Influences on coping styles during pregnancy, and association with postpartum depression: a cohort study

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Abstract

Background Few studies have examined protective or risk factors for coping styles of pregnant women, and studies which focus on coping in different ethnic populations are needed. The aim of this study was to investigate the coping styles of pregnant women and identify possible factors associated with coping. We further explored the effect of coping styles during pregnancy on postpartum depression.

Methods Convenience sampling was used to recruit pregnant women in two maternal and child health hospitals in Hunan province, China. Participants completed the Self-made Questionnaire, Coping Style Questionnaire (CSQ), Generalized Anxiety Disorder (GAD-7), Brief Resilience Scale (BRS), Rosenberg Self-esteem Scale (RSES), and Edinburgh Postnatal Depression Scale (EPDS) at 4 time points (gestational week 12 or earlier; week 21~24; week 31~32; and 6 weeks postpartum). Totally 615 women were included in this study. Linear Regression analyses were used respectively to identify the possible predictors for coping and its effect on postpartum depression.

Results (1) The resilience were associated with both positive and negative coping while self-esteem only related to positive coping in the antenatal period; (2) Women with a higher educational level scored higher on both positive and negative coping in pregnancy; (3) Higher level of positive coping and lower level of negative coping in the antenatal period were associated with postpartum depression.

Conclusions Women with low self-esteem and resilience may have problems in coping in pregnancy and it would be necessary to identify women antenatally with these factors and help them deal with stressors during pregnancy better. Women with a higher level of education were more likely to use both positive and negative coping, which implied integration of different coping could be further explored in future research. Postpartum depression was associated with both positive and negative coping, indicating that coping intervention could be targeted for women with coping issues to prevent postpartum depression for care providers.

Introduction

Coping is defined as consciously and constantly changing behavioral and cognitive efforts to deal with the specific situations that are considered stressful[1]. Its function is to regulate the effects of stressful events, including the evaluation of stressors, and adjusting the event-related somatic and emotional responses[2]. Pregnancy and childbirth are stressful life events for women[3, 4]. Physical discomfort (e.g. back pain, gestational diabetes, pregnancy-induced hypertension), and psychological stress (e.g. self-redefinition, renegotiating relationships with others, work and family responsibilities, fear and unpredictability of childbirth) are stressors that are commonplace for pregnant women, which could further lead to emotional problems. A cohort study from early pregnancy to 5 years postpartum indicated that moderate to high depression and anxiety symptoms could be predicted by antenatal stress and as the level of stress increases the severity of symptoms also increases[5]. Coping during pregnancy, as a mediator between the stressful events and its effects on emotion, could minimize or even

prevent the adversities brought by stressors[6]. Positive coping refers to the ability to handle problems, adapt quickly to stressors and moderate stress responses. Negative coping strategies, such as avoidance, social withdrawal, self-pity and self-accusation could aggravate anxiety[7, 8]. In the perinatal period, the ability to adopt appropriate coping behaviours could buffer mothers and their children from potentially harmful influences of prenatal stressors. Some women with negative coping perceive that stressful events are beyond their coping resources, and contribute to the lack of confidence in their ability to cope and provide behavioral and emotional support to their child[9]. Moreover, coping efforts during different situations are not fixed, and liable to change[10]. Research has shown that the study of coping must take place within the context of a specific stressful situation, and different contexts produce different coping responses[11, 12], leading to the hypothesis that coping response is amenable to intervention [13]. When facing significant stress, people can benefit greatly from structured coping interventions such as problem-solving [14]. Other coping interventions have been shown to be beneficial in pregnant women, for example guided imagery (GI), decreases perceived stress and increases adaptability to different situations[15, 16]and the positive reappraisal coping intervention (PRCI), alleviates anxiety symptoms for women undergoing IVF treatment[17]. If determinants of coping are clarified, coping interventions could be developed for pregnant women at risk.

There have been few studies examining protective or risk factors for coping behaviours, and there are some limitations in the existing literature. Firstly, some studies were focused on a specific population, for example HIV-diagnosed women during pregnancy[18, 19]. Secondly, methodological limitations limit the strength of the evidence, such as the use of cross-sectional designs [20, 21]. In addition, due to the cultural heterogeneity of coping[22-24], studies which focus on coping styles among different ethnic population are still needed. For example, in Greece, women were more likely to use emotion-focused coping in pregnancy[25]. In Ethiopia, religious coping has been proven to be the most commonly used coping strategy by women with postpartum depression[20].

