1. Personal influencing factors

Mental factors. Among all the variables included in this study, the presence of other mental disorders was the strongest risk factors for prenatal stress, anxiety or depression. Consistent with previous studies, the presence of stress is an important risk factor for anxiety in early pregnancy (Li et al., 2019), and the presence of anxiety symptoms are also risk factors for early pregnancy stress (Zhang, 2017). In early pregnancy, persistent morning sickness (Chou et al., 2008) and concerns for income and pregnancy-related issues (fetal development, miscarriage and fetal delivery, etc.) (Zhang et al., 2017) can cause greater stress and emotional alterations, further leading to symptoms of prenatal anxiety (Bowen et al., 2008), which will in turn prompt the occurrence of prenatal stress (Zhang, 2017).

Prenatal depression is more common among women with anxiety symptoms in early pregnancy, which is consistent with the results in some researches (Lancaster et al., 2010; Li et al., 2016; Pampaka et al., 2018a). A study on the psychological status of women with recurrent spontaneous abortion not only found that pregnant women with higher scores on anxiety scales are more prone to depression symptoms, but also pointed out that pregnant women with higher scores on depression scales were more prone to anxiety symptoms, which was similar to the relationship between early pregnancy anxiety and depression in this study (Zhang, 2017). In addition, Clark and Watson (Clark and Watson, 1991) pointed out that there is overlapping between anxiety and depression symptoms, which may be the reason why these two usually coexisted.

Actually, many studies have pointed out that stress, anxiety and depression are highly correlated (Davis et al., 2011). However, different from the results of some relevant researches, our study did not find the correlation between stress and depression, and the reasons might be differences among study populations, regions, study periods and the measurement tools adopted. (Pampaka et al., 2018a; Zhang, S.B., 2017). The results of this study suggest that various prenatal mental disorders are often coexisted and affect each other, therefore, the contents of screening for prenatal mental disorders should cover as many categories of mental disorders as possible within the feasible extent; when finding positive cases, comprehensive analysis and intervention should also be carried out in combination with the results of multiple mental disorder screenings in order to better control the occurrence of prenatal mental disorders.

Other personal factors. We found that the appearance of prenatal stress and anxiety symptoms was related to working status and exercise during pregnancy. Consistent with previous researches, exercise can reduce stress and anxiety and make people feel calm by changing physical mechanisms such as hormone secretion (Bahrke and Morgan, 1978; Jackson, 2013), and housewives or women who were not working during pregnancy had a higher risk of prenatal stress and anxiety than did those who kept working (Baum et al., 1986; Bodecs et al., 2013). Out of work may mean greater economic pressure, more family conflicts, lower socioeconomic status, more unhealthy behaviors (such as drinking and smoking), loneliness due to much unaccompanied leisure time, and the sense of attachment because of economic dependence, and all of these were associated with mental disorder (Bodecs et al., 2013; Raatikainen et al., 2006; Redinger et al., 2018). Ignoring the pressure from work temporarily and continuing to work after pregnancy may enable pregnant women to have a better mental state.

Pregnancy is a stressful event for women. Our study showed that women who smoked actively were less likely to develop stress symptoms than those who did not smoke during pregnancy, which was consist with the results of numerous studies on smoking motivations of women. Smoking is seen by women as a way to cope with pressure. They believe that smoking can reduce negative emotions such as stress and anxiety and bring happiness, and they would love to continue this benefit, including the period of pregnancy (Fidler and West, 2009; Floyd et al., 1993).

We also found that primiparas were at a higher risk of anxiety, which is consistent with the results of Giakoumaki et al. (2009), and the reason may due to their lack of experience in becoming a mother. A primipara's preparation for the role of motherhood in all aspects include adjustment of goals, behaviors, responsibilities and self-conception, and forming the ability to raise and educate children, thereby promote the positive development of the child and herself (Canavarro, 2001). Primiparas had more concerns than multiparas since they were prone to worry about many issues, including housing, childbirth, newborn care, and relationship with their husband/partner (Öhman et al., 2003). Moreover, primiparas usually have higher expectations of labor pain, which make them more prone to anxiety (Engle et al., 1990). Some studies, however, revealed that no differences were found in the prevalence of anxiety between primiparas and multiparas (Lee et al., 2007), which may be attributed to the differences in the regions and time of study.

We reported that the group-oriented personality of pregnant women was associated with prenatal depression. Women with group-oriented personality who "like seeking for social encouragement, lack of personal judgement, and need group support, but do not necessarily have to live in groups" were more likely to have prenatal depressive symptoms (Zhu, and Dai, 1988). Sociotropic/dependent personality has been seen as a depressive quality by many psychologists, and individuals with this personality had a higher risk of depression when exposed to pressure (Coyne and Whiffen, 1995). This result suggests that maternal personality traits also need our attention while conducting the screening for mental disorders during pregnancy. Despite a small number of women with certain personality traits, they may have higher susceptibility to mental disorders.

