Anxiety, depression and social support in Chinese pregnant women with a history of recurrent miscarriage: a prospective study

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Research

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Abstract

**Background:** Women with a history of recurrent miscarriage (RM) are a more vulnerable population, caring for the pregnant women with a history of RM is quite needed. Although evidence suggests an association among anxiety, depression and social support. Yet, it is unclear about changes in and relationships between anxiety, depression and social support among the pregnant women with a history of RM throughout the pregnancy period. The aim of this study was to examine the changes in and relationships among anxiety, depression and social support across three trimesters of pregnancy in Chinese women with a history of RM.

**Methods:** A prospective, longitudinal study was employed. The study was carried out between September 2016 and October 2017 in a teaching hospital in Guangzhou, China. A convenience sample of 166 pregnant women with a history of RM completed the measures at their 6-12, 20-24 and 32-36 gestational weeks. Data were collected by a master student with Zung Self-Rating Anxiety Scale, the Edinburgh Postnatal Depression Scale, and the Perceived Social Support Scale.

**Results:** Anxiety decreased from the early pregnancy to late pregnancy while depression first declined from early pregnancy to mid-pregnancy then remained to late pregnancy. Social support increased from early pregnancy to mid-pregnancy and then remained to late pregnancy. There were correlations in anxiety, depression and social support across the three trimesters of pregnancy.

**Conclusions:** Anxiety and depression are highly prevalent in pregnant women with a history of RM, especially in early pregnancy, which merits clinical attention. Social support was an important buffer against anxiety and depression across the pregnancy. Interventions targeting women with RM may improve the health outcomes of women and their children.

Plain English Summary

Recurrent miscarriage (RM), defined as two or more consecutive pregnancy loss, has been described as a traumatic event for women. Depression and anxiety are highly prevalent in the women diagnosed with RM and may extend to subsequent pregnancy. Social support is a protective factor against depression and anxiety for low risk pregnancy. Yet, it is unclear about changes in and relationships between anxiety, depression and social support among the pregnant women with a history of RM. This study was to examine the changes in and relationships among anxiety, depression and social support in pregnant women with a history of RM. A prospective, longitudinal study was conducted by recruiting 166 in their early pregnancy, and were follow-up in middle and late pregnancy respectively. The occurrence of anxiety symptoms in early, middle and late pregnancy were 47.6%, 36.1% and 32.5% while the occurrence of depressive symptoms were 38%, 34.3% and 31.3% respectively. Our study highlights anxiety and depressive symptoms are highly prevalent in the pregnant women with RM, especially in early pregnancy when social support is at the lowest level. There was moderate correlations among anxiety, depression and social support across the pregnancy. Assessing and managed anxiety and depression in pregnant...
women with a history of RM should be as a routine. Developing evidence-based interventions to enhance the level of social support should also be warranted, especially in the first trimester of pregnancy.

**Background**

Recurrent miscarriage (RM) is a frequent obstetric complication, affecting nearly 5% couples[1]. It is defined as two or more pregnancy loss according to the American Society for Reproductive Medicine[2]. Nearly 80% of women who experienced miscarriage become pregnant again[3], although the risk of future miscarriage can reach 30% and the prognosis worsens with increased maternal age[4].

Pregnancy loss is a complex biological and psychological event and is regarded as a significant loss in women’s lives[5]. The women who have experienced a pregnancy loss are a more vulnerable population and consistently reported to exhibit significantly elevated rates of anxiety and depressive symptoms during a subsequent pregnancy[5, 6]. A recent meta-analysis which combined nineteen studies confirmed the significant effect of perinatal loss on anxiety and depression in women during subsequent pregnancy[7]. Moreover, the number of pregnancy losses significantly predicted the level of anxiety and depressive symptoms in the subsequent pregnancy[8].

In addition, the presence of anxiety and depressive symptoms changes across the three trimesters of pregnancy. For low-risk pregnant women, the prevalence rate for anxiety symptoms in the first trimester was 18.2% increasing as the pregnancy progressed to 24.6% in the third trimester[9]. The change courses of depression varies between systematic reviews. Gavin et al.[10]found that the prevalence of depression in the first trimester is 11.0%, then drops to 8.5% in the second and third trimester, while Bennett et al. [11]found a prevalence of 7.4% in early pregnancy, 12.8% in mid-pregnancy, and 12% in late pregnancy. However, there is little research on the change courses of anxiety and depression in pregnant women with a history of RM.