We used a prospective cohort study design to investigate women's coping styles in their third trimester and to identify possible psychosocial correlates of coping. We further explored the association of coping styles with postpartum depression to provide reference and basis for better psychological health care during pregnancy. We hypothesized that higher levels of antenatal positive coping would be associated with positive demographic or psychosocial variables (e.g. higher education level, income, marital satisfaction, self-esteem, resilience), while negative coping would show the reverse. We hypothesized that a lower level of antenatal positive coping or higher level of negative coping might be related to postpartum depression.

Methods

Aim

To investigate women's coping styles in their third trimester and to identify possible psychosocial determinants of coping, and to explore the association of coping styles with postpartum depression

Study design

This study uses data from a larger cohort study in Hunan Province, central south of China, the primary aim of which was to develop a dynamic predictive model of perinatal depression by measuring depression, social environment, psychological and biological factors from the first trimester of pregnancy to 6 weeks postpartum (not published).

Setting

The cohort study took place in two urban maternal and child health hospitals in Hunan province, China: Hunan Maternal and Child Health Hospital (the largest maternal and child hospital in Hunan province with comprehensive maternal health services) and Ziyang Maternal and Child Health Hospital (in a less economic developed area of Hunan province). The recruitment time was from September 7, 2016 to February 23, 2017. Hunan Province is a medium-developed region in China with per capital Growth Domestic Product (GDP) 49558 Yuan (about 7370 USD) ranked 17th out of 32 administrative areas of China in 2017[26].

Participants

1126 women were recruited by convenience sampling when they attended the hospital outpatient clinic for their first antenatal appointment (the nurses asked women if they were willing to participate this project and the informed consent form would be given to them if they said yes). All women approached completed the baseline survey. The inclusion criteria were as follows: 1) over 18 years old; 2) signed informed consent and willing to accept follow-up; 3) less than 13 weeks of gestation or earlier (gestational weeks was calculated based on the last menstruation); 4) could independently complete the questionnaires. Exclusion criteria: 1) had severe pregnancy complications or mental health diagnosis. This study used the information from participants with complete follow-up data (n=615).

Data collection

The study comprised of 4 time points for data collection: at gestational week 12 or earlier (range: week 4~12, T1); week 21~24 (T2); week 31~32 (T3); and 6 weeks postpartum (T4).

Data were collected in 2 ways:

- 1) Internet-based smartphone app named 'wenjuanxing', a professional online questionnaire-survey platform. We sent a link to the app and questionnaires directly to participants' personal mobile (cell) phones;
- 2) Face to face field survey by paper questionnaires completed with support from nurses trained for the purpose of the study

Information about recruitment and participants flow is depicted in Figure 1. Coping and its potential correlates were detected in the T1, T2, T3. Depression at T4 was an outcome variable in the study of relationship between coping and postpartum depression (see Figure1). At the end of the data collection period, 615 women who had completed questionnaires at T1, T2, T3, T4 constituted participants in this study.

Figure1 Flow of participants through the study.

Instruments

- General information Questionnaire: We designed this questionnaire based on expert opinion with simple items to investigate general sociodemographic information and potential coping-related factors including age, occupation, women's income (per month), marital satisfaction, previous histories of mental health and pregnancy (see Table 1).
- Coping Style Questionnaire (CSQ). The CSQ revised by Xie [8] was used to measure the coping style of women. The scale had been adjusted to suit the characteristics of Chinese people based on the Ways of Coping Questionnaire (WOC) that was designed by Folkman and Lazarus[27]. CSQ has two dimensions (positive coping and negative coping) and 20 items. The first 12 items correspond to positive coping and the others correspond to negative coping. By assigning scores of 0, 1, 2, and 3, to the four options of 'never ', 'sometimes', 'often', and 'almost always' respectively, the mean of each item could be calculated for each dimension to provide a summary score. It should be emphasized that negative coping does not necessarily play a negative role in all cases when explaining results. The test-retest reliability of CSQ was 0.89 and the Cronbach's α coefficient was 0.90.
- Generalized Anxiety Disorder (GAD-7). GAD-7 compiled by Spitzer in 2006[28] has good reliability and validity. It had been widely used for screening anxiety disorders or

evaluating the severity of anxiety symptoms[29, 30].