4.2.2. Family and social influencing factors

We found a higher risk of depression in pregnant women who lack of family care. For many women, pregnancy can seriously affect their quality of life with lifestyle restrictions due to early pregnancy reactions and reduction in physical function (Jomeen, 2004). All these drives women to have greater needs for family care and support, without which they are more likely to experience prenatal depression. In early pregnancy, women are in a sensitive transitional process of recognizing and accepting their own physical and psychological changes. During this period, they tend to have greater emotional alterations, lose their temper more frequently, and be more susceptible to conflicts. Family stress, including family conflicts, was an independent predictor of depression in early pregnancy (Redinger et al., 2018). Recent problems in marriage were associated with the onset of depression (Karaçam and Ançel, 2009). The troublesome relationship between mother-in-law and daughter-in-law, a unique and ubiquitous issue in China, also put pregnant women at a higher risk of prenatal depression (Lau et al., 2011; Yu and Zhu, 2010). Besides, most Asian families believe that pregnancy and childbirth bring joy, but at the same time there is a greater financial burden, especially in low-income families (Roomruangwong and Epperson, 2011). Family financial difficulties are associated with factors such as less autonomy of pregnant women and more family conflicts, leading to greater risk of prenatal depression (Rahman et al., 2003).

The practical application value of the family's advice on delivery mode in early pregnancy is very small, but it can reflect their concern and support for pregnant women to some extent. Therefore, in addition to the overall function of the family, we also explored the influence of main family members (husband, parents and parents-in-law) on pregnant women through their suggestions on the way of deliver. Interestingly, we found that women who did not get advice from their husbands were more likely to experience depression than those who got advice; women who did not get advice from their parents were less likely to have stress symptoms than those who got advice. In terms of partner factors, consistent with previous studies, pregnant women who lack support from partners, have poor relationships with their husband and are dissatisfied with the marriage are more likely to have prenatal depression (Karaçam and Ançel, 2009; Lau et al., 2011; Redinger et al., 2018). In terms of parental factors, due to the one-child policy, the majority of Chinese parents have only one child, and they often show excessive tension and care to their "little sun" during pregnancy (Wang and Fong, 2009). In order to protect the fetuses, the cautious parents would require their daughter to follow traditional ways of health care during pregnancy. They set limits on the types of food, exercise and social activities, and always supervise whether the restrictions are broken; however, traditional pregnancy restrictions overly interfere with the daily routines of pregnant women and lead to prenatal stress (Furber et al., 2009; Lee et al., 2009). In addition, most Chinese women who have received modern education are skeptical about the traditional ways of pregnancy care and they believe that traditional pregnancy restrictions are caused by limitations of poor living and economic conditions in the past. Some Chinese women are gradually accepting and adopting the idea of Western perinatal nursing, but this is different from the traditional oriental health care style advocated by parents. Cultural conflicts may lead to poor relationships between parents and daughters, which will prompt prenatal stress (Chang et al., 2010; Cheung, 2002). This suggests that family support can help women maintain good mental health during pregnancy, and it is also necessary to provide different health education for different family members.

Lack of social support was another factor closely related to the increased risk of prenatal stress and anxiety in this study, which is also consistent with previous studies (Bayrampour et al., 2015; Glazier et al., 2004). Providing social support is a process of interaction between subjective and objective support of people in various aspects (such as information, tool and emotional support, etc.) from many sources including family, friends, neighbors, colleagues and groups involved (Biaggi et al., 2016; Xiao, 1994). Factors including lack of support and care from friends in the community, partner, and family members other than her husband (Engle et al., 1990; Faisal-Cury et al., 2009; Rini et al., 2006; Senturk et al., 2011) and lack of support gained through participation in group activities (Field et al., 2013) are partial reflections of social support and also are related to the occurrence of prenatal stress and anxiety symptoms. Moreover, some researchers have explored the relationship between prenatal maternal stress and social support through path model and found that as part of social support, the family domain plays the most important role in reducing maternal stress through social support (Shishehgar et al., 2016). The finding shows that support from family members may be the main source of social support for pregnant women. This suggests that we can help increase the level of family and social support for pregnant women by intervening in family members, thereby reducing the occurrence of prenatal mental disorders.

Therefore, we suggest that comprehensive screening for mental disorders should be carried out in early pregnancy, and that health-care professionals should respond proactively to mental health problems of pregnant women, which is of great significance to avoid adverse maternal and neonatal outcomes in high-risk groups. Moreover, the social support and the family care have a greater impact on the mental health of pregnant women, the medical authorities should focus on intervening in family members of pregnant women, such as requiring family members to participate in prenatal health education with pregnant women, providing different types of health education programs for different family members and setting up consulting platforms of perinatal nursing for families. Certainly, we should also strengthen the health education of pregnancy-related knowledge to the whole society as much as possible, and provide women with a more friendly social environment.

According to the purpose of this study, we only analyzed influencing factors of stress, anxiety, and depression without considering their association. Some studies have reported that stress, anxiety, and depression are co-existed, thus we will analyze and discuss this issue in future research.