Anxiety and depression in pregnant women have been found to be related to miscarriage, preterm childbirth, low birth weight, emotional and behavioral development disorders in the infant, gestational hypertension, preeclampsia, and other abnormalities during the gestational phase[12, 13]. Furthermore, antenatal anxiety and depression are significant independent predictors of postpartum depression[14].

Psychosocial stress theory identifies social support as a protective factor against depressive and anxiety symptoms during pregnancy[15–17]. Social support is defined as the interpersonal resources accessed and mobilized when individuals attempt to deal with the everyday stresses and strains of life[18]. Social support can provide reassurance, clarification, discussion and stability during stressful events[16, 19]. Two recent systematic reviews consistently confirmed that lack of social support is a factor strongly associated with an increased risk of antenatal anxiety and depression[15, 17]. The women with low levels of social support were more likely to experience antenatal anxiety /depressive symptoms.
Knowledge of the anxiety, depression and social support in pregnant women with a history of RM across the pregnancy will have significant implications for identifying and prevent psychological disease and adverse pregnancy outcomes. However, few researchers have examined changes in and relationships between anxiety, depression and social support among the pregnant women with a history of RM across three trimesters of pregnancy using a longitudinal design. Thus, the aims of this study were: (a) to explore changes in the level of anxiety and depressive symptoms and social support across the three trimester of pregnancy, and (b) to identify the relationship between depression, anxiety and social support across the pregnancy in Chinese women with a history of RM.

**Methods**

**Study design**

A prospective, longitudinal study was used. The participants were recruited at their 6–12 gestational weeks, and were follow-up at 20–24 and 32–36 gestational weeks respectively (three surveys in total).

**Setting and participants**

This study was conducted in Guangzhou between September 2016 and October 2017. Guangzhou is a sub-provincial city located in southeastern China. It is the capital of Guangdong Province. It has a population of approximately 16 million. The participants were recruited from a teaching hospital which has over 3000 beds and provides leading services for patients diagnosed with RM in mainland China.

The women were recruited from the RM clinics of the study hospital. The inclusion criteria were: 1) having a history of two consecutive spontaneous miscarriage; 2) being pregnant as indicated by ultrasonography at 6–12 gestational weeks. Women with a history of psychiatric disorders or miscarried during the period of data collection were excluded.

**Measures**

**Depression.** The Edinburgh Postnatal Depression Scale (EPDS) was used to assess the presence of depressive symptoms[20]. It is a 10-item self-report instrument. For each item, respondents rate how they felt in the past week using the four options: *As much as I ever did, Yes, most of the time, Not at all, or No, never*. The Chinese version of the EPDS has been validated in the sample of Chinese women during pregnancy and has good reliability and validity[21]. Reported internal consistency was 0.91[21]. The prevalence of depressive symptoms was identified using the recommended cutoff point of 13 or above[20, 22]. The Cronbach’s α was 0.76 in the present study.

**Anxiety.** Anxiety symptoms were measured by the Self-Rating Anxiety Scale (SAS)[23]. It contains 20 items. Each item is answered on a 4-point scale ranging from 1 (none or a little of the time) to 4 (most or all of the time). Some of the items reflect positive perceptions and some, negative perceptions. Negative-worded items are reverse-scored prior to the summation of the scores of the individual items. The total score is multiplied by 1.25 to reach a standardized score ranging from 25 to 100; a higher score indicates
a higher level of anxiety and vice versa. An SAS standard score \( \geq 50 \) indicated the presence of anxiety symptoms\[23\]. The Chinese version of Zung’s SAS had demonstrated good reliability and validity\[24\]. The Cronbach’s \( \alpha \) was 0.72 in the present study.