- Brief Resilience Scale (BRS). This 6-item scale was developed by Smith in 2008 to assess resilience-the ability to bounce back or recover from stress[31]. The mean of the six items is the final results.
- Rosenberg Self-esteem Scale (RSES). The RSES, developed by sociologist Dr. Morris Rosenberg[32], was used to measure self-esteem by asking the respondents to reflect on their current feelings for themselves. The RSES is considered a reliable and valid quantitative tool for self-esteem assessment and the Chinese version was used in our research[33, 34].
- Edinburgh Postnatal Depression Scale (EPDS). Postpartum depression was assessed using the EPDS developed by Cox[35]. The scale is a 10-item self-report questionnaire asking participants to consider various depressive symptoms during the last 7 days. In our study, the revised Chinese version of the EPDS was used and the score of 10 was taken as the cut-off point for 'possible depression'[36].

Statistical analysis

All statistical analyses were performed using SPSS version 17.0. For sample description, mean and SD were calculated for continuous variables while absolute number and composition ratio were used for categorical variables. Simple and multiple regressions were conducted to explore the potential factors of each of the two dimensions of coping styles. Multicollinearity was detected using tolerance and VIF. When exploring the effects of coping on postpartum depression, a multiple linear regression was performed after adjusting for possible confounding factors which were associated with coping and also depression in this study. The statistical level of multivariate analyses was $p \leq 0.05$ (two-tailed).

Results

Characteristics of participants and univariate analysis

The mean age of participants was 30.739(SD:4.342; range: 20-46 years); gestational age was from 4 to 12 weeks; mean scores of positive coping and negative coping were 2.032(SD:0.504), and 1.208(SD:0.514) respectively. Participants with complete data constituted our study sample. There were no significant differences for most baseline characteristics between our study sample and the participants lost-to-follow-up for any of the surveys, with the exception of be satisfaction in marriage, previous psychosis, and pregnancy for the first time, which were more common in the study sample (Table 1).

Table 1 Comparison of baseline characteristics between the participants with complete data and those lost-to-follow-up

Characteristics	Participants in Study (n=615)		Participants Lost to Follow-up (n=511)		<i>P</i> value ^a
	<i>n</i>	%	<i>n</i>	%	
Advanced Age					
No	495	80.5	411	80.4	0.981
Yes	120	19.5	100	19.6	
Employed					
No	157	25.5	122	23.9	0.522
Yes	458	74.5	389	76.1	
Education status					
Middle school or lower	57	9.3	70	13.7	0.107
High school	141	22.9	117	22.9	
Bachelor	366	59.5	281	55.0	
Postgraduate or higher	51	8.3	43	8.4	
Income level					
≤2000	200	32.5	168	32.9	0.099
2000~	322	52.4	224	43.8	
5000~	80	13	101	19.8	
≥10000	13	2.1	18	3.5	
Marital satisfaction					
Very satisfied	518	84.2	405	79.3	0.031
Not very satisfied	97	15.8	106	20.7	
Living with parents-in-law					
No	411	66.8	332	65.0	0.512
Yes	204	33.2	179	35.0	
Previous psychosis					
No	598	97.2	506	99.0	0.031
Yes	17	2.8	5	1.0	
First pregnancy					
No	433	70.4	403	78.9	0.001
Yes	182	29.6	108	21.1	
Previous miscarriage					
No	305	49.6	269	52.6	0.308
Yes	310	50.4	242	47.4	
Parity					
0	362	58.9	277	54.2	0.117
≥1	253	41.1	234	45.8	
Smoking					
No	594	96.6	489	95.7	0.438
Yes	21	3.4	22	4.3	
Drinking					
No	568	92.4	472	92.4	0.995
Yes	47	7.6	39	7.6	
Employed(partner)					
No	17	2.8	10	2.0	0.378
Yes	598	97.2	501	98.0	
Education status(partner)					
Middle school or lower	73	11.9	71	13.9	0.814
High school	146	23.7	113	22.1	
Bachelor	343	55.8	281	55.0	
Postgraduate or higher	53	8.6	46	9.0	
GAD-7(Mean, SD)	2.899 (2.862)		3.147 (2.941)		0.102

a: *P*-value was calculated using χ^2 tests, *t*-tests and Mann-Whitney U tests.