4.3. Limitations

Our study has several limitations: Firstly, all participants were recruited from one region of China, and none of them have a history of cesarean section due to the exclusion criteria set in the cohort study; thus, our results may not be applicable to all pregnant women in mainland China. Secondly, only cross-sectional data from early pregnancy in the cohort study are used, so that the causality could not be identified and longitudinal studies are needed to be conducted in the future. Thirdly, despite the extensive application of the 16PF on measuring personality characteristics in the general population, its' reliability and validity have not been verified in Chinese pregnant women. Moreover, only the items of one factor (Q2) in the 16PF were used in this study which may resulted in a poor internal reliability (Cronbach's

α 0.21). Therefore, an independent scale, with good reliability and validity, which reflects the self-sufficient personality traits of women is needed to be developed for future research.

5. Implications

Our study indicates that symptoms of mental disorders characterized by prenatal stress are prevalent in early pregnancy among Chinese women in Chongqing. The influencing factors associated with prenatal stress, anxiety and depression in early pregnancy are work status, exercise during pregnancy, smoking, parity, personality traits, presence of other mental disorders and support from the family and the society. Therefore, the medical authorities should attach importance to the screening of prenatal mental health problems of pregnant women and advocate more care for them from the family and the society.

Declarations of interest

None

Funding

Our study was funded by the National Natural Science Foundation of China (71,573,027).

Acknowledgments

The authors acknowledge the support of the Yubei Maternity and Child Healthcare Hospital, the Jiangjin Maternity and Child Healthcare Hospital, the Yunyang County Maternity and Child Healthcare Hospital, the Dianjiang People's Hospital and participants as well as the hard works of team members in the study. The authors also acknowledge the advice of Professor Xiaoli Yang on psychological scales and the help from Runmiao Xiong about the language.

Author Contributions

All authors contributed to this manuscript. Xiaoni Zhong conceived and designed the cohort study and guided research implementation; Xian Tang administered the project; Dihui Hu, Xian Tang and Zhuo Lu performed the experiments, supervised the execution of the study, and checked the quality of data; Xian Tang and Zhuo Lu analyzed the data; Xian Tang wrote the paper.

Supplementary materials

Supplementary material associated with this article can be found, in the online version, at doi:10.1016/j.jad.2019.05.003.

References

Akçalı Aslan, P., Aydın, N., Yazıcı, E., Aksoy, A.N., Kirkan, T.S., Daloglu, G.A., 2014. Prevalence of depressive disorders and related factors in women in the first trimester of their pregnancies in Erzurum, Turkey. Int. J. Soc. Psychiatry 60, 809–817. https://doi.org/10.1177/0020764014524738.

Alder, J., Fink, N., Bitzer, J., Hosli, I., Holzgreve, W., 2007. Depression and anxiety during pregnancy: a risk factor for obstetric, fetal and neonatal outcome? A critical review of the literature. J. Maternal-Fetal Neonatal Med. 20, 189–209. https://doi.org/10.1080/14767050701209560.

AM, K., 1977. Depression, somatization and the "new cross-cultural psychiatry" Soc. Sci. Med. 11, 3–9. https://doi.org/10.1016/0037-7856(77)90138-X.

Bahrke, M.S., Morgan, W.P., 1978. Anxiety reduction following exercise and meditation. Cognit. Therapy Res, 2, 323–333. https://doi.org/10.1007/bf01172650.

Bansil, P., Kuklina, E.V., Meikle, S.F., Posner, S.F., Kourtis, A.P., Ellington, S.R., Jamieson, D.J., 2010. Maternal and fetal outcomes among women with depression. J. Women's Health 19, 329–334. https://doi.org/10.1089/jwh.2009.1387.

Baum, A., Fleming, R., Reddy, D.M., 1986. Unemployment stress: loss of control, reactance and learned helplessness. Soc. Sci. Med. 22, 509–516. https://doi.org/10.1016/0277-9536(86)90016-X.

Bayrampour, H., McDonald, S., Tough, S., 2015. Risk factors of transient and persistent anxiety during pregnancy. Midwifery 31, 582–589. https://doi.org/10.1016/j.midw.2015.02.009.

Bennett, H.A., Einarson, A., Taddio, A., Koren, G., Einarson, T.R., 2004. Prevalence of depression during pregnancy: systematic review. Obstetr. Gynecol. 103, 698–709. https://doi.org/10.1097/01.AOG.0000116689.75396.5f.

Bergh, B., Mennes, M., Oosterlaan, J., Stevens, V., Stiers, P., Marcoen, A., Lagae, L., 2005. High antenatal maternal anxiety is related to impulsivity during performance on cognitive tasks in 14 and 15-year-olds. Neurosci. Biobehav. Rev. 29, 259–269. https://doi.org/10.1016/j.neubiorev.2004.10.010.

Biaggi, A., Conroy, S., Pawlby, S., Pariante, C.M., 2016. Identifying the women at risk of antenatal anxiety and depression: a systematic review. J. Affect. Disord. 191, 62–77. https://doi.org/10.1016/j.jad.2015.11.014.

Bodecs, T., Szilagyi, E., Cholnoky, P., Sandor, J., Gonda, X., Rihmer, Z., Horvath, B., 2013. Prevalence and psychosocial background of anxiety and depression emerging during the first trimester of pregnancy: data from a Hungarian population-based sample. Psychiatria Danubina 25, 352–358.