**Social support.** Social support was measured by the Perceived Social Support Scale (PSSS)\[25\]. The PSSS contains 12 items. Each item is rated on a 7-point scale ranging from “strongly disagree” to “strongly agree”. Possible scores range from 12 to 84. Higher scores suggest greater perceived social support. The original PSSS has good reliability and validity\[25\]. The Chinese version also has good psychometric properties, with test-retest reliability of 0.81 and internal consistency of 0.85\[19\]. The Cronbach’s \( \alpha \) was 0.89 in the present study.

A self-designed social-demographic questionnaire was used to collect data on age, the length of time being married, monthly household income, employment status and number of living children. A number of antenatal characteristics were also collected, including number of previous miscarriages, time from the last miscarriage, pregnancy following in-vitro fertilization, perceived childbearing importance, planned pregnancy.

**Ethical considerations**

Ethical approval has been obtained from the University and the study hospital. All participants were assured that their data would be kept confidential, the participation was entirely voluntary and they could withdraw from the study at any time. They were informed of the purpose and the procedure of the study. The women’s written consents were obtained before inclusion. During the study period, psychiatric consultation was available when requested by participants. If a participant had an episode of increased depressive or anxiety symptoms, medical care was administered and the participant was provided with a referral to the psychiatry clinic in the Hospital.

**Procedure**

The data were collected by the first author who was a master student majored in Nursing. The eligible women were identified by checking their medical record in the hospital and invited to participate in the study at the RM clinics. Details of the purpose and procedure of the study were explained to the women. After giving informed consent, the participant was asked to complete the SAS, EPDS, PSSS and the socio-demographic questionnaire in an interview room. The participants were followed up until their 32–36 gestational weeks (T2: 20–24 gestational weeks, T3: 32–36 gestational weeks). Appointments for data collection were made in accordance with the participants’ antenatal check-ups. At T2 and T3, the participants were asked to fill in the SAS, EPDS and PSSS in an interview room at the antenatal clinic in the study hospital.

**Statistical Analysis**

Data was analyzed using the SPSS for Windows (version 20.0; SPSS Inc., Chicago, IL., USA). Descriptive statistics were used to analyze the participants’ demographic information and the study variables. Pearson product-moment correlations were used to assess relationships among anxiety, depression and
social support across the three trimesters. Univariate repeated measures analyses of variance (ANOVA) was used to assess changes in anxiety, depression and social support across the three trimester of pregnancy. Paired t-tests were used to examine difference between the mean scores on anxiety, depression and social support from the first trimester to the third trimester.

Results

A total of 298 eligible pregnant women were approached at T1, 20 women refused to participate and 278 completed the first survey (T1: 6-12 gestational weeks), with a response rate of (93.3%). There were 83 women who miscarried after the first measurement and were excluded at T2, 16 pregnant women dropped out at T2. Three women who miscarried after the second measurement and were excluded at T3. Ten women dropped out at T3. Thus, at T2 and T3, 179 and 166 pregnant women completed the second and the third measurement respectively. The recruitment process and the flow of the study are presented in Figure 1. There was no significant difference in demographic characteristics between the women who completed the three measurement and those who did not.

Sample characteristics

Table 1 presents the demographic and antenatal characteristics of the participants. The mean age of the participants was 31.87 years (SD = 4.21). More than 54.2% of the participants had three or more miscarriage previously. 59.6% of the participants had been married for more than five years. Over 74.1% of the participants were childless.

Changes over time in depression

Table 2 presents the ANOVA results of the study variables. An ANOVA revealed the main effect of time, indicating significant mean differences in depression from the first trimester to the third trimester ($F[2, 330] = 8.184, p < 0.001$). Repeated contrasts for time indicated that antenatal depression scores declined from the first trimester to the second trimester ($F[1,165] = 5.887, p = 0.016$). The change in antenatal depression scores between the second trimester and the third trimester was not significant ($F[1,165] = 2.035, p = 0.156$). A paired t-test revealed that the level of depressive symptoms at the first trimester was much higher than those at the third trimester ($t[165] = 4.371, p < 0.001$). The scores of depression across the three trimesters of pregnancy are presented in Figure 2-a. Furthermore, the occurrence of depressive symptoms at T1, T2, and T3 was 38.0% (n = 63), 34.3% (n = 57) and 31.3% (n = 52) respectively.