Simple and Multiple linear regression including factors related to coping styles

Multicollinearity was not detect in both multiple models as none of the variable had a tolerance $\leq$ 0.1 or a VIF $\geq$ 10.

Table 2 Influencing Factors of Positive coping

Characteristics	Mean (SD)	Crude β (95%CI)	Adjusted β (95%CI)
Advanced Age			
No	2.029 (0.503)	—	—
Yes	2.040 (0.510)	0.011 (-0.090, 0.112)	-0.007 (-0.112, 0.097)
Employed			
No	1.956 (0.529)	—	—
Yes	2.058 (0.494)	0.102 (0.011, 0.193)	-0.046(-0.164, 0.072)
Education status			
Middle school or lower	1.692(0.571)	—	—
Dummy 1: High school	1.974(0.509)	0.283 (0.132, 0.433)	0.212 (0.058, 0.366)
Dummy 2: Bachelor	2.077(0.479)	0.385 (0.249, 0.522)	0.247 (0.089, 0.405)
Dummy 3: Postgraduate or higher	2.245(0.392)	0.553 (0.368, 0.738)	0.357 (0.135, 0.578)
Income level			
≤2000	1.939(0.519)	—	—
Dummy 1: 2000~	2.062(0.494)	0.123 (0.035, 0.212)	0.065 (-0.049, 0.179)
Dummy 2: 5000~	2.101(0.472)	0.162 (0.032, 0.292)	0.039 (-0.111, 0.190)
Dummy 3: ≥10000	2.276(0.526)	0.337 (0.056, 0.618)	0.173 (-0.099, 0.445)
Marital satisfaction			
Very satisfied	2.063 (0.501)	—	—
Not very satisfied	1.863 (0.492)	-0.200 (-0.309, -0.091)	-0.046 (-0.154, 0.061)
Living with parents-in-law			
No	2.049 (0.494)	—	—
Yes	1.997 (0.525)	-0.051 (-0.136, 0.034)	0.042 (-0.040, 0.125)
Previous psychosis			
No	2.029 (0.503)	—	—
Yes	2.123 (0.542)	0.094 (-0.149, 0.338)	0.057 (-0.171, 0.286)
First pregnancy			
No	1.989 (0.512)	—	—
Yes	2.132 (0.472)	0.143 (0.056, 0.230)	0.079 (-0.037, 0.195)
Previous miscarriage			
No	2.074 (0.494)	—	—
Yes	2.046 (0.477)	-0.083 (-0.163, -0.004)	0.005 (-0.091, 0.101)
Parity			
0	2.089 (0.484)	—	—
≥1	1.949 (0.522)	-0.140 (-0.221, -0.060)	-0.039 (-0.135, 0.057)
Smoking			
No	2.033 (0.504)	—	—
Yes	1.979 (0.511)	-0.054 (-0.274, 0.166)	-0.007 (-0.229, 0.215)
Drinking			
No	2.038 (0.507)	—	—
Yes	1.955 (0.471)	-0.083 (-0.233, 0.067)	-0.049 (-0.201, 0.103)
Employed(partner)			
No	1.897 (0.500)	—	—
Yes	2.035 (0.504)	0.138 (-0.105, 0.382)	0.055 (-0.173, 0.283)

Education status(partner)			
Middle school or lower	1.853(0.488)	—	—
Dummy 1: High school	1.927(0.538)	0.075 (-0.065, 0.214)	-0.032 (-0.172, 0.109)
Dummy 2: Bachelor	2.087(0.485)	0.235 (0.109, 0.360)	0.069 (-0.071, 0.209)
Dummy 3: Postgraduate or higher	2.206(0.438)	0.354 (0.179, 0.529)	0.102 (-0.101, 0.305)
GAD-7(Mean, SD)	2.899(2.862)	-0.034 (-0.048, -0.020)	-0.014 (-0.028, 0.000)
Resilience (Mean, SD)	3.498(0.580)	0.293 (0.228, 0.358)	0.237 (0.167, 0.306)
Self-esteem (Mean, SD)	29.385(3.383)	0.024 (0.007, 0.040)	0.016 (0.001, 0.032)