Bowen, A., Bowen, R., Maslany, G., Muhajarine, N., 2008. Anxiety in a Socially High-Risk Sample of Pregnant Women in Canada. Canadian J. Psychiat. 53, 435–440. https://doi.org/10.1177/070674370805300708.

Bunevicius, R., Kusminskas, L., Bunevicius, A., Nadisauskiene, R.J., Jureniene, K., Pop, V.J.M., 2009. Psychosocial risk factors for depression during pregnancy. Acta Obstet. Gynecol. Scand. 88, 599–605. https://doi.org/10.1080/00016340902846049.

Canavarro, M.C., 2001. Gravidez e maternidade: representações e tarefas de desenvolvimento. Psicologia da gravidez e da maternidade 17, 49.

Chan, C.Y., Lee, A.M., Lam, S.K., Lee, C.P., Leung, K.Y., Koh, Y.W., Tang, C.S.K., 2013. Antenatal anxiety in the first trimester: risk factors and effects on anxiety and depression in the third trimester and 6-week postpartum. Open J. Psychiatry. https://doi.org/10.4236/ojpsych.2013.33030.

Chang, S.-R., Kenney, N.J., Chao, Y.-M.Y., 2010. Transformation in self-identity amongst Taiwanese women in late pregnancy: a qualitative study. Int. J. Nurs. Stud. 47, 60–66. https://doi.org/10.1016/j.ijnurstu.2009.06.007.

Cheung, N.F., 2002. The cultural and social meanings of childbearing for Chinese and Scottish women in Scotland. Midwifery 18, 279–295. https://doi.org/10.1054/midw.2002.0328.

Chou, F.-H., Avant, K.C., Kuo, S.-H., Fetzer, S.J., 2008. Relationships between nausea and vomiting, perceived stress, social support, pregnancy planning, and psychosocial adaptation in a sample of mothers: a questionnaire survey. Int. J. Nurs. Stud. 45, 1185–1191. https://doi.org/10.1016/j.ijnurstu.2007.08.004.

Clark, L.A., Watson, D., 1991. Tripartite model of anxiety and depression: psychometric evidence and taxonomic implications. J. Abnorm. Psychol. 100, 316–336. https://doi.org/10.1037/0021-843X.100.3.316.

Coyne, J.C., Whiffen, V.E., 1995. Issues in personality as diathesis for depression: the case of sociotropy-dependency and autonomy-self-criticism. Psychol. Bull. 118, 358. https://doi.org/10.1037//0033-2909.118.3.358.

Davis, E.P., Glynn, L.M., Waffarn, F., Sandman, C.A., 2011. Prenatal maternal stress programs infant stress regulation. J. Child Psychol. Psychiatry 52, 119–129. https://doi.org/10.1111/j.1469-7610.2010.02314.x.

Dennis, C.L., Falah-Hassani, K., Shiri, R., 2017. Prevalence of antenatal and postnatal anxiety: systematic review and meta-analysis. Br. J. Psychiatry 210, 315–323. https://doi.org/10.1192/bjp.bp.116.187179.

Ding, X.X., Mao, L.J., Ge, X., Xu, S.J., Pan, W.J., Yan, S.Q., Huang, K., Tao, F.B., 2015. Course and risk factors of maternal pregnancy-related anxiety across pregnancy in Ma'anshan city. J. Hygiene Res. 44, 371–375 (in Chinese).

Duan, Q.Q., Sheng, Q., 2012. Differential Validity of SAS and SDS among Psychiatric Non-Psychotic Outpatients and Their Partners. Chinese Mental Health J. 26, 676–679. https://doi.org/10.3969/j.issn.1000-6729.2012.09.007. (in Chinese).

Engle, P.L., Scrimshaw Sc Fau - Zambrana, R.E., Zambrana Re Fau - Dunkel-Schetter, C., Dunkel-Schetter, C., 1990. Prenatal and postnatal anxiety in Mexican women giving birth in Los Angeles. Health Psychol. 9, 285–299. https://doi.org/10.1037/0278-6133.9.3.285.

Faisal-Cury, A., Menezes, P., Araya, R., Zugaib, M., 2009. Common mental disorders during pregnancy: prevalence and associated factors among low-income women in São Paulo, Brazil. Arch. Women's Mental Health 12, 335. https://doi.org/10.1007/s00737-009-0081-6.

Fidler, J.A., West, R., 2009. Self-perceived smoking motives and their correlates in a general population sample. Nicotine Tobacco Res. 11, 1182–1188. https://doi.org/10.1093/ntr/ntp120.

Field, T., Diego, M., Delgado, J., Medina, L., 2013. Yoga and social support reduce prenatal depression, anxiety and cortisol. J. Bodywork Movement Therapies 17, 397–403. https://doi.org/10.1016/j.jbmt.2013.03.010.

Fisher, J., Tran, T., Tran, T.D., Dwyer, T., Nguyen, T., Casey, G.J., Simpson, J.A., Hanieh, S., Biggs, B.-A., 2013. Prevalence and risk factors for symptoms of common mental disorders in early and late pregnancy in Vietnamese women: a prospective population-based study. J. Affect. Disord. 146, 213–219. https://doi.org/10.1016/j.jad.2012.09.007.