Changes over time in anxiety

An ANOVA revealed the main effect of time, indicating significant mean differences in anxiety across the three trimester of pregnancy ($F[2, 330] = 25.239, p < 0.001$; Table 2). Repeated contrasts for time showed that the SAS scores declined from the first trimester to the second trimester ($F[1,165] = 17.097, p < 0.001$) and then the third trimester ($F[1,165] = 8.143, p = 0.005$). A paired t-test revealed that the level of anxiety symptom at the first trimester was much higher than those at the third trimester ($t[165] = 7.465, p <$
The scores of anxiety across the three trimesters of pregnancy are presented in Figure 2-b. Furthermore, the occurrence of anxiety symptoms at T1, T2 and T3 were 47.6% (n = 68), 36.1% (n = 60) and 32.5% (n = 55) respectively.

Changes over time in social support

An ANOVA revealed the main effect of time, indicating significant mean differences in social support over the course of the pregnancy ($F[2, 330] = 4.037, p = 0.018$; Table 2). Repeated contrasts for time indicated that social support scores increased from the first trimester to the second trimester ($F[1,165] = 7.351, p = 0.007$). The change in social support between the second trimester and the third trimester was not significant ($F[1,165] = 0.657, p = 0.419$). A paired t-test revealed that the level of social support at the first trimester was much lower than those at the third trimester ($t[165] = 2.023, p = 0.045$). The scores of social support across the three trimesters of pregnancy are presented in Figure 2-c.

Relationships among the study variables

Table 3 presents the relationships among study variables. The correlations between anxiety and depression, anxiety and social support, depression and social support at each time point were significant ($p<0.001$).

Discussion

In the present study, nearly one thirds of the pregnant women miscarried before 20–24 gestational weeks. The findings of the present study confirmed the evidence that the women with a history of RM have a very high risk for miscarriage in their subsequent pregnancy[1]. The high risk for miscarriage in the subsequent pregnancy may be a trigger of stress in the pregnant women with a history of RM.

The present study found that the pregnant women with a history of RM had a high level of anxiety and depression across the pregnancy, and the prevalence of anxiety and depressive symptoms were also very high. The occurrence of anxiety symptoms in early, middle and late pregnancy were 47.6%, 36.1% and 32.5% respectively while the occurrence of depressive symptoms were 38%, 34.3% and 31.3% respectively. Carvalho et al.[26]also reported that the prevalence of depressive symptoms was 41.3% among Brazilian pregnant women with a history of RM.

The prevalence of depressive and anxiety symptoms found in the present study were much higher than those found in low-risk pregnant women[9–11]. The findings of the present study consistent with the previous studies[5, 8]confirmed that the women with a history of RM were at a higher risk for developing anxiety and depression in the subsequent pregnancy. The previous miscarriages and having to live with the insecurity and threat of a new miscarriage may result in the elevated prevalence of anxiety and depressive symptoms. The findings of the present study suggest that tracking anxiety and depression should be part of the routine in the prenatal visits of women with RM.
In addition, the present study found that the participants had the highest occurrence of anxiety (47.6%) and depression (38.0%) in early pregnancy. And the level of anxiety decreased from the early pregnancy to late pregnancy while the level of depression first declined from early pregnancy to mid-pregnancy then remained to late pregnancy. These results were different from those reported in low-risk pregnant women with the highest prevalence of anxiety and depression in the second or third trimester[9–11]. It may be due to fears about the possibility of miscarriage decreased and sense of security about the pregnancy and baby increased across the three trimesters of pregnancy. It is reported that prior to 16 weeks of gestation, women with a history of prenatal loss had greater levels of worry about loss in the current pregnancy than did the women without a pregnancy loss[27, 28]. The highest fears of a new miscarriage in the first trimester resulted in the highest occurrence and levels of anxiety and depression. This result highlights the need for maternal anxiety and depressive symptoms to be assessed and managed as early as possible over the course of the pregnancy in the women with a history of RM.