From table 2, education status, resilience, and self-esteem showed statistically significant associations in both univariate and multivariate analysis. The positive regression coefficients of education status, resilience and self-esteem indicated that women having higher educational background, higher self-esteem or better mental resilience had higher scores of positive coping. Furthermore, the level of anxiety was marginally associated with coping ($P=0.059$).

ole 3 Influencing Factors of Negative coping

Characteristics	Mean (SD)	Crude β (95%CI)	Adjusted β (95%CI)
Advanced Age			
No	2.029(0.503)	—	—
Yes	2.040(0.510)	0.001 (-0.102, 0.104)	-0.007 (-0.123, 0.110)
Employed			
No	1.956(0.529)	—	—
Yes	2.058(0.494)	0.014 (-0.079, 0.107)	-0.009 (-0.141, 0.122)
Education status			
Middle school or lower	1.033(0.502)	—	—
Dummy 1: High school	1.233(0.542)	0.200 (0.042, 0.357)	0.202 (0.031, 0.373)
Dummy 2: Bachelor	1.214(0.490)	0.181 (0.038, 0.324)	0.172 (-0.004, 0.348)
Dummy 3: Postgraduate or higher	1.294(0.580)	0.261 (0.067, 0.454)	0.266 (0.021, 0.512)
Income level			
≤2000	1.186(0.521)	—	—
Dummy 1: 2000~	1.217(0.508)	0.031 (-0.060, 0.122)	0.044 (-0.123, 0.131)
Dummy 2: 5000~	1.198(0.489)	0.012 (-0.122, 0.145)	-0.042 (-0.209, 0.125)
Dummy 3: ≥10000	1.375(0.683)	0.189 (-0.100, 0.478)	0.234 (-0.068, 0.537)
Marital satisfaction			
Very satisfied	2.063(0.501)	—	—
Not very satisfied	1.863(0.492)	0.069 (-0.042, 0.181)	0.025 (-0.095, 0.144)
Living with parents-in-law			
No	1.214 (0.514)	—	—
Yes	1.197 (0.513)	-0.017 (-0.103, 0.070)	0.012 (-0.080, 0.103)
Previous psychosis			
No	2.029(0.503)	—	—
Yes	2.123(0.542)	-0.017 (-0.266, 0.231)	-0.035 (-0.288, 0.218)
First pregnancy			
No	1.989(0.512)	—	—
Yes	2.132(0.472)	-0.030 (-0.119, 0.059)	-0.016 (-0.146, 0.113)
Previous miscarriage			
No	2.074(0.494)	—	—
Yes	2.046(0.477)	0.040 (-0.041, -0.121)	0.044 (-0.062, 0.151)
Parity			
0	2.089(0.484)	—	—
≥1	1.949(0.522)	-0.005 (-0.088, 0.077)	-0.003 (-0.110, 0.103)
Smoking			
No	2.033(0.504)	—	—
Yes	1.979(0.511)	-0.020 (-0.244, 0.204)	-0.040 (-0.287, 0.207)
Drinking			
No	2.038(0.507)	—	—
Yes	1.955(0.471)	0.058 (-0.095, 0.211)	0.077 (-0.092, 0.246)
Employed(partner)			
No	1.897(0.500)	—	—
Yes	2.035(0.504)	-0.036 (-0.284, 0.213)	-0.033 (-0.286, 0.220)

Education status(partner)			
Middle school or lower	1.116(0.514)	—	—
Dummy 1: High school	1.171(0.510)	0.055 (-0.089, 0.199)	-0.005 (-0.161, 0.151)
Dummy 2: Bachelor	1.235(0.500)	0.119 (-0.011, 0.249)	0.076 (-0.079, 0.232)
Dummy 3: Postgraduate or higher	1.258(0.596)	0.142 (-0.040, 0.323)	0.078 (-0.148, 0.303)
GAD-7(Mean, SD)	2.899(2.862)	0.014 (0.000, 0.028)	0.008 (-0.008, 0.024)
Resilience (Mean, SD)	3.498(0.580)	-0.108 (-0.178, -0.039)	-0.108 (-0.185, -0.030)
Self-esteem (Mean, SD)	29.385(3.383)	0.000(-0.017, 0.017)	0.001 (-0.017, 0.018)

From table 3, education status (dummy 1 and 3) of women was the only demographic variable significantly associated with negative coping while dummy 2 was marginally associated with negative coping ($P=0.055$). The positive regression coefficients of education status (dummy 1 and 3) suggested that women with higher educational levels had higher scores of negative coping. Women who had better resilience had lower scores of negative coping.