Floyd, R.L., Rimer, B.K., Giovino, G.A., Mullen, P.D., Sullivan, S.E., 1993. A review of smoking in pregnancy: effects on pregnancy outcomes and cessation efforts. Annu. Rev. Publ. Health 14, 379–411. https://doi.org/10.1146/annurev.pu.14.050193.002115.

Furber, C.M., Garrod, D., Maloney, E., Lovell, K., McGowan, L., 2009. A qualitative study of mild to moderate psychological distress during pregnancy. Int. J. Nurs. Stud. 46, 669–677. https://doi.org/10.1016/j.ijnurstu.2008.12.003.

Giakoumaki, O., Vasilaki, K., Lili, L., Skouroliakou, M., Liosis, G., 2009. The role of maternal anxiety in the early postpartum period: screening for anxiety and depressive symptomatology in Greece. J. Psychosomatic Obstetr. Gynecol. 30, 21–28. https://doi.org/10.1080/01674820802604839.

Giardinelli, L., Innocenti, A., Benni, L., Stefanini, M., Lino, G., Lunardi, C., Svelto, V., Afshar, S., Bovani, R., Castellini, G., 2012. Depression and anxiety in perinatal period: prevalence and risk factors in an Italian sample. Arch. Women's Mental Health 15, 21–30. https://doi.org/10.1007/s00737-011-0249-8.

Glazier, R., Elgar, F., Goel, V., Holzapfel, S., 2004. Stress, social support, and emotional distress in a community sample of pregnant women. J. Psychosom. Obstetr. Gynecol. 25, 247–255. https://doi.org/10.1080/01674820400024406.

Grote, N.K., Bridge, J.A., Gavin, A.R., Melville, J.L., Iyengar, S., Katon, W.J., 2010. A meta-analysis of depression during pregnancy and the risk of preterm birth, low birth weight, and intrauterine growth restriction. Arch. Gen. Psychiatry 67, 1012–1024. https://doi.org/10.1001/archgenpsychiatry.2010.111.

Halbreich, U., Karkun, S., 2006. Cross-cultural and social diversity of prevalence of postpartum depression and depressive symptoms. J. Affect. Disord. 91, 97–111. https://doi.org/10.1016/j.jad.2005.12.051.

Hou, Q., Li, S., Jiang, C., Huang, Y., Huang, L., Ye, J., Pan, Z., Teng, T., Wang, Q., Jiang, Y., 2018. The associations between maternal lifestyles and antenatal stress and anxiety in Chinese pregnant women: a cross-sectional study. Sci. Rep. 8, 10771. https://doi.org/10.1038/s41598-018-28974-x.

Hou, T.X., Wang, J.F., 2006. Discussion on Psychological nursing of prenatal anxiety disorder. Heilongj. Med. J. 30, 143–144 (in Chinese).

Howard, L.M., Molyneaux, E., Dennis, C.L., Rochat, T., Stein, A., Milgrom, J., 2014. Non-psychotic mental disorders in the perinatal period. Lancet 384, 1775–1788. https://doi.org/10.1016/s0140-6736(14)61276-9.

Jackson, E.M., 2013. SRESS relief: the role of exercise in stress management. ACSM's Health Fitness J. 17, 14–19. https://doi.org/10.1249/FIT.0b013e31828cb1c9.

Jomeen, J., 2004. The importance of assessing psychological status during pregnancy, childbirth and the postnatal period as a multidimensional construct: a literature review. Clinical Effect. Nurs. 8, 143–155. https://doi.org/10.1016/j.cein.2005.02.001.

Kang, Y.-t., Yao, Y., Dou, J., Guo, X., Li, S.-y., Zhao, C.-n., Han, H.-z., Li, B., 2016. Prevalence and risk factors of maternal anxiety in late pregnancy in China. Int. J. Environ. Res. Pub. Health 13, 468. https://doi.org/10.3390/ijerph13050468.

Karaçam, Z., Ançel, G., 2009. Depression, anxiety and influencing factors in pregnancy: a study in a Turkish population. Midwifery 25, 344–356. https://doi.org/10.1016/j.midw.2007.03.006.

Kingston, D., Heaman, M., Fell, D., Dzakpasu, S., Chalmers, B., 2012. Factors Associated with perceived stress and stressful life events in pregnant women: findings from the Canadian maternity experiences survey. Matern. Child Health J. 16, 158–168. https://doi.org/10.1007/s10995-010-0732-2.

Lancaster, C.A., Gold, K.J., Flynn, H.A., Yoo, H., Marcus, S.M., Davis, M.M., 2010. Risk factors for depressive symptoms during pregnancy: a systematic review. Am. J. Obstet. Gynecol. 202, 5–14. https://doi.org/10.1016/j.ajog.2009.09.007.

Lau, Y., Wong, F., Wang, Y., Ho, D., Wang, Y., 2014. The roles of social support in helping Chinese women with antenatal depressive and anxiety symptoms cope with perceived stress. Arch. Psychiatr. Nurs. 28, 305–313. https://doi.org/10.1016/j.apnu.2014.05.009.