The present study found a moderate correlation between anxiety and depression at each time point. The results of this study suggested the co-morbidity of anxiety and depression over the course of pregnancy in pregnant women with a history of RM. A recent meta-analysis indicated that co-morbid anxiety and depression affects about one in ten low-risk pregnant women[29]. The increased level of anxiety and depressive symptoms in pregnant women with a history of RM may make the comorbidity of anxiety and depression more marked. Co-morbid anxiety and depression are associated with higher symptom severity, chronicity, suicidality, and treatment resistance[29]. The result of this finding suggested health care providers should screen pregnant women with a history of RM for depression as well as for anxiety, and facilitate treatment of both conditions. Correlations was also found between anxiety, depression and social support at each time point. The findings of the present study consistent with the previous studies[15–17] indicated the pivotal role of social support on depression and anxiety over the course of pregnancy.

However, the trend of social support were not in line with that of anxiety or depression, which increased over time in pregnancy with the lowest level in the first trimester. It may due to the infertility stress. Chinese people consider fertility and childbearing ability of great importance to women. There is a tendency of society that “Childlessness is always the woman's fault”[30]. In the present study, nearly one third of the women aged 35 or above. Two thirds of the women had been married for 5 years or longer. These women may have more pressure to have children. Fearing the potential miscarriage in early pregnancy, the women may not disclose her pregnancy to her family members, which may isolate them from possible sources of social support. Ockhuijsen et al.[31] pointed out that pregnant women with a history of RM were uncertain about the ongoing pregnancy and hid their pregnancy. Earlier studies have also demonstrated that these women who have suffered a miscarriage and have become pregnant again are missing the necessary support and understanding regarding their anxieties that they need under their circumstances[32]. Research to develop evidence-based interventions to enhance the level of social support in pregnant women with a history of RM is warranted, especially in the first trimester of pregnancy.
The study has limitations. This study was conducted in only one hospital and most participants were employed women. These findings may not therefore be representative of other settings or apply to those who are unemployed.

**Conclusion**

The present study highlighted that the first trimester of pregnancy was the period when the pregnant women with a history of RM have the highest level and rate of anxiety and depressive symptoms with the lowest level of social support. Tracking anxiety and depression in the prenatal visits in the pregnant women with a history of RM should be the routine care. Research to develop evidence-based interventions to enhance the level of social support and reduce anxiety and depression in pregnant women with a history of RM is warranted.

**Abbreviations**

RM Recurrent miscarriage

SAS Self-Rating Anxiety Scale

EPDS Edinburgh Postnatal Depression Scale

PSSS Perceived Social Support Scale

**Declarations**

**Ethics approval and consent to participate**

The protocol for the research project has been approved by School of Nursing and the Second Affiliated Hospital of Sun Yat-sen University (Sun Yat-sen Memorial Hospital). The research conforms to the provisions of the Declaration of Helsinki in 1995 (as revised in Edinburgh 2000). All participants gave informed consent for the research, and their anonymity was preserved.

**Consent for publication**

Not applicable.

**Availability of data and materials**

The dataset analysed during the current study is not publicly available because consent was not been obtained from the study participants for this. Deidentified data may be made available from the corresponding author on reasonable request, subject to permission from the relevant ethics committees at the hospital and university.

**Competing interests**
There is no potential conflict of interest relevant to this article.

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**Authors' contributions**

JQ and LLG were responsible for the study conception and design; and were responsible for the drafting of the manuscript. XLW helped in drafting the manuscript. JQ performed the data collection. JQ and XLW performed the statistical analysis under supervision of LLG. All the authors reviewed and approved the final manuscript.

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**Tables**

Table 1

Demographic and obstetric characteristic of the participants

\[ n = 166 \]
| Characteristics                              | Mean  | SD   | Range  |
|---------------------------------------------|-------|------|--------|
| Gestational weeks at T1                     | 6.7   | 1.1  | 6-12   |
| Gestational weeks at T2                     | 21.7  | 1.2  | 20-24  |
| Gestational weeks at T3                     | 33.6  | 1.0  | 32-36  |

| Age (Years) |
|-------------|
| 30          | 49   | 29.5 |
| 30-34       | 72   | 43.4 |
| ≥35         | 45   | 27.1 |