Correlation between Coping Style and Postpartum depression

The incidence of postpartum depression was 26.34% ($n=162$). The characteristics of women with or without postpartum depression are listed in Table 4. A multiple linear regression was undertaken to explore the relationship between coping styles and 6-week postpartum depression, and in this model, coping style still showed statistical significance after controlling for potential confounders. Those variables associated with coping and depression in univariate analyses were included in the model as potential confounders. Women with a higher level of positive coping in the third trimester were less likely to have postpartum depression ($\beta=-0.907$, $P=0.016$), while women who had a higher level of negative coping were more likely to have postpartum depression ($\beta=1.045$, $P=0.003$).

Table 4 Characteristics between women with or without postpartum depression

Variables	Without postpartum depression (n=453)		With postpartum depression(n=162)	
	n (%)	Mean (SD)	n (%)	Mean (SD)
Advanced Age				
No	357 (72.1)		138 (27.9)	
Yes	96 (80.0)		24 (20.0)	
Employed				
No	100 (63.7)		75 (36.3)	
Yes	353 (77.1)		105 (22.9)	
Education status				
Middle school	38 (66.7)		19 (33.3)	
High school	103 (73.0)		38 (27.0)	
Bachelor	271 (74.0)		95 (26.0)	
Postgraduate or higher	41(80.4)		10 (19.6)	
Income level				
≤2000	137 (68.5)		63 (31.5)	
2000~5000	242 (75.2)		80 (24.8)	
5001~10000	61 (76.3)		19 (23.7)	
≥10000	13 (100)		0 (0)	
Marital satisfaction				
Very satisfied	396 (76.4)		122 (23.6)	
Not very satisfied	57 (58.8)		40 (41.2)	
Previous psychosis				
No	442 (73.9)		156 (26.1)	
Yes	11 (64.7)		6 (35.3)	
First pregnancy				
No	319 (73.7)		114 (26.3)	
Yes	134 (73.6)		48 (26.4)	
Previous miscarriage				
No	219 (71.8)		86 (28.2)	
Yes	234 (75.5)		76 (24.5)	
Parity				
0	261 (72.1)		101 (27.9)	
≥1	192 (75.9)		61 (24.1)	
GAD-7		2.488 (2.595)		4.048 (3.244)
Positive coping		2.086 (0.470)		1.878 (0.564)
Negative coping		1.183 (0.504)		1.278 (0.535)

Discussion

In this study we found that some sociopsychological factors such as education status, self-esteem and resilience were associated with coping styles during pregnancy, which were also strongly associated with postpartum depression and provided further evidence to support the implementation of coping interventions during pregnancy for postpartum depression prevention.

Women with a higher educational level scored higher on both positive and negative coping. A study in Ethiopia had similar findings: compared with women without formal education, those with formal education had higher scores both in problem-and emotion-focused coping[20]. The association of better educational background with higher levels of positive coping might be attributed to women's access to resources. Women with lower educational levels were more likely to perceive greater stress[37]—which would affect the way they

respond to stressors, and weaken their abilities dealing with challenges. Interestingly—we did not hypothesize that negative coping is positively associated with education status, though dummy 2 only showed marginal statistical significance. One possibility is that coping process is dynamic, and may change in response to different situations[11, 12, 38]. For instance, women who actively solve problems when facing particular stressors might also employ avoidant strategies in other situations. In our investigation, participants only were asked to answer how they cope with stress generally during pregnancy rather than to report their efforts to resolve pregnancy-specific stressors. When women were filling in the questionnaires—different women may have reflected on different types of stressor. Lazarus described how problem-solving and emotion-focused coping should not be conceptualized as independent of one another, or competing, and instead should be viewed as complementary functions working in tandem.[39] Given that negative coping is not always 'negative' and the specific coping strategies are various, further studies should explore the integration of different coping behaviors that might facilitate the ability to handle pregnancy-and childbirth-related stressors, rather than one particular coping strategy and its consequent effects on mental health. This could identify combinations of coping strategies that could withstand stressors surrounding pregnancy. This suggests that individuals adapting better to stressful events might be exactly those who could combine different coping strategies effectively.