Lau, Y., Yin, L., Wang, Y., 2011. Antenatal depressive symptomatology, family conflict and social support among Chengdu Chinese women. Matern. Child Health J. 15, 1416–1426. https://doi.org/10.1007/s10995-010-0699-z.

Lee, A.M., Lam, S.K., Sze Mun Lau, S.M., Chong, C.S.Y., Chui, H.W., Fong, D.Y.T., 2007. Prevalence, course, and risk factors for antenatal anxiety and depression. Obstet. Gynecol. 110, 1102–1112. https://doi.org/10.1097/01.aog.0000287065.59491.70.

Lee, D.T.S., Ngai, I.S.L., Ng, M.M.T., Lok, I.H., Yip, A.S.K., Chung, T.K.H., 2009. Antenatal taboos among Chinese women in Hong Kong. Midwifery 25, 104–113. https://doi.org/10.1016/j.midw.2007.01.008.

Li, J., Mao, J., Du, Y., Morris, J.L., Gong, G., Xiong, X., 2012. Health-related quality of life among pregnant women with and without depression in Hubei, China. Matern. Child Health J. 16, 1355–1363. https://doi.org/10.1007/s10995-011-0900-z.

Li, X.Y., Qiu, T., Huang, H., Tian, F.Q., Wu, H., 2019. Factors associated with anxiety symptoms of women in early pregnancy in Shenyang. J. Environ. Occupat. Med. 36, 63–67. https://doi.org/10.13213/j.cnki.jeom.2019.18608. (in Chinese).

Li, Y., Zeng, Y., Zhu, W., Cui, Y., Li, J., 2016. Path model of antenatal stress and depressive symptoms among Chinese primipara in late pregnancy. BMC Pregnancy Childbirth 16, 180. https://doi.org/10.1186/s12884-016-0972-2.

Lin, H., Li, Y.M., Luo, J.Y., Zhang, F.F., Zhou, S.J., Zeng, J., Zhou, Y.F., Qin, Z.X., 2019. Prevalence and Influencing factors of maternal stress in early pregnancy among pregnant women. Chinese J. Clin. Psychol. 1, 189–193. https://doi.org/10.16128/j.cnki.1005-3611.2019.01.039. (in Chinese).

Liu, H.X., Yang, J., 2012. The Effect of pregnancy education on prenatal anxiety and depression. J. Military Surgeon Southwest China 14, 592–593. https://doi.org/10.3969/j.issn.1672-7193.2012.04.012. (in Chinese).

Mäki, P., Riekki, T., Miettunen, J., Isohanni, M., Jones, P.B., Murray, G.K., Veijola, J., 2009. Schizophrenia in the offspring of antenatally depressed mothers in the northern Finland 1966 birth cohort: relationship to family history of psychosis. Am. J. Psychiatry 167, 70–77. https://doi.org/10.1176/appi.ajp.2009.09010133.

Meng, Z.H., Liu, C.Y., 2011. Study on status quo of maternal stress and anxiety of pregnant women in early pregnancy. Chinese Nurs. Res. 25, 1259–1260. https://doi.org/1009-6493 (2011) 5B-1259-02. (in Chinese).

Milgrom, J., Gemmill, A.W., Bilszta, J.L., Hayes, B., Barnett, B., Brooks, J., Ericksen, J., Ellwood, D., Buist, A., 2008. Antenatal risk factors for postnatal depression: a large prospective study. J. Affect. Disord. 108, 147–157. https://doi.org/10.1016/j.jad.2007.10.014.

O'Connor, T.G., Heron, J., Glover, V., 2002. Antenatal Anxiety predicts child behavioral/emotional problems independently of postnatal depression. J. Am. Acad. Child Adolescent Psychiatry 41, 1470–1477. https://doi.org/10.1097/00004583-200212000-00019.

Öhman, S.G., Grunewald, C., Waldenström, U., 2003. Women's worries during pregnancy: testing the Cambridge worry scale on 200 Swedish women. Scand. J. Caring Sci. 17, 148–152. https://doi.org/10.1046/j.1471-6712.2003.00095.x.

Pampaka, D., Papatheodorou, S.I., AlSeaidan, M., Al Wotayan, R., Wright, R.J., Buring, J.E., Dockery, D.W., Christophi, C.A., 2018a. Depressive symptoms and comorbid problems in pregnancy - results from a population based study. J. Psychosom. Res. 112, 53–58. https://doi.org/10.1016/j.jpsychores.2018.06.011.

Pampaka, D., Papatheodorou, S.I., AlSeaidan, M., Al Wotayan, R., Wright, R.J., Buring, J.E., Dockery, D.W., Christophi, C.A., 2018b. Postnatal depressive symptoms in women with and without antenatal depressive symptoms: results from a prospective cohort study. Arch. Women's Mental Health 22, 93. https://doi.org/10.1007/s00737-018-0880-8.

Pan, Y.L., Gao, L.L., Jin, X.H., 2004. A Comparative study on psychological stress of pregnant women and their spouses. Guangd. Med. J. 10, 1209–1210. https://doi.org/10.13820/j.cnki.gdyx.2004.10.061. (in Chinese).