| The length of time being married (Years) |
|-----------------------------------------|
| ≤4                                      | 67   | 40.4 |
| 5-9                                     | 78   | 47.0 |
| ≥10                                     | 21   | 12.6 |

| Employment |
|------------|
| Employed   | 134  | 80.7 |
| Unemployed | 32   | 19.3 |

| Monthly household income (per person per month) |
|------------------------------------------------|
| ¥4000 (about US$563)                           | 27   | 16.2 |
| ¥4000-¥4999 (about US$563–US$704)              | 32   | 19.3 |
| ¥5000-¥5999 (about US$704–US$845)              | 32   | 19.3 |
| ≥¥6000 (about US$845)                          | 75   | 45.2 |

| Number of the previous miscarriages |
|-------------------------------------|
| 2                                   | 76   | 45.8 |
| 3                                   | 57   | 34.3 |
| ≥4                                  | 33   | 19.9 |

| Time from the last miscarriage (Months) |
|-----------------------------------------|
| ≤6                                      | 28   | 16.9 |
| 7-12                                    | 44   | 26.5 |
> 12 94 56.6
pregnancy following in-vitro fertilization

No 138 83.1
Yes 28 16.9

Perceived childbearing importance

Important 157 94.6
Not important 9 5.4

Number of Children

0 123 74.1
≥ 1 43 25.9

Table 2
Means, standard deviations and the ANOVA results of study variables (n = 166).

| Variables          | T1          | T2          | T3          | ANOVA |
|--------------------|-------------|-------------|-------------|-------|
|                    | Mean  SD    | Mean  SD    | Mean  SD    | F     | P    |
| Anxiety            | 48.9 7.66   | 46.1 10.9   | 44.0 10.5   | 25.2 4 | 0.001 |
| Depression         | 11.3 3.87   | 10.4 4.99   | 9.97 4.92   | 8.18 4 | 0.001 |
| Social support     | 63.3 9.89   | 65.8 10.2   | 65.1 9.01   | 4.04 4 | 0.018 |

Note: T1: 6-12 gestational weeks; T2: 20-24 gestational weeks; T3: 32-36 gestational weeks.

Table 3
Pearson's correlations between study variables (n = 166)
|   | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 |
|---|---|---|---|---|---|---|---|---|---|
| 1. Anxiety at 6-12 gestational weeks |   |   |   |   |   |   |   |   |   |
| 2. Anxiety at 20-24 gestational weeks | - | .542** |   |   |   |   |   |   |   |
| 3. Anxiety at 32-36 gestational weeks |   | .651** | .592** |   |   |   |   |   |   |
| 4. Depression at 6-12 gestational weeks |   | .433** | .442** | .451** |   |   |   |   |   |
| 5. Depression at 20-24 gestational weeks |   | .318** | .497** | .418** | .461** |   |   |   |   |
| 6. Depression at 32-36 gestational weeks |   | .445** | .492** | .443** | .514** | .581** |   |   |   |
| 7. Social support at 6-12 gestational weeks | - .362** | - .318** | - .288** | - .452** | - .191* | - .179* |   |   |   |
8. Social support at 20-24 gestational weeks

|                | .314** | -.419** | -.381** | -.238** | -.365** | -.373** | .257** |
|----------------|--------|---------|---------|---------|---------|---------|--------|

9. Social support at 32-36 gestational weeks

|                | -.321** | -.335** | -.305** | -.350** | -.403** | -.430** | .293** | .284** |
|----------------|---------|---------|---------|---------|---------|---------|--------|--------|

* p < 0.05. ** p < 0.001.

**Figures**
Figure 1

The recruitment process and the flow of the study
Figure 2

Fig 2-a. Longitudinal changes of EPDS scores. Time 1: 6-12 gestational week; Time 2: 20-24 gestational week; Time 3: 32-36 gestational week Fig 2-b. Longitudinal changes of SAS scores. Time 1: 6-12 gestational week; Time 2: 20-24 gestational week; Time 3: 32-36 gestational week Fig 2-c. Longitudinal changes of PSSS scores. Time 1: 6-12 gestational week; Time 2: 20-24 gestational week; Time 3: 32-36 gestational week

Supplementary Files

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

- demographicdata.sav