Women with better resilience were more likely to have a higher level of positive coping and lower level of negative coping in our study. Resilience refers to the ability to bounce back and recover from stress, or to continue forward when facing adversities[31]. Resilient individuals can continue functioning when confronting stressors, which may be explained by their 'resilience resources', including optimism, self-efficacy or mastery, emotional intelligence, and close social networks [40, 41]. Women exposed to stressful pregnancy-related events are likely to cope better if they have resilience resources, and the more the better[40]. Few studies have been undertaken which explore the relationship between resilience and coping during pregnancy, with the exception of those focused on specific resilience resources in pregnancy. Existing research suggests that that optimism and self-efficacy are positively related with avoidant coping, and negatively related with active coping[42, 43], which is consistent with our findings that women with better resilience scored higher on positive coping while scored lower on negative coping. In another study, higher self-esteem was associated with increased use of positive coping, which could be attributed to the fact that high self-esteem, as positive self-evaluation, could be seen as one of the resources of coping and can be used to confront stressors[44]. Others have also shown that women who view themselves positively are better able to adapt to their new role as a mother than women with low self-esteem [44, 45]. Our results concur with a qualitative interview study undertaken with HIV-positive pregnant women in South Africa, which concluded that the increased use of active coping was associated with higher self-esteem and social supports[18]. This suggests that it would be necessary to identify women antenatally with these factors and help them deal with stressors during pregnancy better for care providers.

Our findings indicate that women with lower level of positive coping and higher level of negative coping in the antenatal period are likely to be more vulnerable to experiencing postpartum depression. This aligns with previous research that deemed postpartum depression was negatively correlated with positive coping and positively correlated with negative coping style[46-48][24-27]. For specific coping strategies, two longitudinal studies have shown the occurrence of postpartum depression is associated with avoidant coping behaviours in pregnancy, which were similar in characterization with negative coping[49, 50]. According to stress and coping theory, coping may play a critical role in mediating the influence of pregnancy-related stressors[51]. Coping with stressors positively means mobilizing internal forces or resorting to external resources to minimize the adverse effects caused by stressors. Conversely, women adopting negative coping such as avoidance and substance abuse might be vulnerable to prenatal stress exposures, which is not conducive to the solution of the problem but promotes the generation of negative emotion[21]. Coping intervention could be targeted for women with coping issues to prevent postpartum depression for care providers.

There are a number of limitations in this research. Firstly, 45.38% of participants were lost to follow up during the study, potentially impacting on both internal and external validity. However, baseline characteristics between study sample and the participants lost-to-follow-up were similar, suggesting that our sample was representative of the population of women attending the hospital. A further limitation is that most participants in our research were from urban contexts, and it is not clear how they apply in more rural communities. Finally, all participants were recruited by convenience sampling, suggesting that participants in our study might be atypical and generalizing our finding should be cautious.

Conclusion

Our results indicate that education status, resilience and self-esteem are positively associated with women's positive coping in pregnancy, while lower resilience is associated with negative coping. It would be necessary to identify women antenatally with these factors and coping issues. Women with a higher level of education were more likely to use both positive and negative coping, suggesting that integration of different coping strategies could be further explored in future research. Postpartum depression was associated with both positive and negative coping, indicating that coping intervention could be targeted for women with coping issues during pregnancy to prevent postpartum depression for care providers.

Abbreviations

CSQ: Coping Style Questionnaire

GAD-7: Generalized Anxiety Disorder

BRS: Brief Resilience Scale

RSES: Rosenberg Self-esteem Scale

EPDS: Edinburgh Postnatal Depression Scale

GI: guided imagery

PRCI: positive reappraisal coping intervention

Declarations

Ethical approval and consent to participate

Ethical approval was received from the institutional review board of the institute of clinical pharmacology of Central South University (No.ChiCTR-ROC-16009255). Only women who agreed to participate and gave written consent were included in this research.

Consent for publication

Not applicable

Availability of data and materials

The data sets are available from the corresponding author on reasonable request.

Competing interests

The authors declared that they have no conflicts of interest to this work.

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Authors' contributions

Wenjie Gong conceived the idea of the study. Min Yu analyzed data and wrote the paper. Wenjie Gong interpreted the data. Beck Taylor, Yiyuan Cai and Dong Xu discussed the results and revised the manuscript. All authors have read and approved the final manuscript.

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Figures

Figure 1

Flow of participants through the study