Pawlby, S., Hay, D.F., Sharp, D., Waters, C.S., O'Keane, V., 2009. Antenatal depression predicts depression in adolescent offspring: prospective longitudinal community-based study. J. Affect. Disord. 113, 236–243. https://doi.org/10.1016/j.jad.2008.05.018.

QIAO, Y.-X., WANG, J., LI, J., ABLAT, A., 2009. The prevalence and related risk factors of anxiety and depression symptoms among Chinese pregnant women in Shanghai. Aust. N. Z. J. Obstet. Gynaecol. 49, 185–190. https://doi.org/10.1111/j.1479-828X.2009.00966.x.

Raatikainen, K., Heiskanen, N., Heinonen, S., 2006. Does unemployment in family affect pregnancy outcome in conditions of high quality maternity care? BMC Publ. Health 6, 46. https://doi.org/10.1186/1471-2458-6-46.

Rahman, A., Iqbal, Z., Harrington, R., 2003. Life events, social support and depression in childbirth: perspectives from a rural community in the developing world. Psychol. Med. 33, 1161–1167. https://doi.org/10.1017/S0033291703008286.

Rallis, S., Skouteris, H., McCabe, M., Milgrom, J., 2014. A prospective examination of depression, anxiety and stress throughout pregnancy. Women Birth 27, e36–e42. https://doi.org/10.1016/j.wombi.2014.08.002.

Redinger, S., Norris, S., Pearson, R., Richter, L., Rochat, T., 2018. First trimester antenatal depression and anxiety: prevalence and associated factors in an urban population in Soweto, South Africa. J. Develop. Origins Health Disease 9, 30–40. https://doi.org/10.1017/S204017441700071X.

Rini, C., Schetter, C.D., Hobel, C.J., Glynn, L.M., Sandman, C.A., 2006. Effective social support: antecedents and consequences of partner support during pregnancy. Personal Relat. 13, 207–229. https://doi.org/10.1111/j.1475-6811.2006.00114.x.

Roomruangwong, C., Epperson, C.N., 2011. Perinatal depression in Asian women: prevalence, associated factors, and cultural aspects. Asian Biomed. 5, 179–193. https://doi.org/10.5372/1905-7415.0502.024.

Senturk, V., Abas, M., Berksun, O., Stewart, R., 2011. Social support and antenatal depression in extended and nuclear family environments in Turkey: a cross-sectional survey. BMC Psychiatry 11, 48. https://doi.org/10.1186/1471-244X-11-48.

Shishehgar, S., Dolatian, M., Majd, H.A., Teimouri, Z., Alavi, S.T., Halvaei, P., 2016. Social support and maternal stress during pregnancy: a PATH model. Int. J. Healthcare 2, 44–50. https://doi.org/10.5430/ijh.v2n1p44.

Sidebottom, A.C., Hellerstedt, W.L., Harrison, P.A., Hennrikus, D., 2014. An examination of prenatal and postpartum depressive symptoms among women served by urban community health centers. Arch. Women's Mental Health 17, 27–40. https://doi.org/10.1007/s00737-013-0378-3.

Smilkstein, G., Ashworth, C., Montano, D., 1982. Validity and reliability of the family APGAR as a test of family function. J. Fam. Pract. 15, 303–311.

Song, L.Q., Li, J.L., Tao, M., 2013. The level and influence factors of maternal stress among pregnant women. Chinese J. Nurs. 48, 808–811. https://doi.org/10.3761/j.issn.0254-1769.2013.09.014. (in Chinese).

Staneva, A., Bogossian, F., Pritchard, M., Wittkowski, A., 2015. The effects of maternal depression, anxiety, and perceived stress during pregnancy on preterm birth: a systematic review. Women Birth 28, 179–193. https://doi.org/10.1016/j.wombi.2015.02.003.

Sun, L., 2012. A Cohort Study On Effects of Maternal Emotional Symptoms On Adverse Pregnancy Outcomes Among Chinese women. Master's thesis, Anhui Medical University, Anhui (in Chinese).

Sun, S.W., Li, J.Q., Pu, H.L., Yu, X.Y., 2018. Survey and analysis on present situation of sicial support and family care for pregnant women with fetal abnormality. J. Nurs. Rehab. 17, 16–19. https://doi.org/10.3969/j.issn.1671-9875.2018.05.005. +22(in Chinese).

Tao, H.H., 2016. The relationship between maternal emotional symptoms during pregnancy and preschool children's emotional and behavioral problems: a birth cohort study. Master's thesis. Anhui Medical University, Anhui.

Van den Bergh, B.R., Marcoen, A., 2004. High antenatal maternal anxiety is related to ADHD symptoms, externalizing problems, and anxiety in 8- and 9-year-olds. Child Dev. 75, 1085–1097. https://doi.org/10.1111/j.1467-8624.2004.00727.x.

Walder, D.J., Laplante, D.P., Sousa-Pires, A., Veru, F., Brunet, A., King, S., 2014. Prenatal maternal stress predicts autism traits in 6½ year-old children: project Ice Storm. Psychiatry Res. 219, 353–360. https://doi.org/10.1016/j.psychres.2014.04.034.

Wang, J., 2014. Observation study on females' depression from pregnancy to postpartum and immigrant females' postpartum depression in Wuhan city. Doctoral thesis. Huazhong University of Science & Technology, Wuhan.

Wang, Y., Fong, V.L., 2009. Little emperors and the 4: 2: 1 generation: China's singletons. J. Am. Acad. Child Adolescent Psychiatry 48, 1137–1139. https://doi.org/10.1097/CHI.0b013e3181bc72f8.

Wang, Y.Q., Wang, Y., Guo, X.J., 2015. Investigation and analysis of depression between the first and second trimester of pregnancy. Nurs. J. Chinese People's Liberat. Army 32, 5–8. https://doi.org/10.3969/j.issn.1008-9993.2015.18.002. (in Chinese).

Waqas, A., Raza, N., Lodhi, H.W., Muhammad, Z., Jamal, M., Rehman, A., 2015.

Psychosocial factors of antenatal anxiety and depression in Pakistan: is social support a mediator? PLoS One 10, e0116510. https://doi.org/10.1371/journal.pone.0116510.

Wen-Shing, T., 1975. The nature of somatic complaints among psychiatric patients: the Chinese case. Compr. Psychiatry 16, 237–245. https://doi.org/10.1016/0010-440X(75)90050-4.

Woods, S.M., Melville, J.L., Guo, Y., Fan, M.-Y., Gavin, A., 2010. Psychosocial stress during pregnancy. Am. J. Obstet. Gynecol. 202, 61.e1–61.e7. https://doi.org/10.1016/j.ajog.2009.07.041.

Xiao, S.Y., 1994. The theoretical basis and research application of social support rating scale. J. Clin. Psychiatry 4, 98–100 (in Chinese).

Yu, J., Zhu, L.P., 2010. An investigation of anxiety and depression disorders among pregnant women in different trimesters in Shanghai. Chinese J. Woman Child Health Res. 21, 21–23. https://doi.org/10.3969/j.issn.1673-5293.2010.01.007. (in Chinese).

Yu, Y., Li, M., Pu, L., Wang, S., Wu, J., Ruan, L., Jiang, S., Wang, Z., Jiang, W., 2017. Sleep was associated with depression and anxiety status during pregnancy: a prospective longitudinal study. Arch. Women's Mental Health 20, 695. https://doi.org/10.1007/s00737-017-0754-5.

Zhang, H., 2017a. Investigation and analysis of psychological state of patients with recurrent spontaneous abortion. Master's thesis. Chongqing Medical University, Chongqing.

Zhang, J.L., Hao, J.H., Tao, F.B., Wang, H., Zhu, P., Xu, S.J., Su, P.Y., 2011. Influencing factors of pregnancy-related anxiety in first trimester of pregnancy. Chinese J. Publ. Health 27, 969–971 (in Chinese).

Zhang, S.B., 2017b. The Course of Maternal Pregnancy-Specific Stress across Pregnancy and Effects on Primary Pregnancy Outcomes: A Prospective Study. Master's thesis. The Chinese Center for Disease Control and Prevention, Beijing.

Zhang, S.B., Zheng, R.M., Wu, J.L., Yang, L., Huang, X., Wang, S.X., 2017. Prevalence of Pregnancy-Specific Stress in 961 Early Pregnant Women. Chinese J. Woman Child Health Res. 28, 510–513. https://doi.org/10.3969/j.issn.1673-5293.2017.05.007. (in Chinese).

Zhang, Z.J., 2005. Behavioral Medicine Scale Manual, 2nd ed. Chinese Medical Electronic Audio and Video Publishing House, Beijing, China, pp. 214–215 267-268. (in Chinese).

Zhao, Z.M., Pan, X.F., Qi, X.R., Li, S.Q., Zhao, Y., Chang, H., Xue, Q.P., Wen, Y., Liu, X., Yang, C.X., 2014. PIH59–Antenatal Depression and its risk factors among Women in Chengdu of China results from a hospital based survey. Value Health 17, A514. https://doi.org/10.1016/j.jval.2014.08.1589.

Zheng, D.D., Zhou, L.H., Wu, X.L., Wang, L.-P., 2018. Investigation on the influencing factors of fear of delivery in primipara in the third trimester of pregnancy. Mater. Child Health Care China 33, 3525–3528. https://doi.org/10.7620/zgfybj.j.issn.1001-4411.2018.15.53. (in Chinese).

Zheng, R.S., 2011. Study on the relationships among sleep quality, sleepiness, fatigue, anxiety and depression of pregnant women. Master's thesis. Central South University, Hunan.

Zhu, B.L., Dai, Z.H., 1988. Revision of Chinese Norm of 16 Personality Factor Questionnaire. J. Psychol. Sci. 16–20. https://doi.org/10.16719/j.cnki.1671-6981.1988.06.004. (in Chinese).

Zung, W.K., 1965. A self-rating depression scale. Arch. Gen. Psychiatry 12, 63–70. https://doi.org/10.1001/archpsyc.1965.01720310065008.